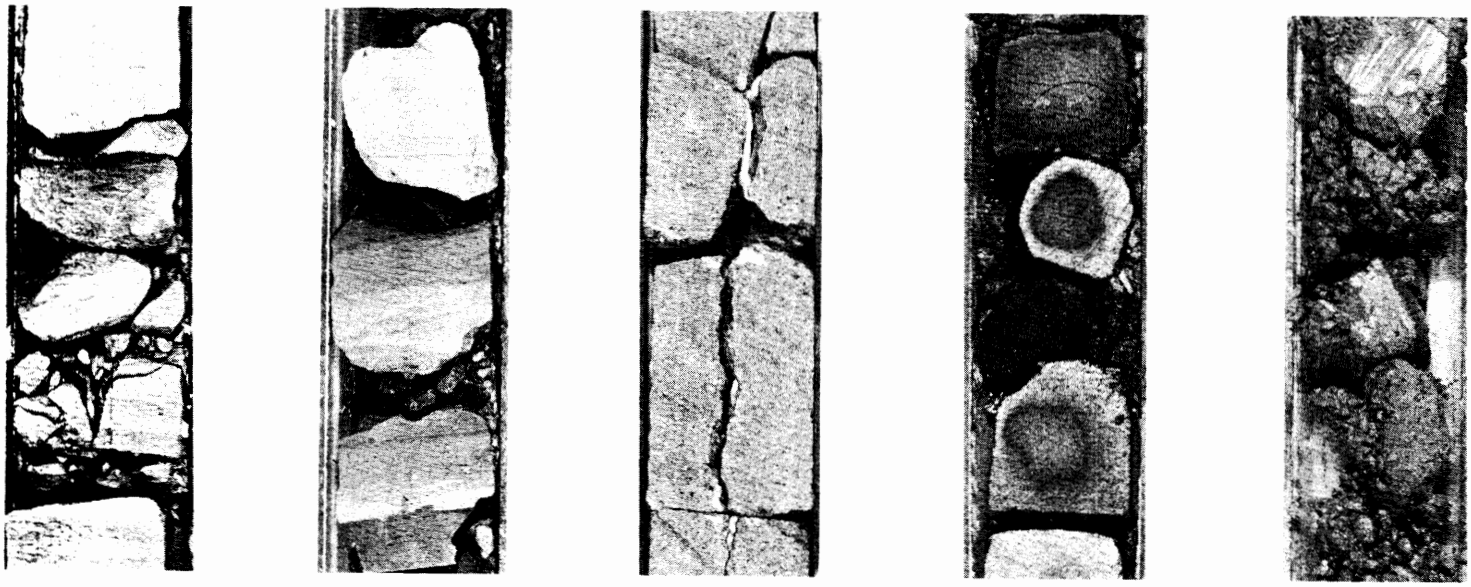
INITIAL CORE DESCRIPTIONS

DEEP SEA DRILLING PROJECT

LEG 58

NORTH PHILIPPINE SEA



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Under Contract C-482
By the
UNIVERSITY OF CALIFORNIA
Scripps Institution of Oceanography
Prime Contractor for the Project

INITIAL CORE DESCRIPTIONS

DEEP SEA DRILLING PROJECT

LEG 58

10 December 1977 — 31 January 1978

A Project Planned by and Carried Out With the Advice of the
JOINT OCEANOGRAPHIC INSTITUTIONS FOR DEEP EARTH SAMPLING (JOIDES)

MEMBER ORGANIZATIONS

Institute of Geophysics, University of Hawaii
Lamont-Doherty Geological Observatory, Columbia University
School of Oceanography, Oregon State University
Graduate School of Oceanography, University of Rhode Island
Rosenstiel School of Marine and Atmospheric Sciences, University of Miami
Scripps Institution of Oceanography, University of California
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Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover
Ocean Research Institute, University of Tokyo
USSR Academy of Sciences, P. P. Shirshov Institute of Oceanology, Moscow

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PARTICIPATING SCIENTISTS

George deVries Klein, Kazuo Kobayashi, Herve Chamley, Doris Curtis, Henry Dick, Dorothy Jung Echols, David M. Fountain, Hajimu Kinoshita, Nicholas G. Marsh, Atsuyuki Mizuno, Gennady V. Nisterenko, Hisatake Okada, Jon R. Sloan, Douglas Waples, Stan M. White

UNIVERSITY OF CALIFORNIA, SAN DIEGO

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SCRIPPS INSTITUTION OF OCEANOGRAPHY LA JOLLA, CALIFORNIA 92093

March 15, 1979

Dear Colleague:

This document has been printed and distributed by the Deep Sea Drilling Project for the purpose of sample selection by interested earth scientists. Sample requests are honored two months after publication of the Initial Core Descriptions or no later than one year following completion of the cruise on which the samples were collected. It is an interim and informal document consisting of site data and sedimentologic and paleontologic data and interpretations as known six (6) months post-cruise. These data, while adequate for most sample selection needs, are subject to slight revision by the time of issue of the corresponding volume of the Initial Reports of the Deep Sea Drilling Project.

The information contained herein is preliminary and privileged, consequently this document is not to be cited or used as the basis of other publications. Data cited or used in a manuscript will be considered a breach of professional ethics.

Thank you for your interest in the Deep Sea Drilling Project.

Sincerely,

David G. Moore
Chief Scientist
Deep Sea Drilling Project

INITIAL CORE DESCRIPTIONS – LEG 58

OBJECTIVES OF LEG 58

Leg 58 was planned to build on the prior successes of Legs 6 and 31 in the North Philippine Sea and to answer some unresolved problems left from prior drilling in the back-arc basins of the western Pacific (Legs 6, 7, 19, 20, 21, 30, 31). Specifically, Leg 58 drilled three sites in the Shikoku Basin and two in the Daito Ridge-and-Basin Province (Figure 1) of the northwestern Philippine Sea with the aim of determining: (1) the tectonic evolution of the two basins, (2) the nature of the basaltic basement in these areas, (3) the relationship of sediment types to tectonics in the region, and (4) the paleooceanography and biostratigraphy of the region. It was expected that drilling into the basement at all these sites,but particularly in the Shikoku Basin, would permit calibration of magnetic anomaly age determinations and their relevance to spreading models proposed for various back-arc basins.

Leg 58 began in Yokohama, Japan, on December 10, 1977 and ended in Naha, Okinawa,Japan on January 31, 1978. Five sites were drilled; core recovery data is shown in Table 1.

SHIKOKU BASIN RESULTS

The sedimentology and stratigraphy of the Shikoku Basin sites (442, 443, and 444) were similar (Figure 2). All sections consisted of hemipelagic clays with accessory nannofossil ooze and volcanic ash. A pelagic red clay with nannofossils occurred at the base of the sedimentary sequence on top of basalt at each site.

The basalts are similar to oceanic tholeiites at Sites 443 and 444, but at 442, the basalts differ from normal oceanic tholeiites because they lack olivine and are highly vesicular. Both pillow basalts and massive, intrusive basalts are present, giving rise to a complex basalt stratigraphy; one basalt sill intruded sediments at Site 444.

Magnetic inclination of sediments showed that the paleolatitude of the Shikoku Basin was located nearly 500 km south of its present position 15 m.y.B.P. Paleomagnetic measurements of basalts showed that the source of the magnetic anomaly signal is below the depth of maximum penetration.

The age of the oldest sediment recovered at each site was 18-21 m.y.B.P. (442), and 14-15 m.y.B.P. (443, 444). The oldest sediment age at 442 is in agreement with the magnetic anomaly for the site (anomaly 6), but is at variance with the magnetic anomaly age (6A) at 443 and 444. Earlier magnetic mapping suggested that the basin spreading ceased 17 m.y.B.P., but our drilling disclosed that volcanism continued until 14 to 15 m.y.B.P. and closed with the intrusion of a sill about 13 to 14 m.y.B.P. The Shikoku Basin was therefore characterized by a history of later off-ridge volcanism, and this volcanism has obscured the possiblity of using the age of the oldest sediment to assist in determining the validity of tectonic interpretations determined from magnetic anomalies. Earlier magnetic surveys suggested that the Shikoku Basin formed by symmetrical spreading, but our drilling results are compatible either with symmetrical, single-limb or asymmetrical spreading models.

DAITO RIDGE-AND-BASIN RESULTS

The stratigraphy and sedimentology of the two sites (445, 446) in the Daito Ridge-and-Basin Province of the northwest Philippine Sea are similar, with an older (Eocene) succession of turbidites and debris flow deposits containing reworked shallow-water foraminifera *(Nummulites)*, overlain by pelagic carbonates (445) or pelagic clays (446) (Figure 3).

Igneous rocks were recovered only at Site 446 in the Daito Basin and consist of 23 tholeiitic sills intruding early Eocene turbidites. These sills contain altered olivine and hornblende. The age of this intrusive activity is not known.

The age of the oldest sediment recovered at 445 and 446 is 52 m.y.B.P. Although basement was not reached, drilling terminated not far above it, suggesting both areas may have basement as young as earliest Eocene. Paleomagnetic analysis shows that Sites 445 and 446 shifted from an equatorial latitude during early Eocene to their present latitude, a lateral shift of approximately 2,000 km. That shift in paleolatitude suggests that the basement of the Daito Ridge-and-Basin Province formed during the earliest stage (Paleogene) of two-limb spreading of the west Philippine Basin.

For fuller discussion, see *Geotimes,* May 1978, v. 23, no. 5, p. 23-25, and Klein, G. deV., Kobavashi, K., et al., 1978, *Nature,* v. 273, p. 746-748.

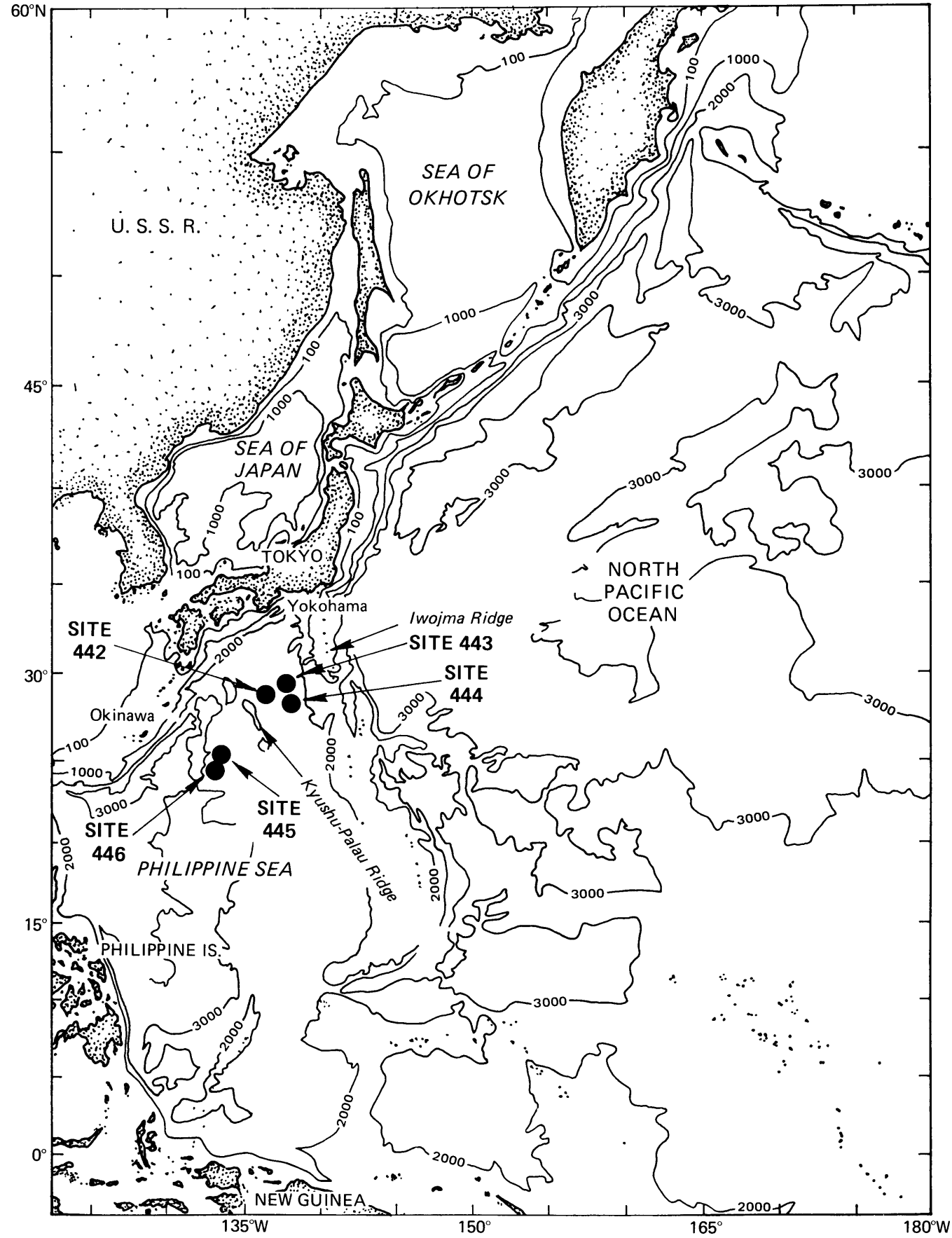


Figure 1. Leg 58 Site Location Map

Table 1. Leg 58 Coring Summary

HOLE	DATES (1977, 1978)	LATITUDE	LONGITUDE	WATER DEPTH* (m)	PENETRATION (m)	NUMBER OF CORES	METERS CORED	METERS RECOVERED	PER CENT OF RECOVERY
442	17 December	28° 59.00'N	136° 03.43'E	4639.0	0.5	1	0.5	0.10	20
442A	18-20 December	28° 59.00'N	136° 03.43'E	4639.0	313.5	34	313.5	154.26	49
442B	20-27 December	28° 59.04'N	136° 03.43'E	4634.5	455.0	20	187.5	50.99	27
443	28 December-4 January	29° 19.65'N	137° 26.43'E	4372.0	581.5	64	581.5	304.05	52
444	4-5 January	28° 38.25'N	137° 41.03'E	4843.0	91.5	10	91.5	41.49	45
444A	6-9 January	28° 38.25'N	137° 41.03'E	4843.0	310.0	27	228.0	107.20	47
445	11-17 January	25° 31.36'N	133° 12.49'E	3377.0	892.0	94	892.0	619.52	69
446	18-21 January	24° 42.04'N	132° 46.49'E	4952.0	420.5	46	420.5	197.10	47
446A	22-26 January	24° 42.04'N	132° 46.49'E	4952.0	628.5	28	256.5	117.09	46
						324	2971.5	1591.80	54

*water depth is from sea level

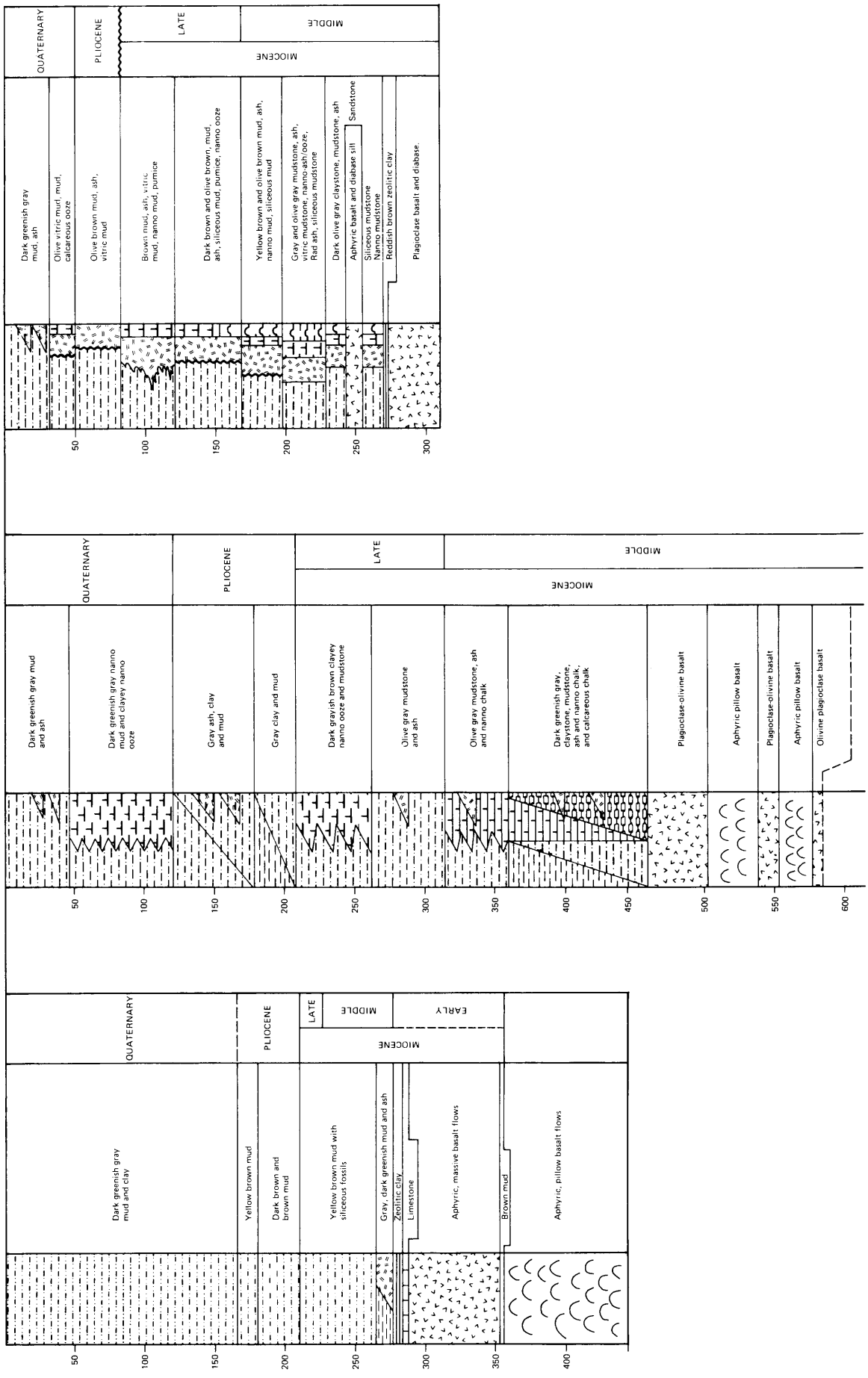


Figure 2. The Sedimentology and Stratigraphy of the Shikoku Basin Sites (442, 443, and 444).

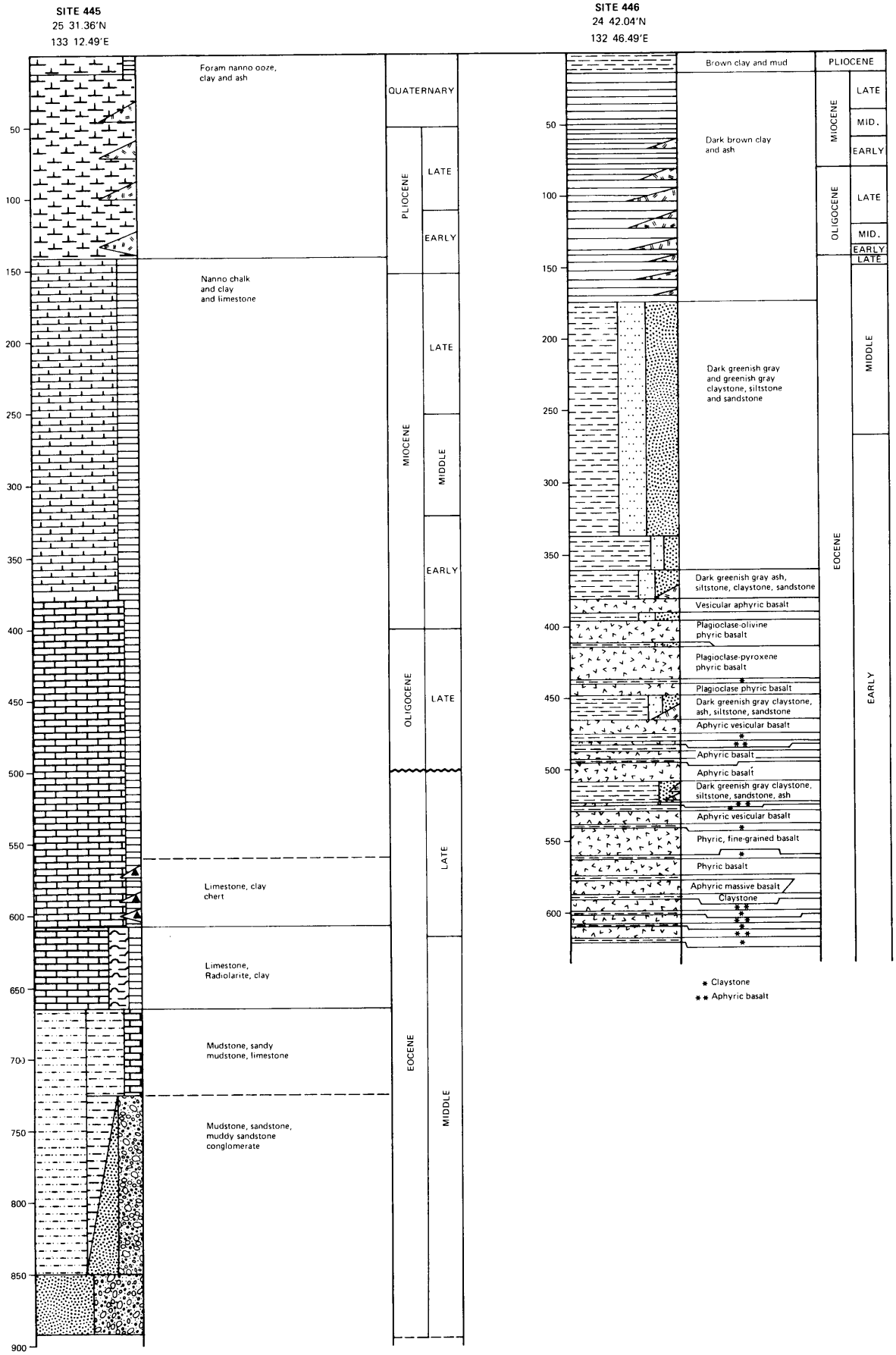


Figure 3. The Stratigraphy and Sedimentology of Two Sites (445 and 446) in the Daito Ridge-and-Basin Province of the Northwest Philippine Sea.

EXPLANATORY NOTES

INTRODUCTION

Leg 58 Initial Core Description is presented here to aid investigators in selecting samples for detailed study. Samples from Leg 58 become available to the Scientific Community two months after the publication of this ICD.

Potential investigators who desire to obtain samples should refer to the DSDP-NSF Sample Distribution Policy. Sample request forms may be obtained from:

The Curator
Deep Sea Drilling Project, A-031
University of California, San Diego
La Jolla, California 92093

Requests must be as specific as possible: include site, core, section, interval within a section, and volume of sample required. The purpose of this publication is to aid interested investigators in understanding the (1) terminology, labeling, and numbering conventions used by the Deep Sea Drilling Project (DSDP); (2) sediment classification and biostratigraphic framework used on Leg 58; and in addition (3) present the preliminary lithologic and paleontologic data on core forms, so that sampling can be guided. However, the investigator should be aware that the data is subject to future revision.

NUMBERING OF SITES, HOLES, CORES, AND SAMPLES

DSDP drill sites are numbered consecutively from the first site drilled by *Glomar Challenger* in 1968. Site numbers are slightly different from hole numbers. A site number refers to one or more holes drilled while the ship was positioned over one acoustic beacon. These holes could be located within a radius as great as 900 meters from the beacon. Several holes may be drilled at a single site by pulling the drill pipe above the sea floor (out of one hole) and moving the ship 100 meters or more from the previous hole, and then begin drilling another hole.

The first (or only) hole drilled at a site takes the site number. A letter suffix distinguishes each additional hole at the same site. For example: the first hole takes only the site number; the second takes the site number with suffix A; the third takes the site number with suffix B, and so forth. It is important, for sampling purposes, to distinguish the holes drilled at a site, since recovered sediments or rocks from different holes usually do not come from equivalent positions in the stratigraphic column.

The cored interval is measured in meters below the sea floor. The depth interval of an individual core is the depth below sea floor that the coring operation began to the depth that the coring operation ended. Each coring interval is generally 9.5 meters long, which is the nominal length of a core barrel; however, the coring interval may be shorter or longer (rare). "Cored intervals" are not necessarily adjacent to each other, but may be separated by "drilled intervals". In soft sediment, the drill string can be "washed ahead" with the core barrel in place, but not recovering sediment, by pumping water down the pipe at high pressure to wash the sediment out of the way of the bit and up the space between the drill pipe and wall of the hole; however, if thin hard rock layers are present then it is possible to get "spotty" sampling of these resistant layers within the washed interval, and thus have a cored interval greater than 9.5 meters.

Cores taken from a hole are numbered serially from the top of the hole downward. Core numbers and their associated cored interval in meters below the sea floor are normally unique for a hole, however, problems may arise if an interval is cored twice. When this situation occurs, the core number is assigned a suffix, such as "S"* for supplementary.

Full recovery for a single core is normally 9.28 meters of sediment or rock, which is in a plastic liner (6.6 cm I.D.), plus about a 0.2 meter-long sample (without a plastic liner) in the Core-Catcher. The Core-Catcher is a device at the bottom of the core barrel which prevents the cored sample from sliding out when the barrel is being retrieved from the hole. The

*Note that this designation has been used on previous legs as a prefix to the core number for sidewall core samples.

sediment-core, which is in the plastic liner, is then cut into 1.5 meter-long sections and numbered serially from the top of the sediment-core (Figure 4). When we obtain full recovery, the sections are numbered from 1 through 7 with the last section possibly being shorter than 1.5 meters. The Core-Catcher sample is placed below the last section when the core is described, and labeled Core-Catcher (CC): it is treated as a separate section.*

When recovery is less than 100 per cent, and if the sediment or rock is contiguous, the recovered sediment is placed in the top** of the cored interval, and then 1.5 meter-long sections are numbered serially, starting with Section 1 at the top. There will be as many sections as needed to accommodate the length of the core recovered (Figure 5); for example 3 meters of core sample in plastic liners will be divided into two 1.5 meter-long sections. Sections are cut starting at the top of the recovered sediment, and the last section may be shorter than the normal 1.5 meter length.

When recovery is less than 100 per cent, the sediment's original stratigraphic position in the cored interval is unknown, so we employ the convention assigning the top of the sediment recovered to the top of the cored interval. This is done for convenience in data handling, and consistency. If recovery is less than 100 per cent, and core fragments are separated, and if shipboard scientists believe the sediment was not contiguous, then sections are numbered serially and the intervening sections are noted as void, whether it is contiguous or not. The Core-Catcher sample is described in the Visual Core Descriptions beneath the lowest section.

Samples are designated by centimeter distances from the top of each section to the top and bottom of the sample in that section. A full identification number for a sample consists of the following information:

Leg
Site
Hole
Core Number
Interval in centimeters from the top of section

For example, a sample identification number of "58-442B-9-3, 12-14 cm" is interpreted as follows: 12 to 14 cm designates a sample taken at 12 to 14 cm from the top of Section 3 of Core 9, from the third hole drilled at Site 442 during Leg 58. A sample from the Core-Catcher of this core is designated as "58-442B-9, CC, 12-14 cm".

The depth below the sea floor for a sample numbered "58-442B-9-3, 12-14 cm", is the summation of the following: 1) the depth to the top of the cored interval for Core 9, which is 362 meters; 2) plus 3 meters for Sections 1 and 2 (each 1.5 meters long); and plus the 12 cm depth below the top of Section 3. All of these variables add up to 365.12 meters***, which theoretically is the sample depth below the sea floor.

HANDLING OF CORES

A core was normally cut into 1.5 meter sections, sealed, and labeled; and then the sections were brought into the core laboratory for processing. The following determinations were normally made before the sections are split: gas analysis, thermal conductivity analysis (soft sediment only), and continuous wet-bulk density determinations using the Gamma Ray Attentuation Porosity Evaluation (GRAPE).

The cores were then split longitudinally into "working" and "archive" halves. Samples were extracted from the "working" half, including those for determination of grain-size distribution, mineralogy by x-ray diffraction, sonic velocity by the Hamilton Frame method, wet-bulk density by a static GRAPE technique, water content by gravimetric analysis, carbon-carbonate analysis, per cent calcium carbonate (Karbonate Bomb), geochemical analysis, paleontological studies, and others.

Smear slides from each major lithology, and most minor lithologies, were prepared and examined microscopically. The archive half was then described and photographed. Physical disturbance by the drill bit, color, texture (for uncemented

* This procedure is followed for sediments only. For basalts, the Core-Catcher sample is incorporated into and given the number of the last section.

** This technique differs from the labeling systems used on Legs 1 through 45, which had a designation called "zero section", but did not have a "number 7 section".

*** Sample requests should refer to a specific interval within a core-section, rather than the level below sea floor.

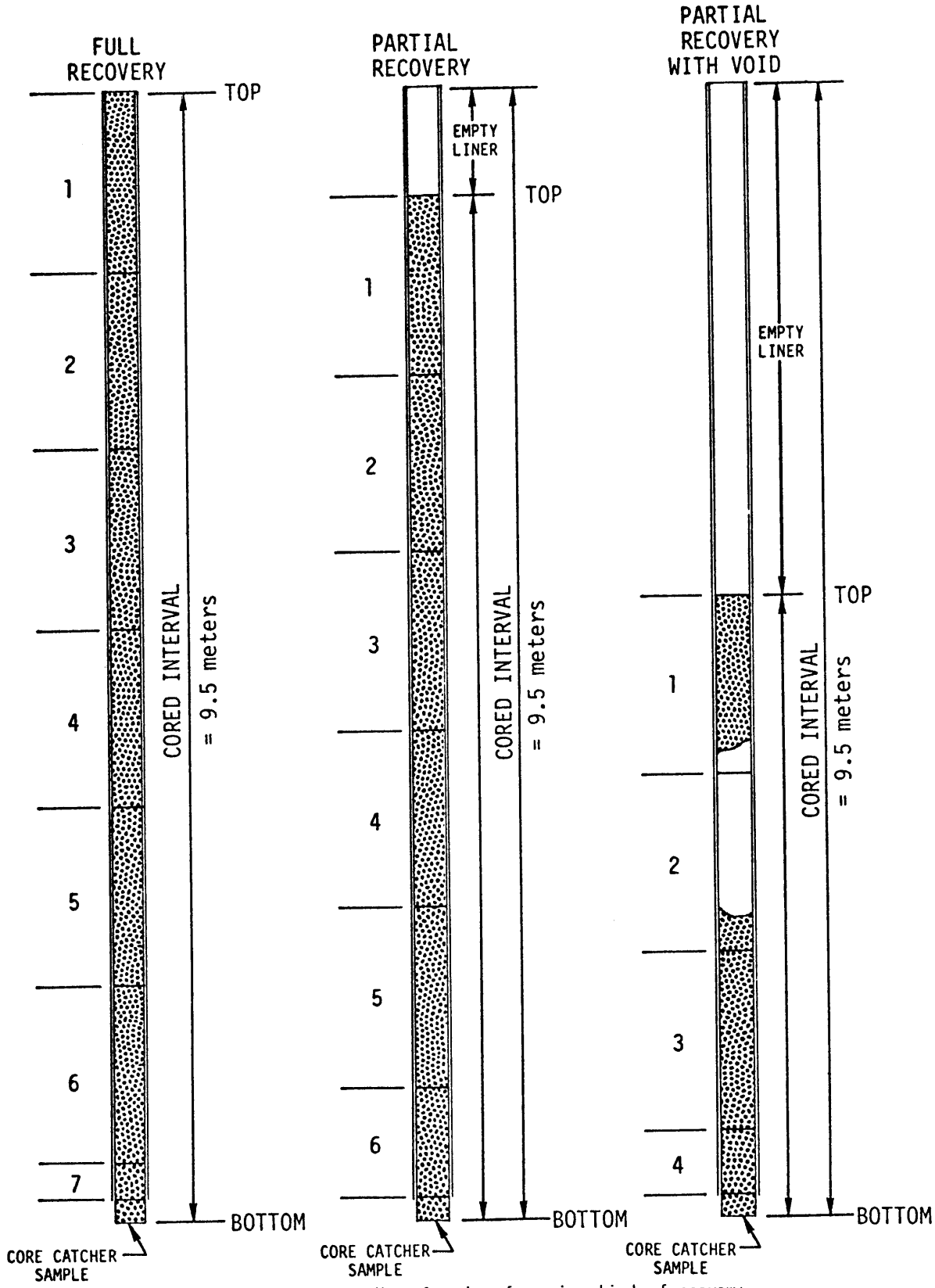


Figure 4. Labeling of sections for various kinds of recovery.

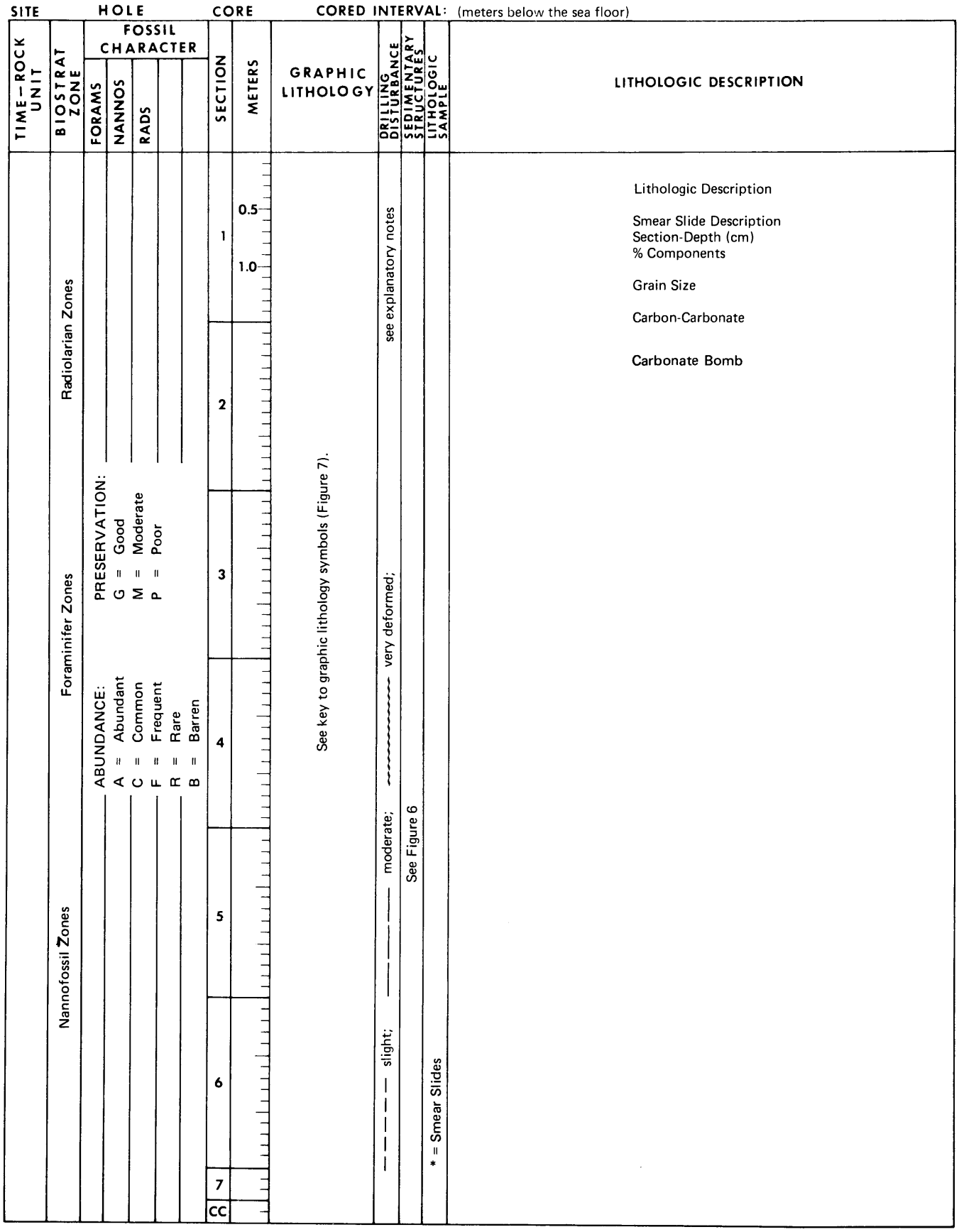


Figure 5. Sample core form (sediment).

lithologies), sedimentary structure and composition (±20%) of the various lithologies were noted on standard core description sheets.

After the cores were sampled and described, they are maintained in cold storage aboard *Glomar Challenger* until they can be transferred to the DSDP repository. Core sections which were removed for organic geochemistry study were frozen immediately on board ship and kept frozen. All Leg 58 cores and frozen cores are presently stored at the DSDP West Coast Repository (Scripps Institution of Oceanography).

Core descriptions, smear slide descriptions, carbonate bomb determinations (% $CaCO_3$; these data were determined aboard ship), grain-size analyses, carbon-carbonate determinations (both determined at the DSDP shore-based laboratory), and x-ray diffraction data (from the labs of German Müller, Universitat Heidelberg) serve as the data for the Visual Core Descriptions in this volume. These samples, and their location in the core, are coded with a symbol on the core description sheets. The key to these codes, in order to identify the samples, is in Figure 5.

SEDIMENT DESCRIPTION CONVENTIONS

SEDIMENT DISTURBANCE

Recovered rocks, and particularly the soft sediments, may be extremely disturbed. This mechanical disturbance is the result of the coring technique, which uses a large 25 cm diameter bit with a small 6.0 cm diameter opening for the core sample. The following disturbance categories are used for soft and firm sediment. These categories will be indicated on the Core Description Sheet (in a column) by coded patterns to which the key is in Figure 5. The categories are as follows:

(a) Slightly deformed: Bedding contacts are slightly bent.

(b) Moderately deformed: Bedding contacts have undergone extreme bowing.

(c) Very deformed: Bedding is completely disturbed, sometimes showing symmetrical diapir-like structure.

(d) Soupy: Water saturated intervals which have lost all aspects of original bedding.

SEDIMENTARY STRUCTURES

In the soft, and even in some harder sedimentary cores, it may be extremely difficult to distinguish between natural structures and structures created by the coring process. A column on the Core Description Sheet (Figure 5) may have patterns (coded symbols) to indicate typical structures. The key to the set of structure-symbol codes is in Figure 6. The symbols used on Leg 58 were a pilot test of a system recommended by an *ad hoc* committee of the JOIDES Sedimentary Petrology and Physical Properties Panel.

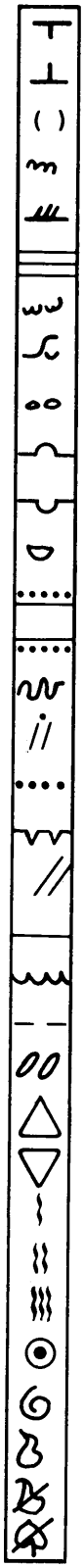
COLOR

Colors of the geologic material are determined with a Munsell or Geological Society of America Rock-Color Chart. Colors were determined immediately after the cores were split and while they were in a wet condition.

GRAPHIC LITHOLOGY COLUMN

A graphic lithologic column is presented. This graphic column is based on this lithologic classification scheme presented below. The lithologies and their corresponding symbols are in Figure 7. Often a single lithology will be represented by a single pattern. Some lithologies are represented by a grouping of two or more symbols. The symbols in this grouping may correspond to end member sediment constituents, such as clay and nannofossil ooze. Normally the symbol for the dominant

Primary Structures



Interval over which primary sedimentary structures occur

Structures indistinct

Current ripples

Micro-cross–laminae (including climbing ripples)

Parallel laminae

Wavy bedding

Flaser bedding

Lenticular bedding

Slump blocks or slump folds

Load casts

Scour

Graded bedding (NORMAL)

Graded bedding (REVERSED)

Convolute and contorted bedding

Water escape pipes

Sedimentary clasts

Mudcracks

Cross-stratification

Sharp contact

Scoured, sharp contact

Gradational contact

Imbrication

Fining-upward sequence

Coarsening-upward sequence

Bioturbation - minor (20% surface area)

Bioturbation - moderate (30-60% surface area)

Bioturbation - strong (more than 60% surface area)

Secondary Structures

Concretions

Compositional Symbols

Fossils in general (megafossils)

Shells (complete)

Shell fragments

Wood fragments

Figure 6. Sedimentary structure symbols.

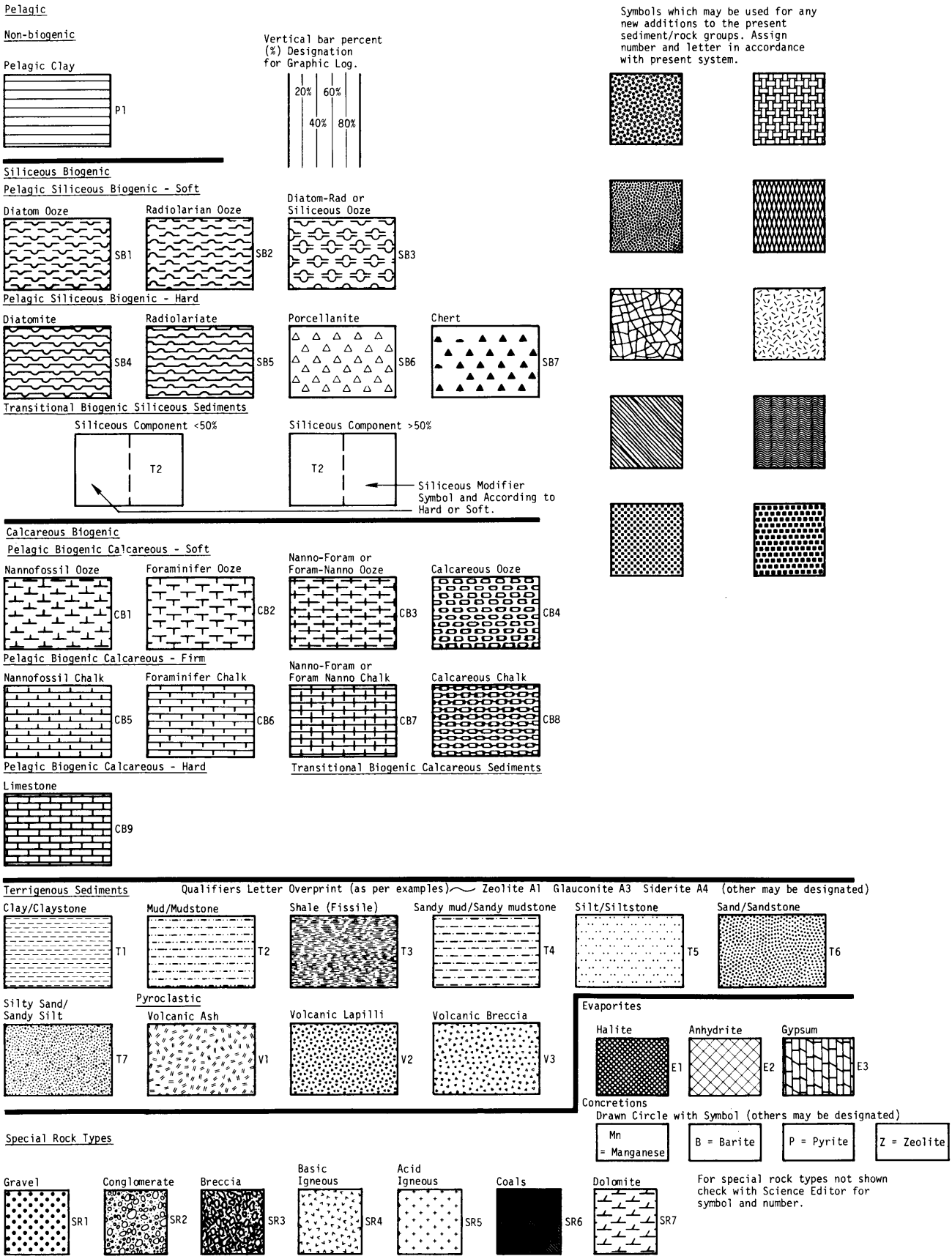


Figure 7. Graphic symbols to accompany the lithologic classification scheme.

constituent is placed on the right-hand side of the column, and the symbol for the subordinate constituent will be on the lef-hand side of the column (see examples in Figure 7). The percentage of one component to another may be represented in the graphic column by the symbols being presented in proportion to their percentages. For example the left 20% of the column may have a clay symbol while the right 80% of the column may have a nannofossil ooze symbol. This would mean that the sample was approximately 80% nannofossils and 20% clay. The vertical lines which separate the symbols are shown in Figure 8 with their corresponding percentages and positions in the column.

TEXT OF CORE DESCRIPTION

Format, style, and terminology of the descriptive portion of the Core Description Sheets (Figure 5)are not controlled by the "Mandatory Graphic Lithologic Column Scheme", beyond the minimal name assignment which is derived from the lithologic classification (described below). Colors and additional information such as structure and textures, are normally included in the text portion of the core description.

LITHOLOGIC CLASSIFICATION

The basic classification system used here was devised by the JOIDES Panel on Sedimentary Petrology and Physical Properties (SPPP) and adopted for use by the JOIDES Planning Committee in March 1974.

GENERAL PRINCIPLES

This classification is not comprehensive, therefore, a category of "Special Rock Types" will create additional definitions and terminology of rock types not covered. The classification is descriptive and genetic implications are not intended. These divisions are naturally artificial, and the proposed classification is only a rough grouping of what we really find in nature. The classification, as used in this volume, will use data which was primarily estimated or measured aboard the ship.

I. General rules for class limits and order of components in a sediment name.

A. Sediment assumes the names of those components present only in quantities greater than 15 per cent.

B. Where more than one component is present, the component in greatest abundance is listed farthest to the right, and other components are listed progressively to the left in order of decreasing abundance.

C. The class limits are based on percentage intervals given below for various sediment types.

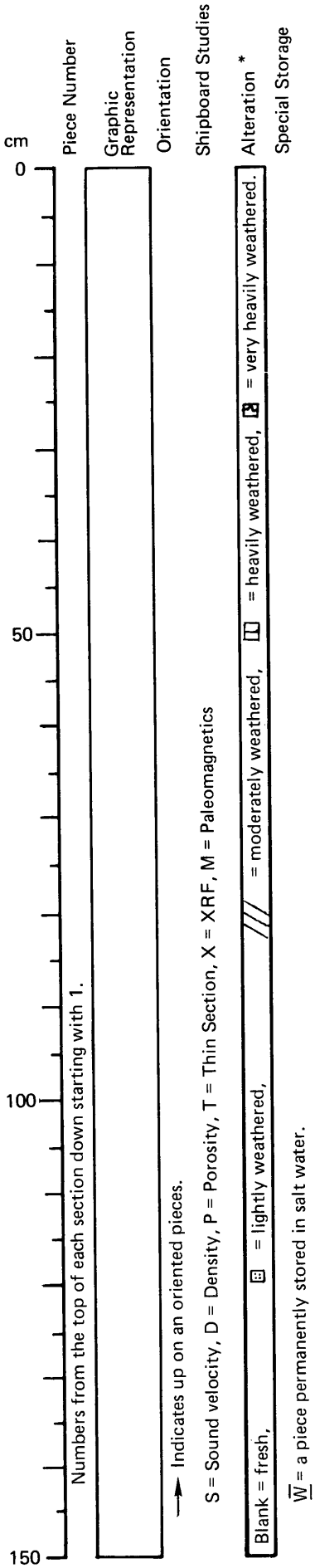
II. Composition Class Boundaries

A. $CaCO_3$ content (determined by $CaCO_3$ bomb)

30% and 60%. With a 5% precision and given the natural frequency distribution of $CaCO_3$ contents in oceanic sediments, these boundaries can be reasonably ascertained.

B. Biogenic Opal Abundance

Expressed as per cent siliceous skeletal remains in smear slides: 10, 30, and 50%. Smear slide estimates of identifiable siliceous skeletal material generally imply a significantly higher total opal abundance. The boundaries have been set to take this into account.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.	

Summary of Visual Description

Summary of Thin Section Description

Shipboard Chemical, paleomagnetic and Physical Property Data

*Alteration (weathering) explanatory nomenclature.

Fresh: No discoloration
Lightly weathered: Slight discoloration at edges
Moderately weathered: Discolored, but gray core
Heavily weathered: Completely discolored
Very heavily weathered: Beginning to disagregate, clayey

Figure 8. Sample core form (basement).

C. Abundance of Authigenic Components

Zeolites, Fe and Mn micronodules, etc., fish bones, and other indicators of very slow sedimentation (estimated in smear slides); semiquantitative boundary: common 10%. These components are quite conspicuous and a semiquantitative estimate is adequate. Even a minor influx of calcareous, siliceous, or terrigenous material will, because of the large difference in sedimentation rate, dilute them to insignificance.

D. Abundance of Terrigenous Detrital Material

Estimated from smear slides: 30 per cent.

E. Qualifiers

Numerous qualifiers are suggested; the option should be used freely. However, components of less than 5% (in smear slide) should not be used as a qualifier except in special cases.

DESCRIPTIVE DATA

Sediment and rock names are defined solely on the basis of composition and texture. Composition is most important for description of those deposits more characteristic of open marine conditions, with texture becoming more importnat for the classification of hemipelagic and nearshore facies. These data are primarily determined on board the ship by (1) visual estimates "in smear slides" with the aid of a microscope.

SMEAR SLIDES

The lithologic classification of sediments is based on visual estimates of texture and composition in smear slides made on board ship. These estimates are of areal abundances on the slide and may differ somewhat from the more accurate laboratory analyses of grain size, carbonate content, and mineralogy. Experience has shown that distinctive minor components can be accurately estimated (±1% or 2%), but that an accuracy of ±10% for major constituents is rarely attained. Carbonate content is especially difficult to estimate in smear slides, as is the amount of clay present. The locations of smear slides made are given on the core description sheets.

SEDIMENT INDURATION

The determination of induration is highly subjective, but field geologists have successfully made similar distinctions for many years. The criteria of Gealy, E. L., et al. (1971) are used for calcareous deposits; subjective estimate or behavior in core cutting is used for others.

a). Calcareous sediments

- Soft: Oozes have little strength and are readily deformed under the finer or the broad blade of a spatula.
- Firm: Chalks are partly indurated oozes, they are friable limestones that are readily deformed under the fingernail or the edge of a spatula blade.
- Hard: Cemented rocks are termed limestones.

b). The following criteria are used for other sediments:

If the material is soft enough for the core to be split with a wire cutter, the sediment name only is used (e.g. silty clay; sand).

If the core must be cut on the band saw or diamond saw, the suffix 'stone' is used (e.g. silty claystone; sandstone).

DESCRIPTION OF SEDIMENT TYPES (Figure 7)

A. Pelagic Clay

Principally authigenic pelagic deposits that accumulate at very slow rates. The class is often termed brown clay, or red clay, but since these terms are confusing, they are not recommended.

1. Boundary With Terrigenous Sediments

   Where authigenic components (Fe/Mn micronodules, zeolites), fish debris, etc., become common in smear slides. NOTE: Because of large discrepancy in accumulation rates, transitional deposits are exceptional.

2. Boundary With Siliceous Biogenic Sediments

   <30% identifiable siliceous remains.

3. Boundary With Calcareous Biogenous Sediments

   Generally the sequence is one passing from pelagic clay through siliceous ooze to calcareous ooze, with one important exception: at the base of many oceanic sections, black, brown or red clays occur directly on basalt, overlain by or grading up into calcareous sediments. Most of the basal clayey sediments are rich in iron, manganese and metallic trace elements. For proper identification they require more elaborate geochemical work than is available on shipboard. These sediments are placed in the "Special Rock" category, but care should be taken to distinguish them from ordinary pelagic clays.

B. Pelagic Siliceous Biogenic Sediments

These are distinguished from the previous category because they have more than 30% identifiable siliceous microfossils. They are distinguished from the following category by a $CaCO_3$ content of less than 30%. There are two classes: Pelagic biogenic siliceous sediments (containing less than 30% silt and clay); and transitional biogenic siliceous sediments (containing more than 30% silt and clay and more than 10% diatoms).

1. Pelagic Biogenic Siliceous Sediments

   (a) Soft: Siliceous ooze (radiolarian ooze, diatomaceous ooze, depending on dominant component).

   (b) Hard: Radiolarite, porcellanite, diatomite, and chert.

   (c) Qualifiers:

   Radiolaria dominant - radiolarian ooze or radiolarite.

   Diatoms dominant - diatom ooze or diatomite.

   Where uncertain - siliceous (biogenic) ooze, chert or porcellanite; when containing >10% $CaCO_3$, qualifiers are as follows:

   Indeterminate Carbonate: Calcareous --
   Nannofossils Only: Nannofossil --
   Foraminifera Only: Foraminiferal --

   Nannofossil-Foraminiferal --
   Foraminiferal-Nannofossil --
   depending on dominant component

2. Transitional Biogenic Siliceous Sediments

Diatoms	<50%	diatomaceous mud:	soft
		diatomaceous mudstone:	hard
Diatoms	>50%	muddy diatom ooze:	soft
		muddy diatomite:	hard

Radiolarian equivalents in this category are rare and can be specifically described.

C. Pelagic Biogenous Calcareous Sediments

These are distinguished from the previous categories by a $CaCO_3$ content in excess of 30%. There are two classes: Pelagic biogenic calcareous sediments (containing less than 30% silt and clay); and transitional biogenic calcareous sediments (containing more than 30% silt and clay).

1. Pelagic Biogenic Calcareous Sediments

(a) Soft: calcareous ooze

(b) Firm: chalk

(c) Hard: indurated chalk

The term limestone should preferably be restricted to cemented rocks.

(d) Compositional Qualifiers:

Principal components are: nannofossils and foraminifera. One or two qualifiers may be used, for example:

Foram %	**Name**
<10	Nannofossil ooze, chalk, limestone
10-25	Foraminiferal-nannofossil ooze
25-50	Nannofossil-foraminiferal ooze
>50	Foraminiferal ooze

Calcareous sediment containing more than 10-20% identifiable siliceous fossils carry the qualifier radiolarian, diatomaceous, or siliceous depending on the quality of the identification. For example, radiolarian-foraminiferal ooze.

2. Transitional Biogenic Calcareous Sediments

(a) $CaCO_3$ 30-60%: Marly calcareous pelagic sediments.

Soft: Marly calcareous (or nannofossil, foraminifera, etc.) ooze (see below).

Firm: Marly chalk.

Hard: Marly limestone.

(b) $CaCO_3$>60%: Calcareous pelagic sediments.

Soft: Calcareous (or nannofossil, foraminiferal, etc.) ooze (see below).

Firm: Chalk.

Hard: Limestone.

NOTE: Sediments containing 10-30% $CaCO_3$ fall in other classes where they are denoted with the adjective "calcareous". Less than 10% $CaCO_3$ is ignored.

Terrigenous Sediments

Terrigenous sediments are distinguished by a terrigenous component in excess of 30%, and siliceous and authigenic components, each less than 10%.

Sediments in this category are subdivided into textural groups (by smear slide estimation or grain size analysis on the basis of the relative proportions of sand, silt, and clay. The size limits are those defined by Wentworth (1922). Textural classification follows the triangular diagram of Shepard (1954).

The transition between pelagic and terrigenous sediments are termed hemipelagic.

Volcanogenic Sediments

Pyroclastic rocks are described according to the textural and compositonal scheme of Wentworth and Williams (1932). The textural groups are:

>32 mm - Volcanic breccia
32 mm - 4 mm - Volcanic lapilli
< 4 mm - Volcanic ash (tuff when indurated)

The composition of these pyroclastic rocks are described as vitric (glass), crystalline, or lithic.

Sediments rich in ash are described in the following manner:

% Ash	Soft-Sediment	Indurated
0-10	Mud	Mudstone
10-30	Vitric mud	Vitric mudstone
30-60	Muddy ash	Tuffite
>60	Ash	Tuff

QUALIFIERS

In general, sediments containing various constituents in the 10 to 30% range may be identified in the name of sediment such as vitric diatomaceous mud or vitric muddy diatomaceous ooze. If more than one such qualifier is used, they are listed in order of increasing abundance in the sediment.

SPECIAL STUDIES

CARBONATE BOMB

Per cent $CaCO_3$ was also determined on board ship by the "Karbonate Bomb" technique (Müller and Gastner, 1971). In this simple procedure, a sample is powdered and treated with HC1 in a closed cylinder. Any resulting CO_2 pressure is proportional to the $CaCO_3$ content of the sample. Application of the calibration factor to the manometer reading (X 100) yields per cent $CaCO_3$. Per cent error can be as low as 1% for sediments high in $CaCO_3$, and in general an accuracy of ±2 to 5% can be obtained.

These data are presented on the core forms. The sample interval is designated by two numbers: the section number, followed by the top of the sample interval, for example: a sample from Section 2 from 11 to 12 cm with 90% calcium carbonate will be present on the core form as follows:

CARBONATE BOMB:
2-11 (90)

CARBON-CARBONATE ANALYSIS

Following the cruise, sediment samples were analyzed at the DSDP sediment laboratory on a LECO WR-12 Carbon Analyzer. Sample preparation procedues are identical to those used with the old LECO 70 Analyzer as outlined in Boyce and Bode (1972) and Bode (1973). Discussion so the LECO WR-12 Analyzer are in Bode (1973). Accuracy and precision of the results are as follows:

Total carbon = ±0.3% (absolute)

Organic carbon = ±0.06% (absolute)

$CaCO_3$ = ±3% (absolute)

The carbon-carbonate data are presented on the Core Forms (sample code CC). The sample interval is designated by two numbers: the section number, followed by the top of the sample interval, for example: a sample from Section 2 from 11 to 12 cm with 90% total carbon, 0.1% organic carbon, and 74% calcium carbonate will be presented on the core forms as follows:

CARBON-CARBONATE:
2-11 (90, 0.1, 74)

GRAIN SIZE ANALYSIS

Distribution of sand-size, silt-size, and clay-size particles was determined from 10cc sediment samples at the DSDP sediment laboratory by standard sieve and pipette methods (Appendix III, of Volume IV, Initial Reports of the Deep Sea Drilling Project, p. 745 with modified settling times as in Boyce, 1972). Textures in Appendix II use Shepard's (1954) sediment classification. The sand, silt, and clay boundaries are based on the Wentworth (1922) scale. Thus the particle size of the sand, silt, and clay fractions ranges from 2000 to 62.5 μm, and less than 3.91 μm, respectively.

Grain size data are presented on the Core Forms (sample code GZ). On the Core Forms the sample interval is designated by two numbers: the section number and the top of the sample interval within that section, for example a sample from Section 2 from 11 to 13 cm with a grain-size distribution of 20% sand-size, 30% silt-size, and 50% clay-size will be presented on the Core Form as follows:

GRAIN SIZE:
2-11 (20, 30, 50)

BIOSTRATIGRAPHY

Biostratigraphic studies of Leg 58 material were still in progress when the Leg 58 Initial Core Descriptions were compiled. Consequently, biostratigraphic boundaries given herein are tentative; although no major changes in age assignments are anticipated, some boundaries are likely to be adjusted prior to publication of the Initial Reports for Leg 58.

BASEMENT DESCRIPTION CONVENTIONS

Core Forms

Initial Core Description Forms for igneous and metamorphic rocks are not the same as those used for sediments. The sediment barrel sheets are substantially those published in previous Initial Reports. Igneous rock representation on Barrel Sheets, however, is too compressed to provide adequate information for rock sampling. Consequently, Visual Core Description Forms, modified from those used on board ship, are used here for more complete graphic representation. Each of these forms covers one 1.5 meter section. All shipboard chemical and physical property data, as well as summary hand-specimen and thin section descriptions are presented for each section.

All basalts were split using a rock saw into archive and working halves. The latter was described and sampled on board ship. In a typical Basalt Description Form (Figure 8), the left box is a visual representation of the working half. Two closely spaced horizontal lines in this column indicate the location of styrofoam spacers taped between basalt pieces inside the liner. Each piece is numbered sequentially from the top of each section, beginning with the number 1. Pieces are labeled on the rounded, not the sawed surface. Pieces which could be fit together before splitting are given the same number, but are separately consecutively lettered, as 1A, 1B, 1C, etc. Spacers were placed between pieces with different numbers, but not between those with different letters and the same number. In general, addition of spacers represents a drilling gap (no recovery). All pieces which are cylindrical and longer than the liner diameter have orientation arrows pointing up, both on the archive and working halves. Special procedures were adopted to ensure that orientation was preserved through every step of the sawing and labeling process. All orientable pieces are indicated by upward-pointing arrows to the right of the graphic representation on the description forms. Since the pieces were rotated during drilling it is not possible to sample for declination studies.

Samples were taken for various measurements on board ship. The type of measurement and approximate location are indicated in the column headed "Shipboard Studies" using the following notation:

X = X-ray fluorescene and CHN chemical analysis
M = magnetics measurement
S = sonic velocity measurements
T = thin section
D = density measurements
P = porosity measurements

The state of alteration (see Figure 8 for symbols) is shown in the column labeled "Alteration."

On Leg 58 some pieces were stored permanently in salt water. These are labeled with a "W" in the "Special Storage" column.

SAMPLE DISTRIBUTION POLICY

Deep Sea Drilling Project/International Phase of Ocean Drilling

Distribution of Deep Sea Drilling samples for investigation will be undertaken in order to (1) provide supplementary data to support GLOMAR CHALLENGER scientists in achieving the scientific objectives of their particular cruise, and in addition to serve as a mechanism for contributions to the INITIAL REPORTS; (2) provide individual investigators with materials to conduct detailed studies beyond the scope of the Initial Reports; and (3) provide the reference centers where paleontologic materials are stored with samples for reference and comparison purposes.

The National Science Foundation has established a Sample Distribution Panel to advise on the distribution of core materials. This panel is chosen in accordance with usual Foundation practices, in a manner that will assure advice in the various disiplines leading to a complete and adequate study of the cores and their contents. Funding for the proposed research must be secured separately by the investigator. It cannot be provided through the Deep Sea Drilling Project.

The Deep Sea Drilling Project's Curator is responsible for distributing the samples and controlling their quality, as well as preserving and conserving core material. He also is responsible for maintaining a record of all samples that have been distributed, shipboard and subsequent, indicating the recipient, and the natures of the proposed investigation. This information is made available to all investigators of DSDP materials as well as other interested researchers on request.

The distribution of samples is made directly from one of the two existing repositories, Lamont-Doherty Geological Observatory and Scripps Institution of Oceanography, by the Curator or his designated representative.

1. Distribution of Samples for Research Leading to Contributions to Initial Reports

Any investigator who wishes to contribute a paper to a given volume of the Initial Reports may write to the Chief Scientist, Deep Sea Drilling Project (A-031), Scripps Institution of Oceanography, University of California at San Diego, La Jolla, California 92093, U.S.A., requesting samples from a forthcoming cruise. Requests for a specific cruise should be received by the Chief Scientist TWO MONTHS in advance of the departure of the cruise in order to allow time for the review and consideration of all requests and to establish a suitable shipboard sampling program. The request should include a statement of the nature of the study proposed, size and approximate number of samples required to complete the study, and any particular sampling technique or equipment that might be required. The requests will be reviewed by the Chief Scientist of the Project and the cruise co-chief scientists; approval will be given in accordance with the scientific requirements of the cruise as determined by the appropriate JOIDES Advisory Panel(s). If approved, the requested samples will be taken, either by the shipboard party if the workload permits, or by the curatorial staff shortly following the return of the cores to the repository. Proposals must be of a scope to ensure that samples can be processed and a contribution completed in time for publication in the Initial Reports. Except for rare, specific instances involving ephemeral properties, sampling will not exceed one-quarter of the volume of core recovered, with no interval being depleted and one-half of all core being retained as an archive. Shipboard sampling shall not exceed approximately 100 igneous samples per investigator; in all cases co-chief scientists are requested to keep sampling to a minimum.

The co-chief scientists may elect to have special studies of selected core samples made by other investigators. In this event the names of these investigators and complete listings of all materials loaned or distributed must be forwarded, if possible, prior to the cruise or, as soon as possible following the cruise, to the Chief Scientist through the DSDP Staff Science Representative for that particular cruise. In such cases, all requirements of the Sample Distribution Policy shall also apply.

If a dispute arises or if a decision cannot be reached in the manner prescribed, the NSF Sample Distribution Panel will conduct the final arbitration.

Any publication of results other than in the Initial Reports within twelve (12) months of the completion of the cruise must be approved and authored by the whole shipboard party and, where appropriate, shore-based investigators. After twelve months, individual investigators may submit related papers for open publication provided they have submitted their contributions to the Initial Reports. Investigations not completed in time for inclusion in the Initial Reports for a specific cruise may not be published in other journals until final publication of that Initial Report for which it was intended. Notice of submission to other journals and a copy of the article should be sent to the DSDP Chief Science Editor.

2. Distribution of Samples for Research Leading to Publication other than in Initial Reports

A. Researchers intending to request samples for studies beyond the scope of the Initial Reports should first obtain sample request forms from the Curator, Deep Sea Drilling Project (A-031), Scripps Institution of Oceanography, University of California at San Diego, La Jolla, California 92093, U.S.A. On the forms the researcher is requested to specify the quantities and intervals of the core required, make a clear statement of the proposed research, state time required to complete and submit results for publication, specify the status of funding and the availability of equipment and space foreseen for the research.

In order to ensure that all requests for highly desirable but limited samples can be considered, approval of requests and distribution of samples will not be made prior to 2 months after publication of the Initial Core Descriptions (I.C.D.). ICD's required to be published within 10 months following eachs:cruise. The only exceptions to this policy will be for specific instances involving ephemeral properties. Requests for samples can be based on the Initial Core Descriptions, copies of which are on file at various institutions throughout the world. Copies of original core logs and data are kept on file at DSDP and at the Repository at Lamont-Doherty Geological Observatory, Palisades, New York. Requests for samples from researchers in industrial laboratories will be handled in the same manner as these from academic organizations, with the same obligation to publish results promptly.

B. (1) The DSDP Curator is authorized to distribute samples up to 50 ml per meter of core. Requests for volumes of material in excess of this amount will be referred to the NSF Sample Distribution Panel for review and approval. Experience has shown that most investigations can be accomplished with 10ml sized samples or less. All investigators are encouraged to be as judicious as possible with regard to sample size and, especially, frequency within any given core interval. The Curator will not automatically distribute any parts of the cores which appear to be in particularly high demand; requests for such parts will be referred to the Sample Distribution Panel for review. Requests for samples from thin layers or important stratigraphic boundaries will also require Panel review.

(2) If investigators wish to study certain properties which may deteriorate prior to the normal availability of his samples, they may request that the normal waiting period not apply. All such requests must be reviewed by the curators and approved by the NSF Sample Distribution Panel.

C. Samples will not be provided prior to assurance that funding for sample studies either exists or is not needed. However, neither formal approval of sample requests nor distribution of samples will be made until the appropriate time (Item A). If a sample request is dependent, either wholly or in part, on proposed funding, the organization to whom the funding proposal has been submitted any information on the availability (or potential availability) of samples that it may request.

D. Investigators receiving samples are responsible for:

(1) publishing significant results; however contributions shall not be submitted for publication prior to 12 months following the termination of the appropriate leg;

(2) acknowledging, in publications, that samples were supplied through the assistance of the U.S. National Science Foundation and others as appropriate;

(3) submitting five (5) copies (for distribution to the Curator's file, the DSDP Repositories, the GLOMAR CHALLENGER's Library, and the National Science Foundation) of all reprints of published results to the Curator, Deep Sea Drilling Project (A-012), Scripps Institution of Oceanography, University of California at San Diego, La Jolla, California 92093, U.S.A.;

(4) returning, in good condition, the remainders of samples after termination of research, if requested by the Curator.

E. Cores are made available at repositories for investigators to examine and to specify exact samples in such instances as may be necessary for the scientific purposes of the sampling, subject to the limitations of B (1 and 2) and D, above, with specific permission of the Curator or his delegate.

F. Shipboard-produced smear slides of sediments and thin sections of indurated sediments, igneous and metamorphic rocks, will be returned to the appropriate repository at the end of each cruise or at the publication of the Initial Reports for that cruise. These smear slides and thin sections will form a reference collection of the cores stored at each repository and may be viewed at the respective repositories as an aid in the selection of core samples.

G. The Deep Sea Drilling Project routinely processes by computer most of the quantitative data presented in the Initial Reports. Space limitations in the Initial Reports preclude the detailed presentation of all such data. However, copies of the computer readout are available for those who wish the data for further analysis or as an aid in selecting samples. A charge will be made to recover expenses in excess of $50.00 incurred in filling requests.

3. Other Records

Magnetics, seismic reflection, downhole logging, and bathymetric data collected by the GLOMAR CHALLENGER will also be available for distribution at the same time samples become available.

Requests for data may be made to:

Associate Chief Scientist,
Science Services
Deep Sea Drilling Project (A-031)
Scripps Institution of
Oceanography
University of California
at San Diego
La Jolla, California 92093

A charge will be made to recover the expenses in excess of $50.00 in filling individual requests. If required, estimated charges can be furnished before the request is processed.

4. Reference Centers

As a separate and special category samples will be distributed for the purpose of establishing up to five reference centers where paleontologic materials will be available for reference and comparison purposes. The first of these reference centers has been approved at Basel, Switzerland.
Revised 9/28/76

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SITE SUMMARY SHEET

SITE 442 HOLES 442, 442A, and 442B

Date occupied	December 12, 1977		
Date departed	December 27, 1977		
Time on hole	13 days 23 hours		
Position: latitude	28° 59.00'N to 28° 59.04'N		
longitude	136° 03.43'E		
Water depth (sea level)	4639.0-4634.5 corrected meters, echo sounding		
Water depth (rig floor)	4649.0-4644.5 corrected meters, echo sounding		
Bottom felt at	4649.0-4644.5 meters, drill pipe		
Penetration	442 = 0.5	442A = 313.5	442B = 455.0 meters
Number of holes	3		
Number of cores	442 = 1	442A = 34	442B = 20 meters
Total length of cored section	442 = 0.5	442A = 313.5	442B - 187.5 meters
Total core recovered	442 = 0.10	442A = 154.26	442B = 50.99 meters
Percentage core recovery	442 = 20	442A = 49	442B = 27%
Oldest Sediment Cored			
Depth sub-bottom		442A = 286.1	442B = 353.0 meters
Nature		442A = limestone	442B = clayey nannofossil ooze
Age	442A = late early Miocene (17-19 m.y.B.P.)		442B = early Miocene (18-21 m.y.B.P.)
Measured velocity		442A = 3.75	442B = 1.57 km/s
Basement			
Depth sub-bottom		442A = 313.5	442B = 455.0 meters
Nature		442A = basalt	
Velocity range		442A = 3.98-4.66	442B = 3.85-5.25 km/s

Principal Results:

Site 442 is located in the west-central part of the Shikoku Basin on magnetic anomaly 6. The stratigraphic section consists of 164 meters of Pleistocene mud and clay, 45 meters of Pliocene mud, 67 meters of late Miocene mud/volcanic ash, 9.7 meters early Miocene zeolitic clay/claystone, 0.4 meters of early Miocene limestone, 66 meters of massive basalt flows with normal magnetic polarity, and 92 meters of pillow basalt flows with normal polarity in the upper part and reverse polarity in the lower part. Continuous sedimentation started with pelagic limestone and clay and was then dominated by hemipelagic processes, at or near the CCD. Basement age of early Miocene (18-21 m.y.B.P.) agrees with magnetic anomaly age for anomaly 6. Basaltic basement shows higher than normal vesicularity and is characterized by absence of olivine.

SITE 442 HOLE CORE 1 CORED INTERVAL: 0.0-0.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS			SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Upper Pleistocene or Holocene	*Emiliania huxleyi* Zone (N) N 23 (*Gtr. inflata–Gtr. truncatulinoides* Zone)	FP	CG	AG			CC						

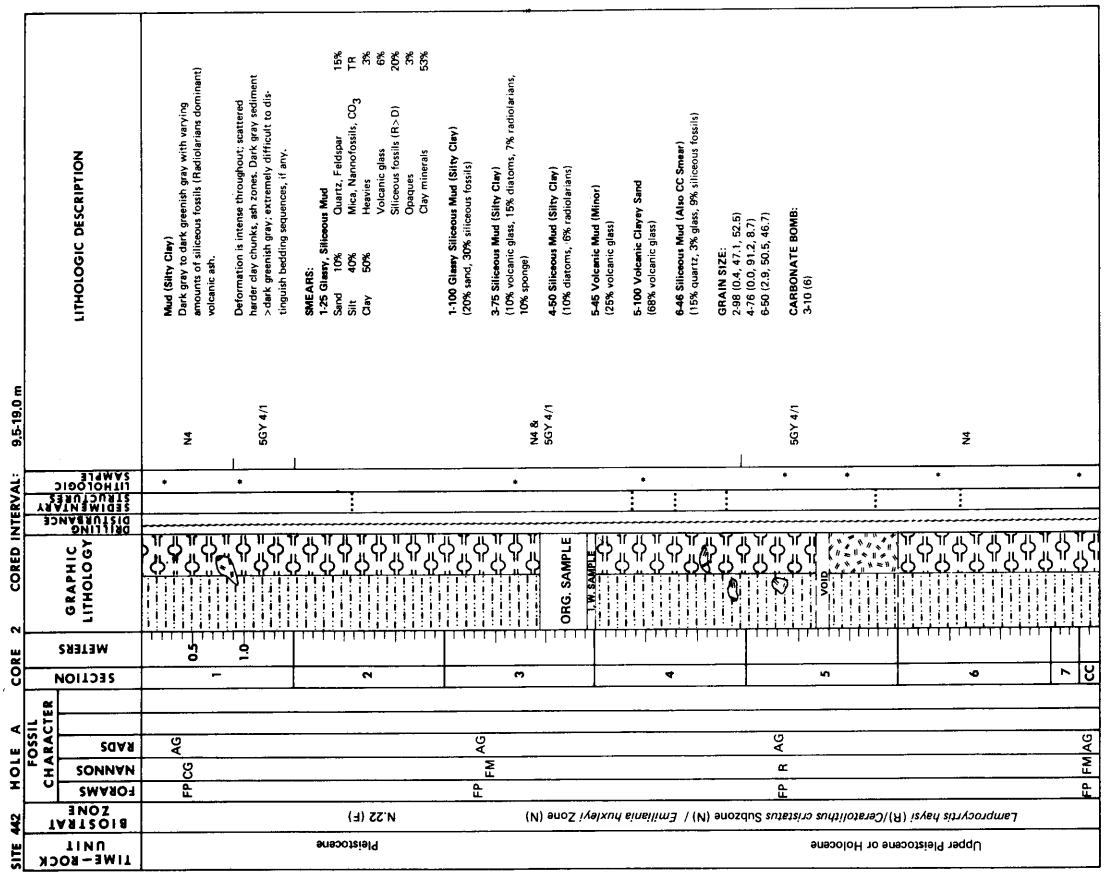
Siliceous silty clay with volcanic lapilli; rads (20%) >diatoms>silicos; dark greenish gray (5GY 4/1). Siliceous fossils are well-preserved.

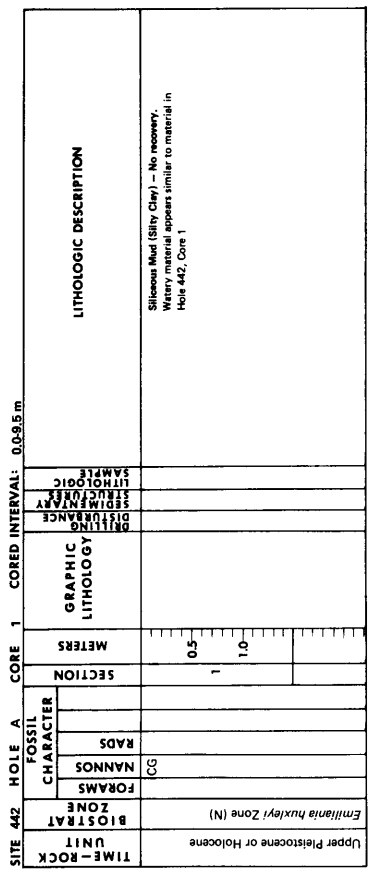
0.1 m recovery included pumice fragments (1-2 cm diameter, rounded).

SMEARS:

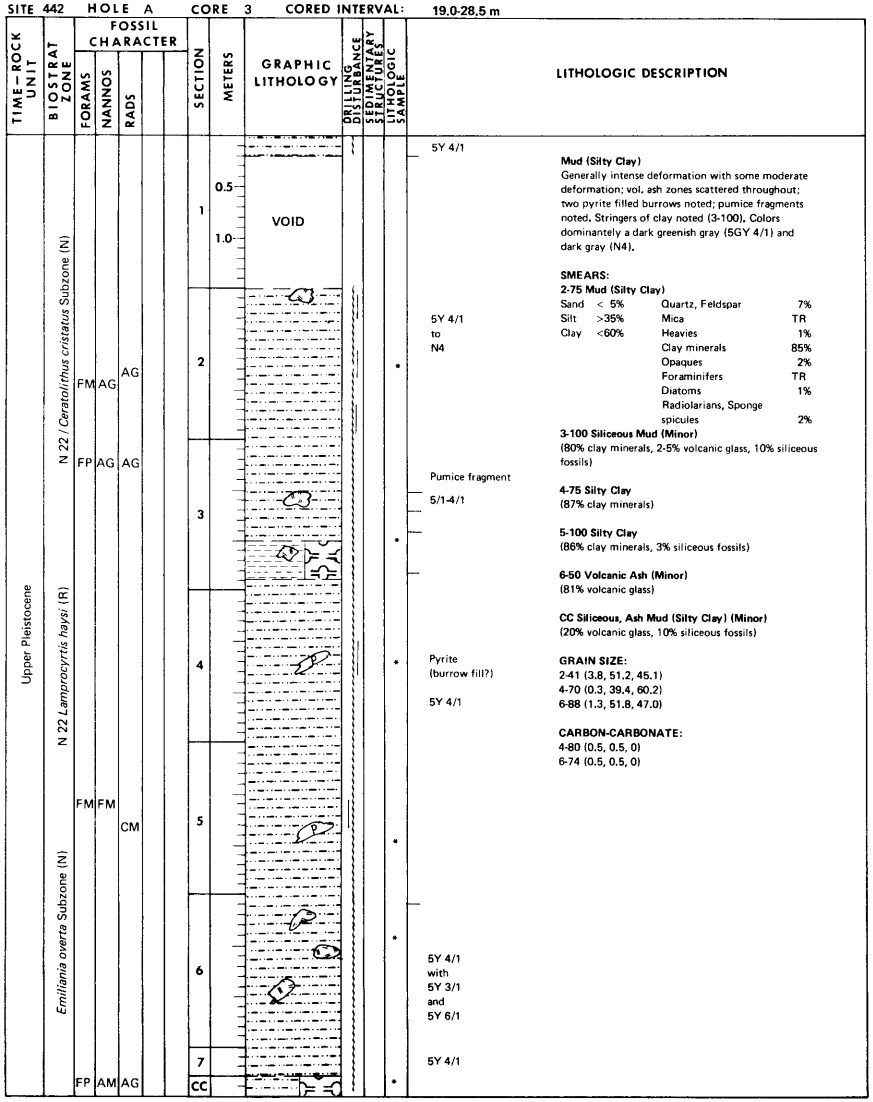
CC Siliceous Silty Clay

Sand	2%	Quartz, Feldspar	25%
Silt	43%	Mica, Heavies	TR
Clay	55%	Clay minerals	43%
		Volcanic glass	5%
		Foraminifers	TR- 2%
		Nannofossils	5%
		Siliceous fossils (Radiolarians dominant)	20%
		Opaques	5%


SITE 442
HOLE A
CORE 2
CORED INTERVAL: 9.5-19.0 m
TIME–ROCK UNIT
Pleistocene
Upper Pleistocene or Holocene
BIOSTRAT ZONE
N.22 (F)
Emiliania huxleyi Zone (N) / Emiliania huxleyi Zone (N)
Lamprocyrtis haysi (R)/Ceratolithus cristatus Subzone (N)
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
ORG. SAMPLE
T.W. SAMPLE
VOID
Mud (Silty Clay)
Dark grey to dark greenish gray with varying amounts of siliceous fossils (Radiolarians dominant) volcanic ash.
Deformation is intense throughout; scattered harder clay chunks, ash zones. Dark gray sediment >dark greenish gray; extremely difficult to distinguish bedding sequences, if any.
SMEARS:
1-25 Glassy, Siliceous Mud
Sand 10% Quartz, Feldspar 15%
Silt 40% Mica, Nannofossils, CO3 TR
Clay 50% Heavies 3%
Volcanic glass 6%
Siliceous fossils (R>D) 20%
Opaques 3%
Clay minerals 53%
1-100 Glassy Siliceous Mud (Silty Clay)
(20% sand, 30% siliceous fossils)
3-75 Siliceous Mud (Silty Clay)
(10% volcanic glass, 15% diatoms, 7% radiolarians, 10% sponge)
4-50 Siliceous Mud (Silty Clay)
(10% diatoms, 6% radiolarians)
5-45 Volcanic Mud (Minor)
(25% volcanic glass)
5-100 Volcanic Clayey Sand
(68% volcanic glass)
6-46 Siliceous Mud (Also CC Smear)
(15% quartz, 3% glass, 9% siliceous fossils)
GRAIN SIZE:
2-98 (0.4, 47.1, 52.5)
4-76 (0.0, 91.2, 8.7)
6-50 (2.9, 50.5, 46.7)
CARBONATE BOMB:
3-10 (6)
N4
5GY 4/1
N4 & 5GY 4/1
5GY 4/1
N4


SITE 442
HOLE A
CORE 1
CORED INTERVAL: 0.0-9.5 m
TIME–ROCK UNIT
Upper Pleistocene or Holocene
BIOSTRAT ZONE
Emiliania huxleyi Zone (N)
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
CG
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Siliceous Mud (Silty Clay) – No recovery.
Watery material appears similar to material in Hole 442, Core 1

SITE 442 HOLE A CORE 3 CORED INTERVAL: 19.0-28.5 m



Mud (Silty Clay)
Generally intense deformation with some moderate deformation; vol. ash zones scattered throughout; two pyrite filled burrows noted; pumice fragments noted. Stringers of clay noted (3-100). Colors dominantly a dark greenish gray (5GY 4/1) and dark gray (N4).

SMEARS:

2-75 Mud (Silty Clay)

Sand	< 5%	Quartz, Feldspar	7%
Silt	>35%	Mica	TR
Clay	<60%	Heavies	1%
		Clay minerals	85%
		Opaques	2%
		Foraminifers	TR
		Diatoms	1%
		Radiolarians, Sponge spicules	2%

3-100 Siliceous Mud (Minor)
(80% clay minerals, 2-5% volcanic glass, 10% siliceous fossils)

4-75 Silty Clay
(87% clay minerals)

5-100 Silty Clay
(86% clay minerals, 3% siliceous fossils)

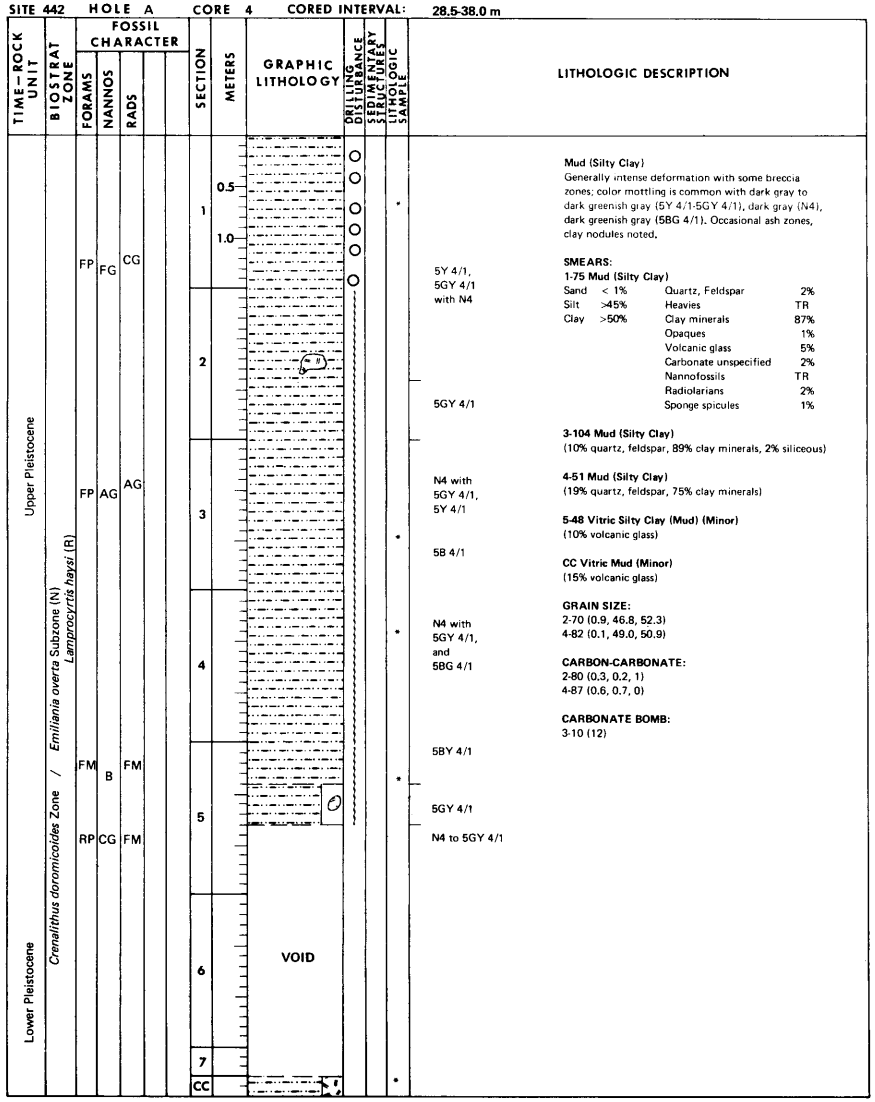
6-50 Volcanic Ash (Minor)
(81% volcanic glass)

CC Siliceous, Ash Mud (Silty Clay) (Minor)
(20% volcanic glass, 10% siliceous fossils)

GRAIN SIZE:
2-41 (3.8, 51.2, 45.1)
4-70 (0.3, 39.4, 60.2)
6-88 (1.3, 51.8, 47.0)

CARBON-CARBONATE:
4-80 (0.5, 0.5, 0)
6-74 (0.5, 0.5, 0)

SITE 442 HOLE A CORE 4 CORED INTERVAL: 28.5-38.0 m



Mud (Silty Clay)
Generally intense deformation with some breccia zones; color mottling is common with dark gray to dark greenish gray (5Y 4/1-5GY 4/1), dark gray (N4), dark greenish gray (5BG 4/1). Occasional ash zones, clay nodules noted.

SMEARS:

1-75 Mud (Silty Clay)

Sand	< 1%	Quartz, Feldspar	2%
Silt	>45%	Heavies	TR
Clay	>50%	Clay minerals	87%
		Opaques	1%
		Volcanic glass	5%
		Carbonate unspecified	2%
		Nannofossils	TR
		Radiolarians	2%
		Sponge spicules	1%

3-104 Mud (Silty Clay)
(10% quartz, feldspar, 89% clay minerals, 2% siliceous)

4-51 Mud (Silty Clay)
(19% quartz, feldspar, 75% clay minerals)

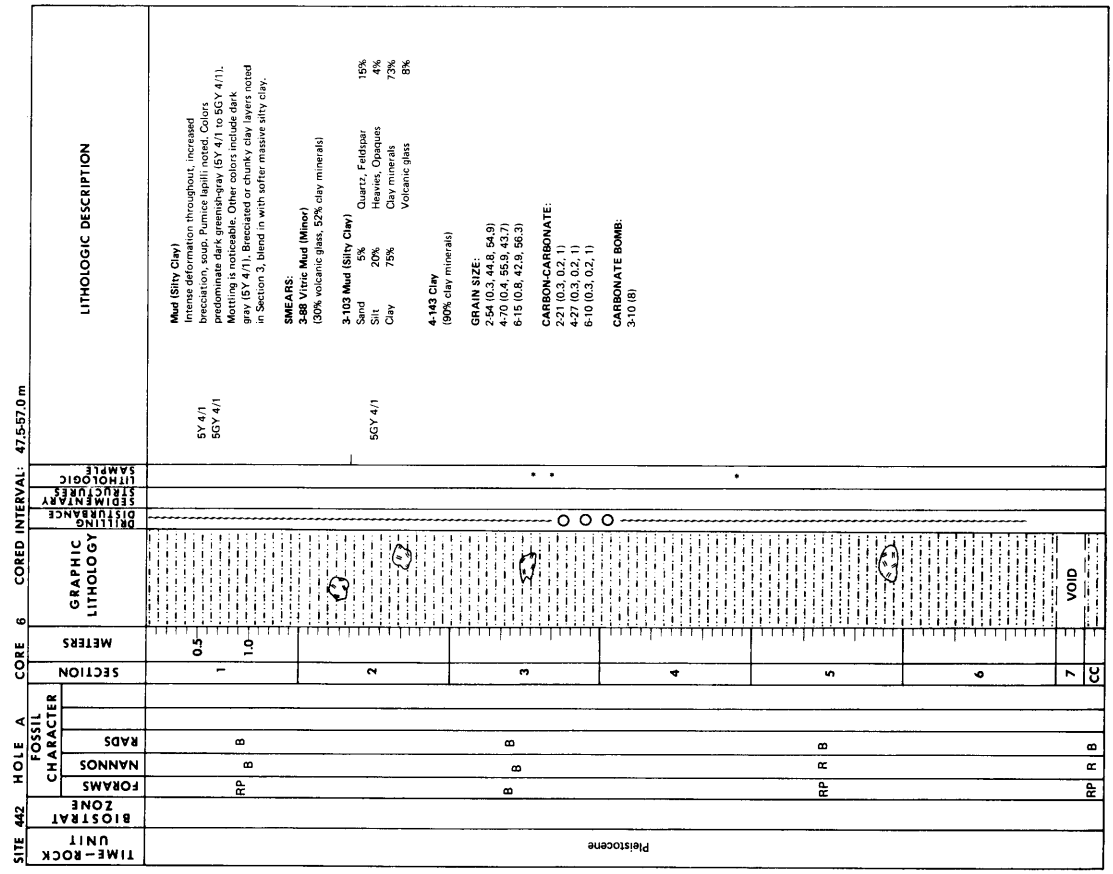
5-48 Vitric Silty Clay (Mud) (Minor)
(10% volcanic glass)

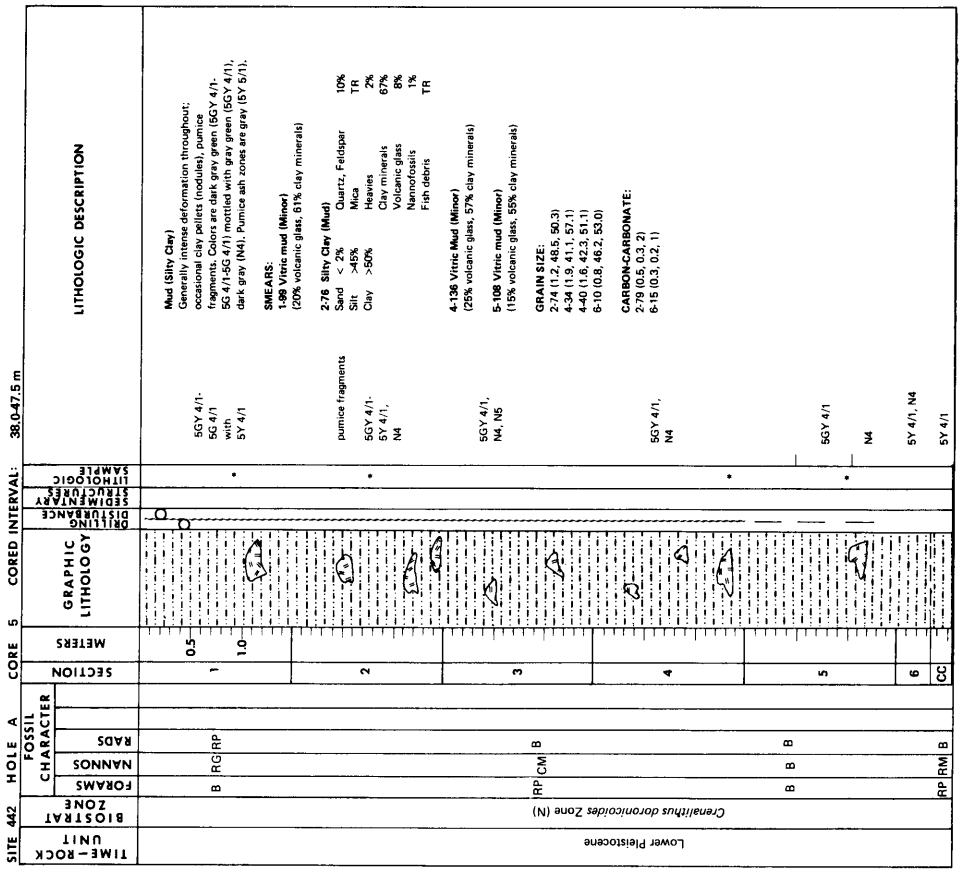
CC Vitric Mud (Minor)
(15% volcanic glass)

GRAIN SIZE:
2-70 (0.9, 46.8, 52.3)
4-82 (0.1, 49.0, 50.9)

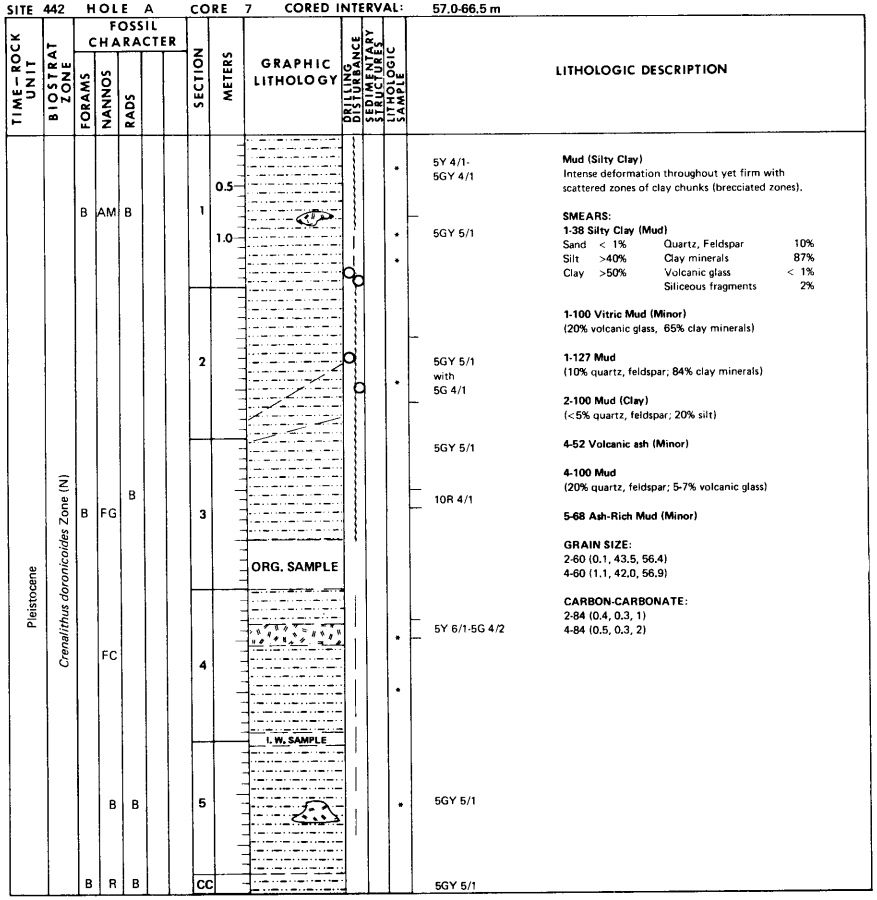
CARBON-CARBONATE:
2-80 (0.3, 0.2, 1)
4-87 (0.6, 0.7, 0)

CARBONATE BOMB:
3-10 (12)

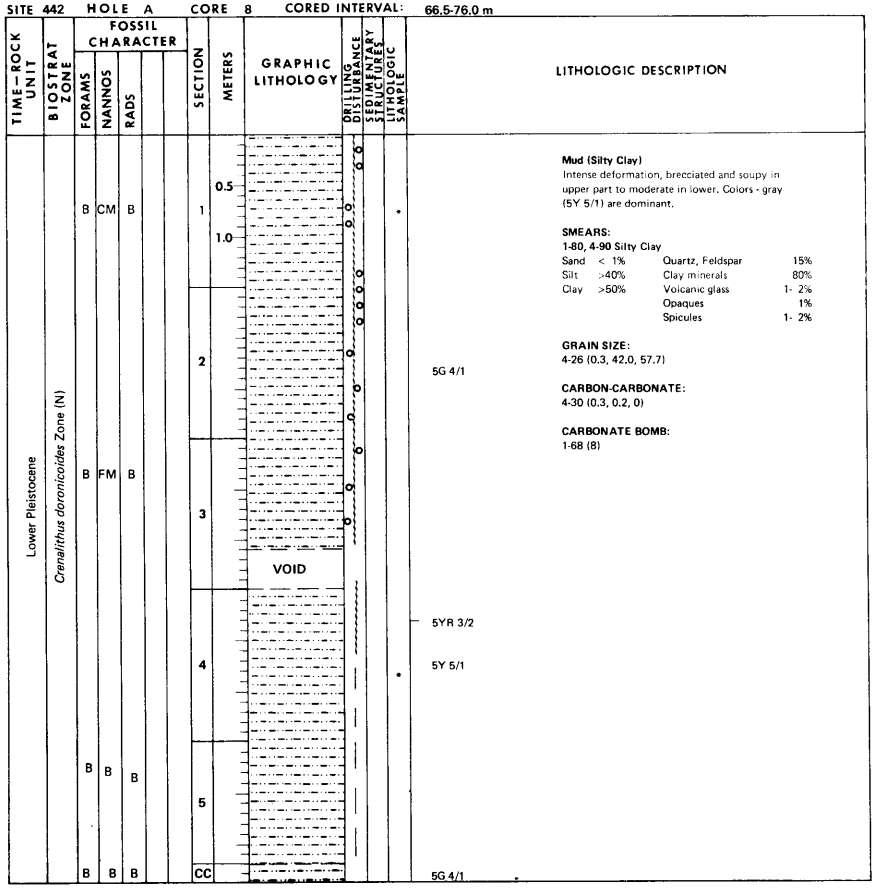

SITE 442 HOLE A CORE 6 CORED INTERVAL: 47.5-57.0 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Pleistocene
Mud (Silty Clay)
Intense deformation throughout, increased brecciation, soup. Pumice lapilli noted. Colors predominate dark greenish-gray (5Y 4/1 to 5GY 4/1). Mottling is noticeable. Other colors include dark gray (5Y 4/1). Brecciated or chunky clay layers noted in Section 3, blend in with softer massive silty clay.
5Y 4/1
5GY 4/1
SMEARS:
3-86 Vitric Mud (Minor)
(30% volcanic glass, 32% clay minerals)
3-103 Mud (Silty Clay)
Sand 5% Quartz, Feldspar 15%
Silt 20% Heavies, Opaques 4%
Clay 75% Clay minerals 73%
Volcanic glass 8%
5GY 4/1
4-143 Clay
(90% clay minerals)
GRAIN SIZE:
2-54 (0.3, 44.8, 54.9)
4-70 (0.4, 55.9, 43.7)
6-15 (0.8, 42.9, 56.3)
CARBON-CARBONATE:
2-21 (0.3, 0.2, 1)
4-27 (0.3, 0.2, 1)
6-10 (0.3, 0.2, 1)
CARBONATE BOMB:
3-10 (8)
VOID


SITE 442 HOLE A CORE 5 CORED INTERVAL: 38.0-47.5 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Lower Pleistocene
Crenalithus doronicoides Zone (N)
Mud (Silty Clay)
Generally intense deformation throughout; occasional clay pellets (nodules), pumice fragments. Colors are dark gray green (5GY 4/1-5G 4/1-5G 4/1) mottled with gray green (5GY 4/1), dark gray (N4). Pumice ash zones are gray (5Y 5/1).
5GY 4/1-5G 4/1 with 5Y 4/1
SMEARS:
1-99 Vitric mud (Minor)
(20% volcanic glass, 61% clay minerals)
2-76 Silty Clay (Mud)
Sand < 2% Quartz, Feldspar 10%
Silt >45% Mica TR
Clay >50% Heavies 2%
Clay minerals 67%
Volcanic glass 8%
Nannofossils 1%
Fish debris TR
pumice fragments
5GY 4/1-5Y 4/1, N4
4-136 Vitric Mud (Minor)
(25% volcanic glass, 57% clay minerals)
5GY 4/1, N4, N5
5-108 Vitric mud (Minor)
(15% volcanic glass, 55% clay minerals)
GRAIN SIZE:
2-74 (1.2, 48.5, 50.3)
4-34 (1.9, 41.1, 57.1)
4-40 (1.6, 42.3, 51.1)
6-10 (0.8, 46.2, 53.0)
5GY 4/1, N4
CARBON-CARBONATE:
2-79 (0.5, 0.3, 2)
6-15 (0.3, 0.2, 1)
5GY 4/1
N4
5Y 4/1, N4
5Y 4/1

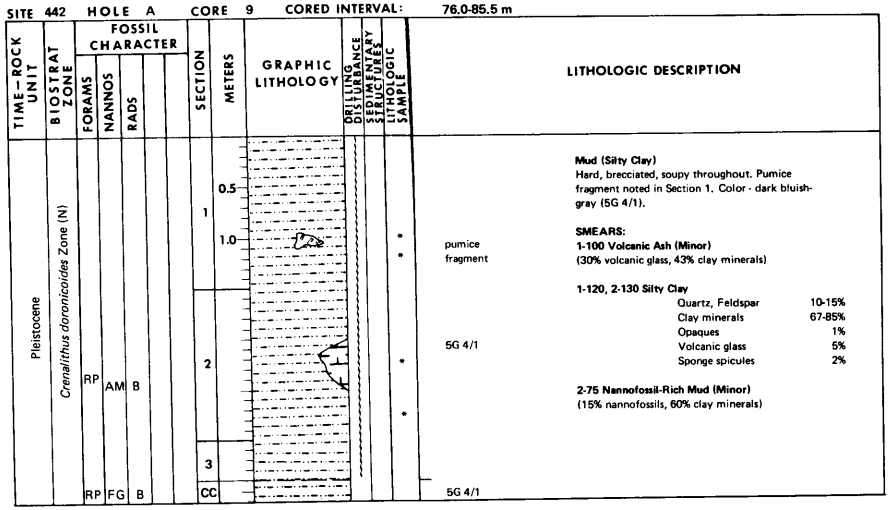
SITE 442 HOLE A CORE 7 CORED INTERVAL: 57.0-66.5 m



SITE 442 HOLE A CORE 8 CORED INTERVAL: 66.5-76.0 m



SITE 442 HOLE A CORE 9 CORED INTERVAL: 76.0-85.5 m



Mud (Silty Clay)
Hard, brecciated, soupy throughout. Pumice fragment noted in Section 1. Color - dark bluish-gray (5G 4/1).

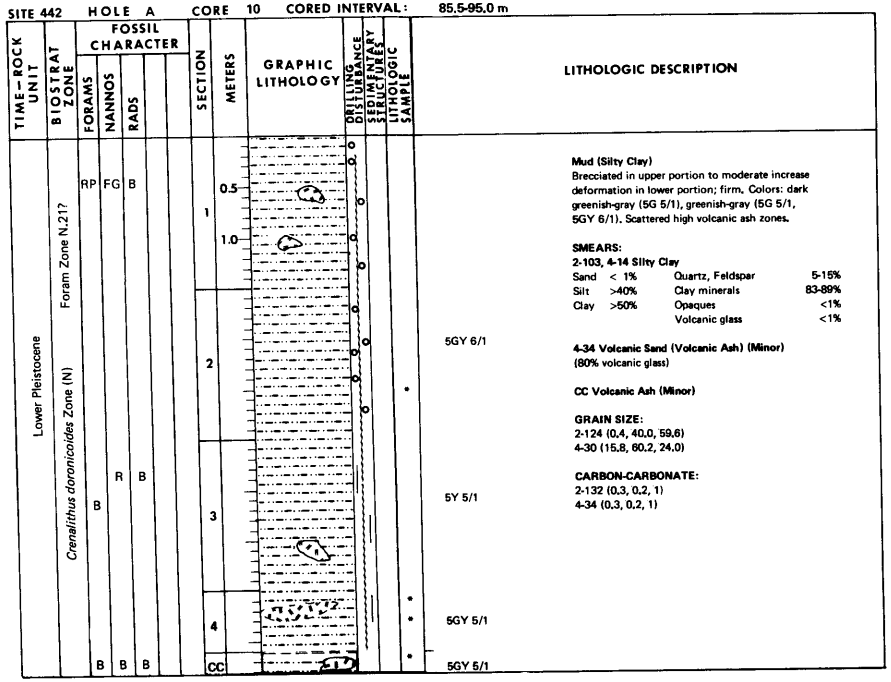
SMEARS:
1-100 Volcanic Ash (Minor)
(30% volcanic glass, 43% clay minerals)

1-120, 2-130 Silty Clay

Quartz, Feldspar	10-15%
Clay minerals	67-85%
Opaques	1%
Volcanic glass	5%
Sponge spicules	2%

2-75 Nannofossil-Rich Mud (Minor)
(15% nannofossils, 60% clay minerals)

SITE 442 HOLE A CORE 10 CORED INTERVAL: 85.5-95.0 m



Mud (Silty Clay)
Brecciated in upper portion to moderate increase deformation in lower portion; firm. Colors: dark greenish-gray (5G 5/1), greenish-gray (5G 5/1, 5GY 6/1). Scattered high volcanic ash zones.

SMEARS:
2-103, 4-14 Silty Clay

Sand	< 1%	Quartz, Feldspar	5-15%
Silt	>40%	Clay minerals	83-89%
Clay	>50%	Opaques	<1%
		Volcanic glass	<1%

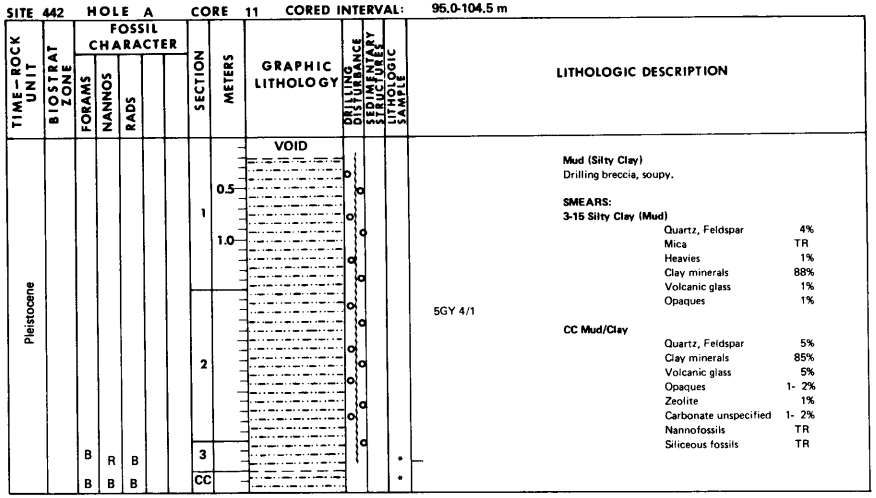
4-34 Volcanic Sand (Volcanic Ash) (Minor)
(80% volcanic glass)

CC Volcanic Ash (Minor)

GRAIN SIZE:
2-124 (0.4, 40.0, 59.6)
4-30 (15.8, 60.2, 24.0)

CARBON-CARBONATE:
2-132 (0.3, 0.2, 1)
4-34 (0.3, 0.2, 1)

SITE 442 HOLE A CORE 11 CORED INTERVAL: 95.0-104.5 m



Mud (Silty Clay)
Drilling breccia, soupy.

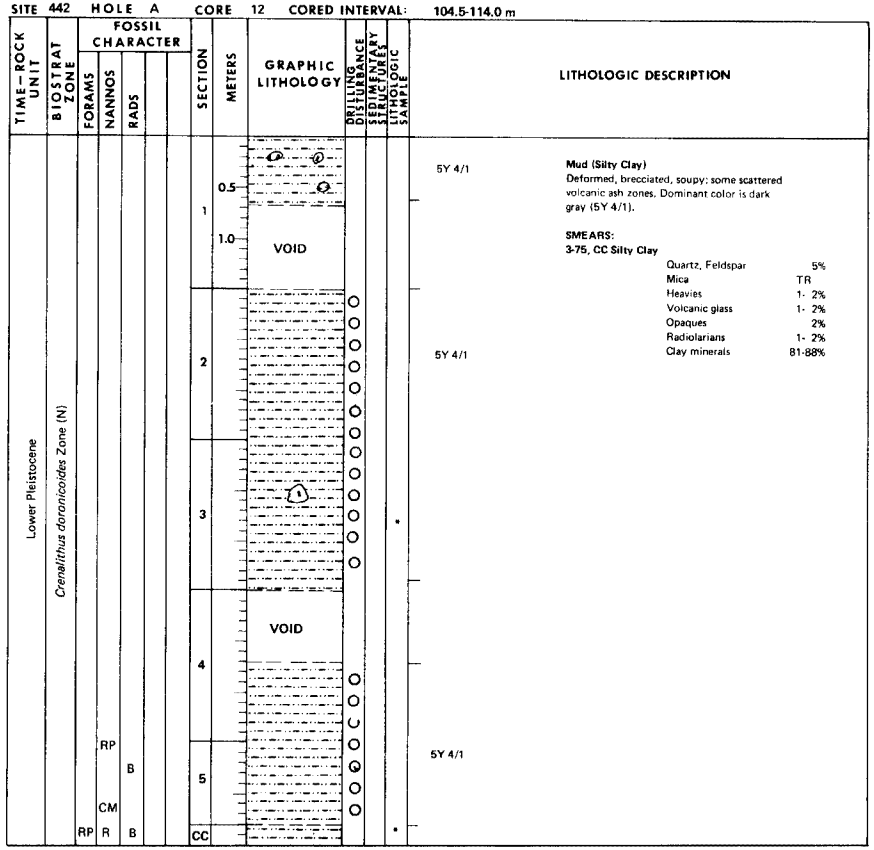
SMEARS:
3-15 Silty Clay (Mud)

Quartz, Feldspar	4%
Mica	TR
Heavies	1%
Clay minerals	88%
Volcanic glass	1%
Opaques	1%

CC Mud/Clay

Quartz, Feldspar	5%
Clay minerals	85%
Volcanic glass	5%
Opaques	1- 2%
Zeolite	1%
Carbonate unspecified	1- 2%
Nannofossils	TR
Siliceous fossils	TR

SITE 442 HOLE A CORE 12 CORED INTERVAL: 104.5-114.0 m

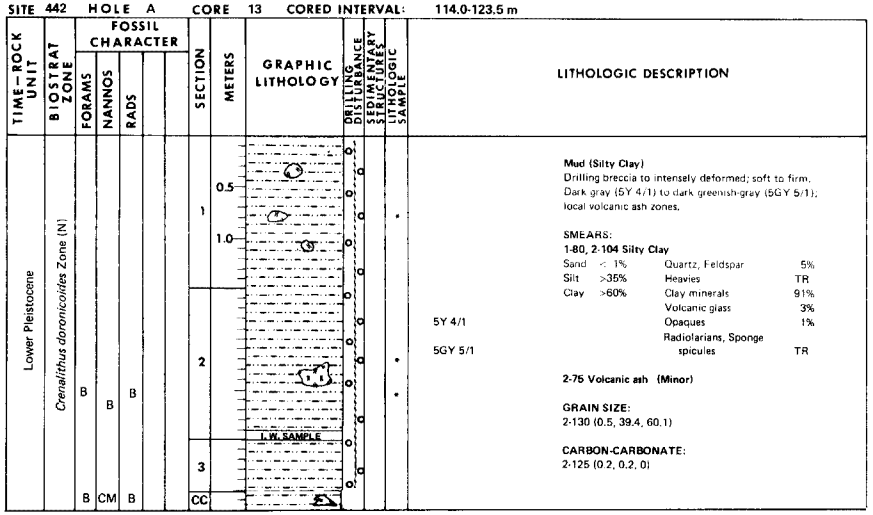


Mud (Silty Clay)
Deformed, brecciated, soupy; some scattered volcanic ash zones. Dominant color is dark gray (5Y 4/1).

SMEARS:
3-75, CC Silty Clay

Quartz, Feldspar	5%
Mica	TR
Heavies	1- 2%
Volcanic glass	1- 2%
Opaques	2%
Radiolarians	1- 2%
Clay minerals	81-88%

SITE 442 HOLE A CORE 13 CORED INTERVAL: 114.0-123.5 m



Mud (Silty Clay)
Drilling breccia to intensely deformed; soft to firm. Dark gray (5Y 4/1) to dark greenish-gray (5GY 5/1); local volcanic ash zones.

SMEARS:
1-80, 2-104 Silty Clay

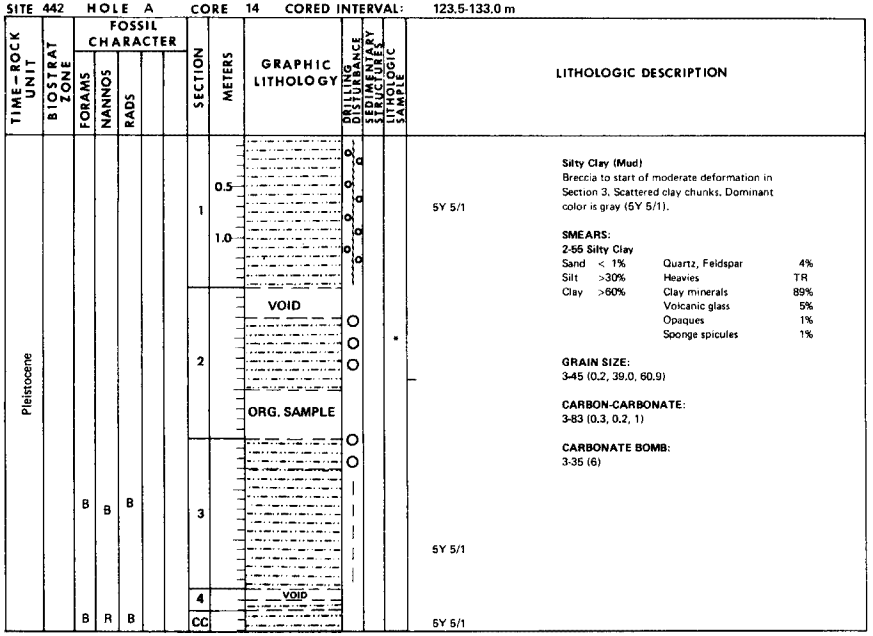
Sand	< 1%	Quartz, Feldspar	5%
Silt	>35%	Heavies	TR
Clay	>60%	Clay minerals	91%
		Volcanic glass	3%
		Opaques	1%
		Radiolarians, Sponge spicules	TR

2-75 Volcanic ash (Minor)

GRAIN SIZE:
2-130 (0.5, 39.4, 60.1)

CARBON-CARBONATE:
2-125 (0.2, 0.2, 0)

SITE 442 HOLE A CORE 14 CORED INTERVAL: 123.5-133.0 m



Silty Clay (Mud)
Breccia to start of moderate deformation in Section 3. Scattered clay chunks. Dominant color is gray (5Y 5/1).

SMEARS:
2-55 Silty Clay

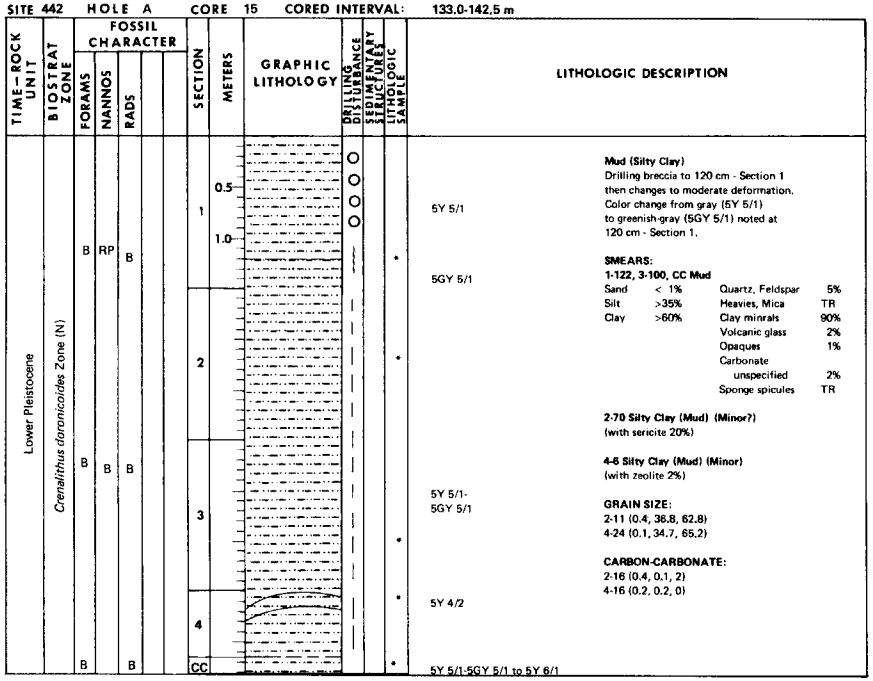
Sand	< 1%	Quartz, Feldspar	4%
Silt	>30%	Heavies	TR
Clay	>60%	Clay minerals	89%
		Volcanic glass	5%
		Opaques	1%
		Sponge spicules	1%

GRAIN SIZE:
3-45 (0.2, 39.0, 60.9)

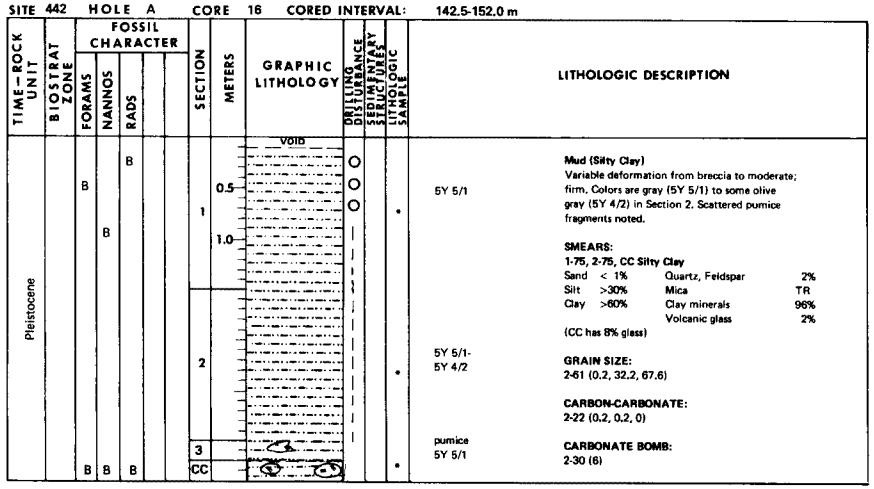
CARBON-CARBONATE:
3-83 (0.3, 0.2, 1)

CARBONATE BOMB:
3-35 (6)

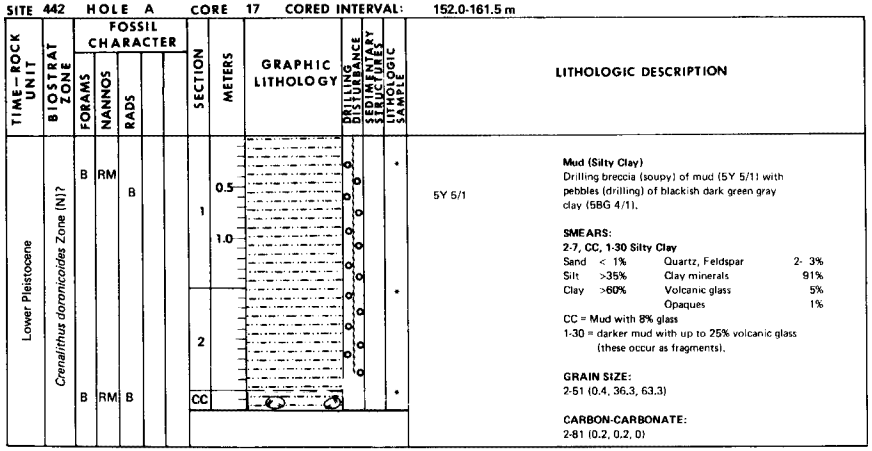
SITE 442 HOLE A CORE 15 CORED INTERVAL: 133.0-142.5 m



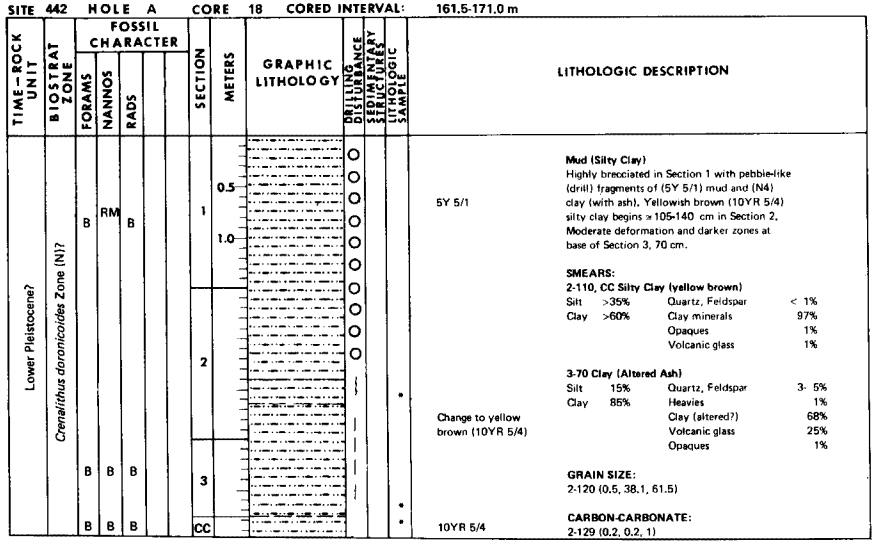
SITE 442 HOLE A CORE 16 CORED INTERVAL: 142.5-152.0 m



SITE 442 HOLE A CORE 17 CORED INTERVAL: 152.0-161.5 m



SITE 442 HOLE A CORE 18 CORED INTERVAL: 161.5-171.0 m



MGG 1505028

SITE 442 HOLE A CORE 19 CORED INTERVAL: 171.0-180.5 m

Time-Rock Unit: Pliocene
Biostrat Zone: *Pterocanium prismatium* or *Spongaster pentas* (R)

Section	Forams	Nannos	Rads	Graphic Lithology	Color
1	B	B	B	VOID (downhole contamination)	10YR 5/4 darkens
2					darkens; 10YR 5/4
3	B	B	RP	ORG. SAMPLE; I. W. SAMPLE	10YR 5/4
CC	B	B	FM		

LITHOLOGIC DESCRIPTION

Mud (Silty Clay)
Firm to hard with moderate deformation. Darker zones from ≥ 140 cm - Section 1 to 40 cm - Section 2.

SMEARS:
1-135 Clay (Mud)
(2% quartz, feldspar, 96% clay minerals)

2-75 Clay (Mud)

Sand	TR	Quartz, Feldspar	20%
Silt	20%	Heavies	TR
Clay	80%	Clay minerals	80%
		Volcanic glass, Opaques	TR

3-75 Silty Clay (Mud)
(13% quartz, feldspar, 84% clay minerals)

CC Silty Clay (Mud)
(3% quartz, feldspar, 8% volcanic glass)

GRAIN SIZE:
2-20 (1.9, 35.1, 62.9)

CARBON-CARBONATE:
2-7 (0.1, 0.1, 0)

CARBONATE BOMB:
3-5 (8)

SITE 442 HOLE A CORE 20 CORED INTERVAL: 180.5-190.0 m

Section	Forams	Nannos	Rads	Color
1	B	B	B	10YR 5/2-4/2 to 10YR 7/3
CC	B	B	B	10YR 5/2-10YR 4/2

LITHOLOGIC DESCRIPTION

Mud (Silty Clay)
Moderate deformation (slight in some cases). Color changes noticeable from grayish-brown to dark grayish-brown (0-12) with pumice noticed; dark gray brown (10YR 4/2) at 12-25; very pale brown (10YR 7/3) to pale brown (6/3) at 25-28, gray brown to very dark gray brown (10YR 5/2 to 4/2 to 3/2).

SMEARS:
1-10 Silty Clay

Sand	TR	Quartz, Feldspar	10%
Silt	30%	Heavies	TR
Clay	70%	Clay minerals	90%
		Volcanic glass, Opaques	TR

1-14 Silty Clay
(15% quartz, feldspar, 84% clay minerals, TR radiolarians)

1-26 Ash (Minor)

Sand	60%	Quartz, Feldspar	5%
Silt	40%	Heavies	TR
		Volcanic glass	95%

1-14 Silty Clay
(15% quartz, feldspar, 84% clay minerals, TR radiolarians)

1-122 Silty Clay
(14% quartz, feldspar, 5% volcanic glass, TR radiolarians)

CC Silty Clay
(97% clay minerals, 2% quartz, feldspar)

SITE 442 HOLE A CORE 21 CORED INTERVAL: 190.0-199.5 m

Section	Forams	Nannos	Rads	Color
1	B	B	B	10YR 5/3 to 4/3 to 10YR 4/2 to 10YR 3/2
2				10YR 5/2-5/3; 10YR 5/4-4/3
3	R	B	B	10YR 4/1-3/2=ash; 10YR 5/2-10YR 4/2-4/3
4				
CC	R	B	B	10YR 5/2

LITHOLOGIC DESCRIPTION

Mud (Silty Clay)
Slight to moderate deformation with some brecciated zones in Section 1. Generally brown to dark brown (10YR 5/3-4/3) with changes to dark grayish-brown - or very dark grayish-brown. Section 2 is yellowish-brown to brown (10YR 5/4-4/3). Section 3 generally brown (4/3) to yellow brown (10YR 5/4) with ash noted at 55 and 85 cm; varying color changes.

SMEARS:
1-68, 1-135, 2-84, 3-55, CC Clay

Sand	5%	Quartz, Feldspar	4-12%
Silt	10%	Mica, Heavies	TR
Clay	85%	Clay minerals	85%
		Volcanic glass	2- 3%
		Opaques	TR
		Radiolarians, Sponge spicules	TR

GRAIN SIZE:
2-43 (0.4, 29.7, 69.9)

CARBON-CARBONATE:
2-48 (0.1, 0.1, 0)

CARBONATE BOMB:
1-10 (6)

SITE 442 HOLE A CORE 22 CORED INTERVAL: 199.5-209.0 m

Section	Forams	Nannos	Rads	Graphic Lithology	Color
1	R	B	B	VOID	10YR 3/3-10YR 4/1-10YR 5/3
CC	C	B	B		10YR 4/3-4/4

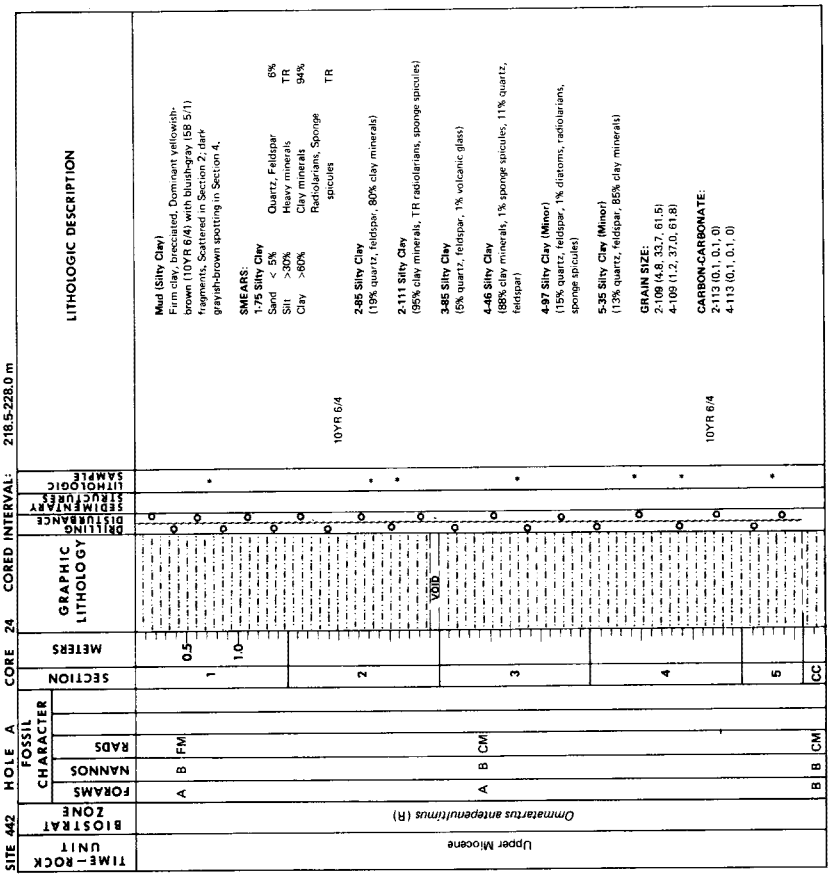
LITHOLOGIC DESCRIPTION

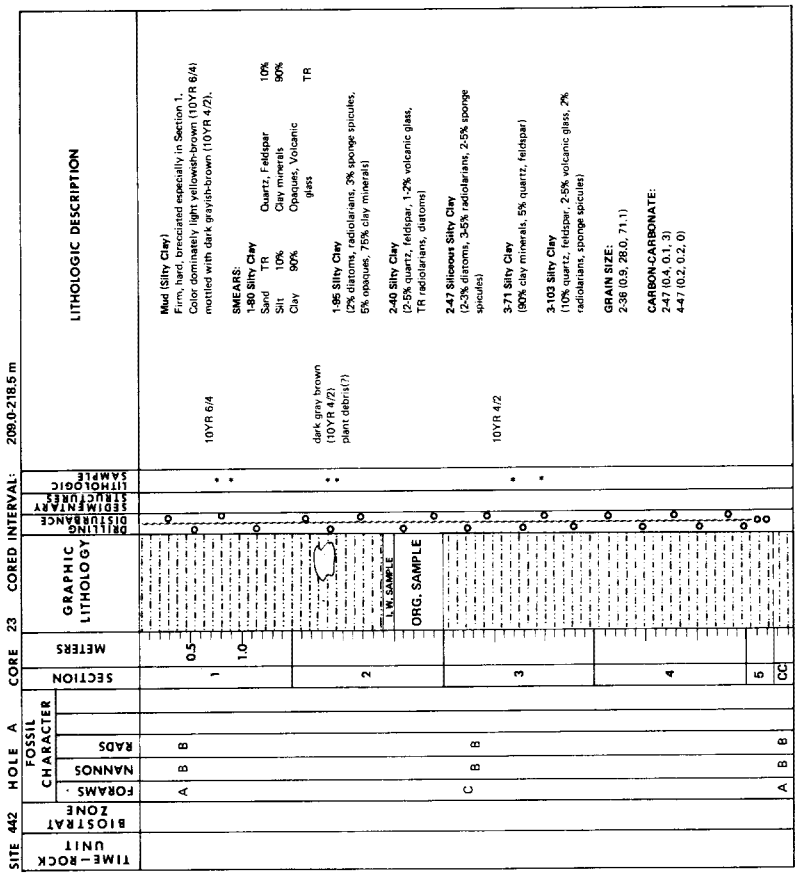
Mud (Silty Clay)
Drilling breccia of dark brown (10YR 3/3) and dark gray (10YR 4/1) clay. In CC clay is brown to dark brown plus dark yellow brown (10YR 4/3-4/4).

SMEARS:
1-140 Silty Clay

Sand	TR	Quartz, Feldspar	2%
Silt	>25%	Clay minerals	90%
Clay	>70%	Volcanic glass	7-10%
		Sponge spicules	1%

GRAIN SIZE:
1-145 (0.6, 26.9, 72.5)


SITE 442 HOLE A CORE 24 CORED INTERVAL: 218.5-228.0 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Upper Miocene
Ommatartus antepenultimus (R)
Mud (Silty Clay)
Firm clay, brecciated. Dominant yellowish-brown (10YR 6/4) with bluish-gray (5B 5/1) fragments. Scattered in Section 2, dark grayish-brown spotting in Section 4.
SMEARS:
1-75 Silty Clay
Sand < 5% Quartz, Feldspar 6%
Silt >30% Heavy minerals TR
Clay >60% Clay minerals 94%
Radiolarians, Sponge spicules TR
10YR 6/4
2-85 Silty Clay
(19% quartz, feldspar, 80% clay minerals)
2-111 Silty Clay
(95% clay minerals, TR radiolarians, sponge spicules)
VOID
3-85 Silty Clay
(5% quartz, feldspar, 1% volcanic glass)
4-46 Silty Clay
(88% clay minerals, 1% sponge spicules, 11% quartz, feldspar)
4-97 Silty Clay (Minor)
(15% quartz, feldspar, 1% diatoms, radiolarians, sponge spicules)
5-35 Silty Clay (Minor)
(13% quartz, feldspar, 85% clay minerals)
GRAIN SIZE:
2-109 (4.8, 33.7, 61.5)
4-109 (1.2, 37.0, 61.8)
CARBON-CARBONATE:
2-113 (0.1, 0.1, 0)
4-113 (0.1, 0.1, 0)
10YR 6/4


SITE 442 HOLE A CORE 23 CORED INTERVAL: 209.0-218.5 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Mud (Silty Clay)
Firm, hard, brecciated especially in Section 1. Color dominately light yellowish-brown (10YR 6/4) mottled with dark grayish-brown (10YR 4/2).
10YR 6/4
SMEARS:
1-80 Silty Clay
Sand TR Quartz, Feldspar 10%
Silt 10% Clay minerals 90%
Clay 90% Opaques, Volcanic glass TR
dark gray brown (10YR 4/2) plant debris(?)
1-95 Silty Clay
(2% diatoms, radiolarians, 3% sponge spicules, 5% opaques, 75% clay minerals)
2-40 Silty Clay
(2.5% quartz, feldspar, 1-2% volcanic glass, TR radiolarians, diatoms)
2-47 Siliceous Silty Clay
(24-3% diatoms, 3-5% radiolarians, 2-5% sponge spicules)
10YR 4/2
3-71 Silty Clay
(90% clay minerals, 5% quartz, feldspar)
3-103 Silty Clay
(10% quartz, feldspar, 2-5% volcanic glass, 2% radiolarians, sponge spicules)
GRAIN SIZE:
2-36 (0.9, 28.0, 71.1)
CARBON-CARBONATE:
2-47 (0.4, 0.1, 3)
4-47 (0.2, 0.2, 0)
L.W. SAMPLE
ORG. SAMPLE

SITE 442 HOLE A CORE 25 CORED INTERVAL: 228.0-237.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Middle Miocene	*Cannartus petterssoni* (R)	F	B	CM	1	0.5				*	10YR 5/4 with 10YR 4/3-3/3-10YR 4/2-10YR 3/2
						1.0					
					2					*	
					3					*	
					4					*	10YR 5/3
		R	B	CM	CC					*	10YR 3/3 with 10YR 2/1-10YR 3/1

Mud (Silty Clay)
Firm, brecciated clay; dark yellowish-brown (10YR 5/4) to brown (10YR 4/3). Mottling with grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2); pyritic zones noted in Sections 2 and 3. Dark layers may mark relict bedding; colors very dark gray (10YR 3/1) to very dark grayish-brown (10YR 3/2).

SMEARS:
2-110 Siliceous Silty Clay (Mud)
(3-5% diatoms, radiolarians, sponge spicules, 70-75% clay minerals)

2-143 Silty Clay (pyritic)

Sand	< 1%	Quartz, Feldspar	10-15%
Silt	>40%	Clay minerals	68-70%
Clay	>50%	Pyrite	7-10%
		Volcanic glass	2%
		Siliceous fragments	1%

3-90 Silty clay (with pyrite, siliceous)
(5% pyrite, 3-5% diatoms, radiolarians)

4-6 Silty Clay (with siliceous fragments)
(3-5% pyrite, diatoms, radiolarians, siliceous?)

4-32 Silty Clay (with siliceous)
(1-2% volcanic glass, 3-5% diatoms, radiolarians, 5-8% quartz, feldspar)

4-92 Silty Clay
(6-11% siliceous fragments, 5-7% pyrite)

GRAIN SIZE:
2-41 (1.5, 48.3, 50.2)
4-41 (1.1, 42.6, 56.2)

CARBON-CARBONATE:
2-60 (0.2, 0.1, 1)
4-60 (0.1, 0.1, 0)

SITE 442 HOLE A CORE 26 CORED INTERVAL: 237.5-247.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Middle Miocene	*Dorcadospyris alata* (R) uncertain by nannoplankton	R	CP	CP	1	0.5					10YR 5/4
						1.0					
					2					*	
		B	B	CM	CC					*	10YR 5/4

Mud (Silty Clay)
Breccia in Section 1 with burrows noted in the lower part, intense deformation continues to 55 cm, Section 2 with moderate below. Scattered diffuse areas with pyrite occur in Section 2. Burrows with pyrite are noted in Section 2 (< 20%). Clay is firm but disturbed in Section 2.

SMEARS:
2-75 Silty Clay

Sand	< 2%	Quartz, Feldspar	5%
Silt	>40%	Mica	TR
Clay	>50%	Clay minerals	80%
		Volcanic glass	TR
		Pyrite	2%
		Zeolite	1%
		Siliceous fragments	10%

CC Silty Clay
(3% pyrite, 10% siliceous fragments)

GRAIN SIZE:
2-94 (1.6, 41.3, 57.1)

CARBON-CARBONATE:
2-106 (0.2, 0.1, 1)

SITE 442 HOLE A CORE 27 CORED INTERVAL: 247.0-256.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Middle Miocene	*Dorcadospyris alata* (R)	R	B	CM	1	0.5					10YR 5/4
						1.0					
					2		I.W. SAMPLE			*	10YR 5/4 mottled with 10YR 4/2

Silty Clay (Mud)
Section 1 = drilling breccia. Moderate to intense disturbance in Section 2 (50-150) with yellow brown (10YR 5/4) mottled with dark grayish-brown (10YR 4/2). Pumice pebble noted in Section 2.

SMEARS:
2-135 Silty Clay (dark color) (Minor)

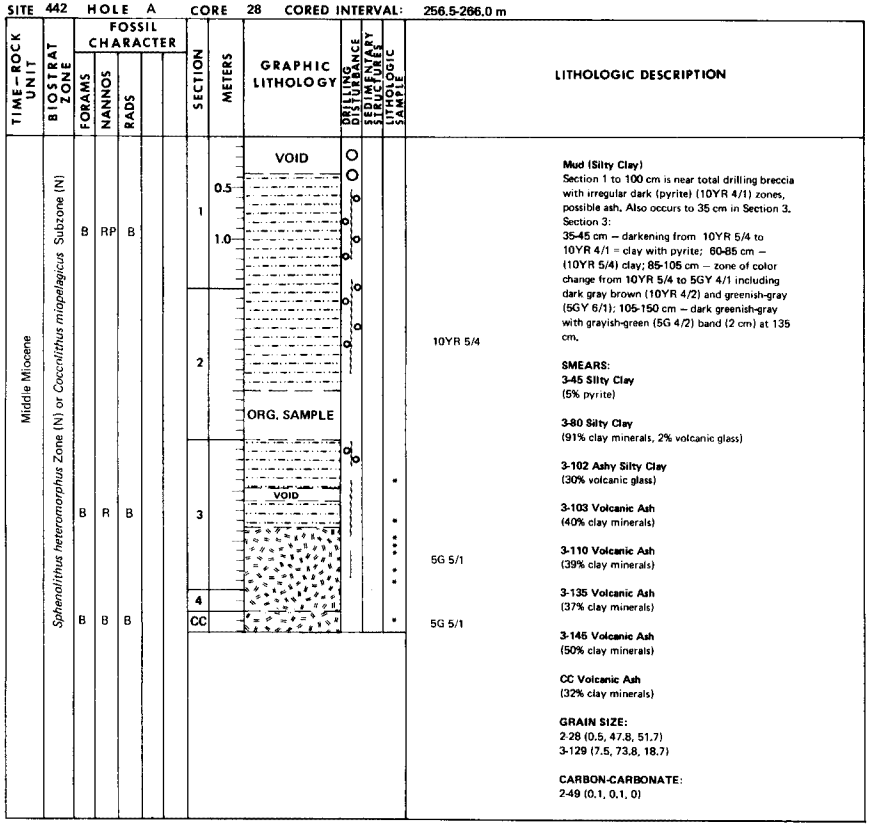
Sand	10%	Quartz, Feldspar	3%
Silt	10%	Mica	TR
Clay	80%	Heavies	1%
		Clay minerals	84%
		Volcanic glass	1%
		Pyrite	7%
		Radiolarians	2%
		Sponge spicules	1%

2-140 Silty Clay (light color)
(TR radiolarians, 1% sponge spicules, 5% volcanic glass)

GRAIN SIZE:
2-103 (3.6, 47.0, 49.4)

CARBON-CARBONATE:
2-107 (0.1, 0.1, 0)

SITE 442 HOLE A CORE 28 CORED INTERVAL: 256.5-266.0 m



Mud (Silty Clay)
Section 1 to 100 cm is near total drilling breccia with irregular dark (pyrite) (10YR 4/1) zones, possible ash. Also occurs to 35 cm in Section 3.
Section 3:
35-45 cm – darkening from 10YR 5/4 to 10YR 4/1 = clay with pyrite; 60-85 cm – (10YR 5/4) clay; 85-105 cm – zone of color change from 10YR 5/4 to 5GY 4/1 including dark gray brown (10YR 4/2) and greenish-gray (5GY 6/1); 105-150 cm – dark greenish-gray with grayish-green (5G 4/2) band (2 cm) at 135 cm.

SMEARS:
3-45 Silty Clay
(5% pyrite)

3-80 Silty Clay
(91% clay minerals, 2% volcanic glass)

3-102 Ashy Silty Clay
(30% volcanic glass)

3-103 Volcanic Ash
(40% clay minerals)

3-110 Volcanic Ash
(39% clay minerals)

3-135 Volcanic Ash
(37% clay minerals)

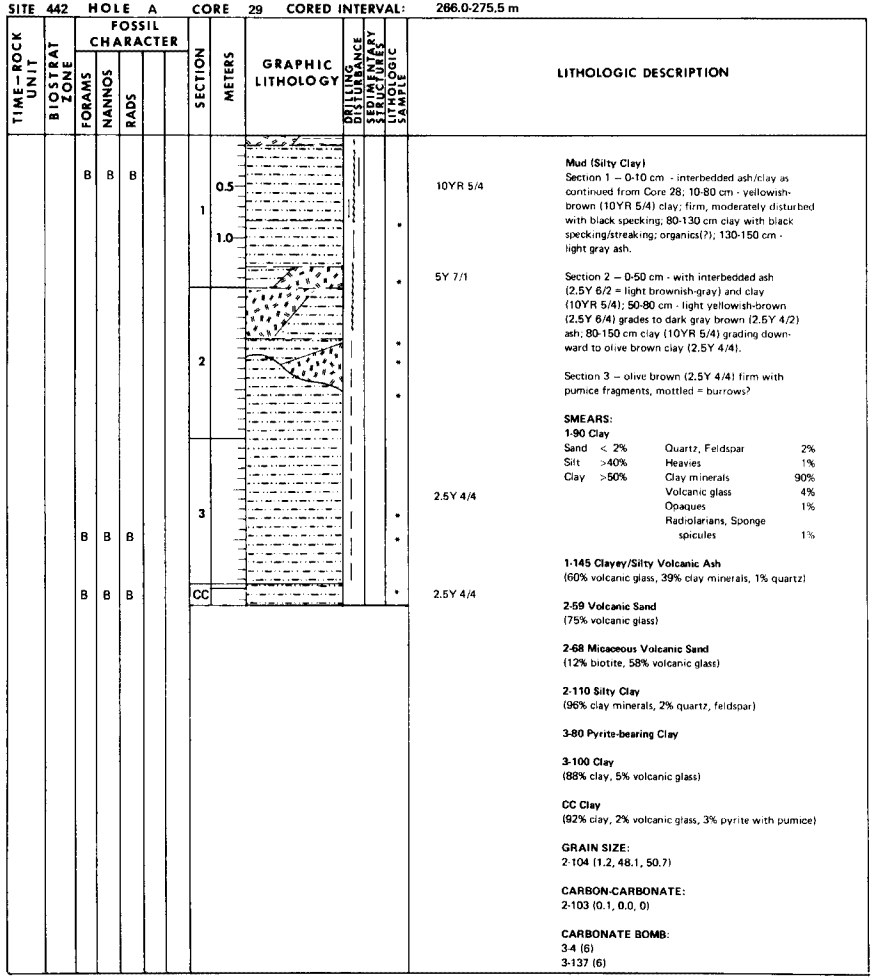
3-145 Volcanic Ash
(50% clay minerals)

CC Volcanic Ash
(32% clay minerals)

GRAIN SIZE:
2-28 (0.5, 47.8, 51.7)
3-129 (7.5, 73.8, 18.7)

CARBON-CARBONATE:
2-49 (0.1, 0.1, 0)

SITE 442 HOLE A CORE 29 CORED INTERVAL: 266.0-275.5 m



Mud (Silty Clay)
Section 1 – 0-10 cm - interbedded ash/clay as continued from Core 28; 10-80 cm - yellowish-brown (10YR 5/4) clay; firm, moderately disturbed with black specking; 80-130 cm clay with black specking/streaking; organics(?); 130-150 cm - light gray ash.

Section 2 – 0-50 cm - with interbedded ash (2.5Y 6/2 = light brownish-gray) and clay (10YR 5/4); 50-80 cm - light yellowish-brown (2.5Y 6/4) grades to dark gray brown (2.5Y 4/2) ash; 80-150 cm clay (10YR 5/4) grading downward to olive brown clay (2.5Y 4/4).

Section 3 – olive brown (2.5Y 4/4) firm with pumice fragments, mottled = burrows?

SMEARS:
1-90 Clay

Sand	< 2%	Quartz, Feldspar	2%
Silt	>40%	Heavies	1%
Clay	>50%	Clay minerals	90%
		Volcanic glass	4%
		Opaques	1%
		Radiolarians, Sponge spicules	1%

1-145 Clayey/Silty Volcanic Ash
(60% volcanic glass, 39% clay minerals, 1% quartz)

2-59 Volcanic Sand
(75% volcanic glass)

2-68 Micaceous Volcanic Sand
(12% biotite, 58% volcanic glass)

2-110 Silty Clay
(96% clay minerals, 2% quartz, feldspar)

3-80 Pyrite-bearing Clay

3-100 Clay
(88% clay, 5% volcanic glass)

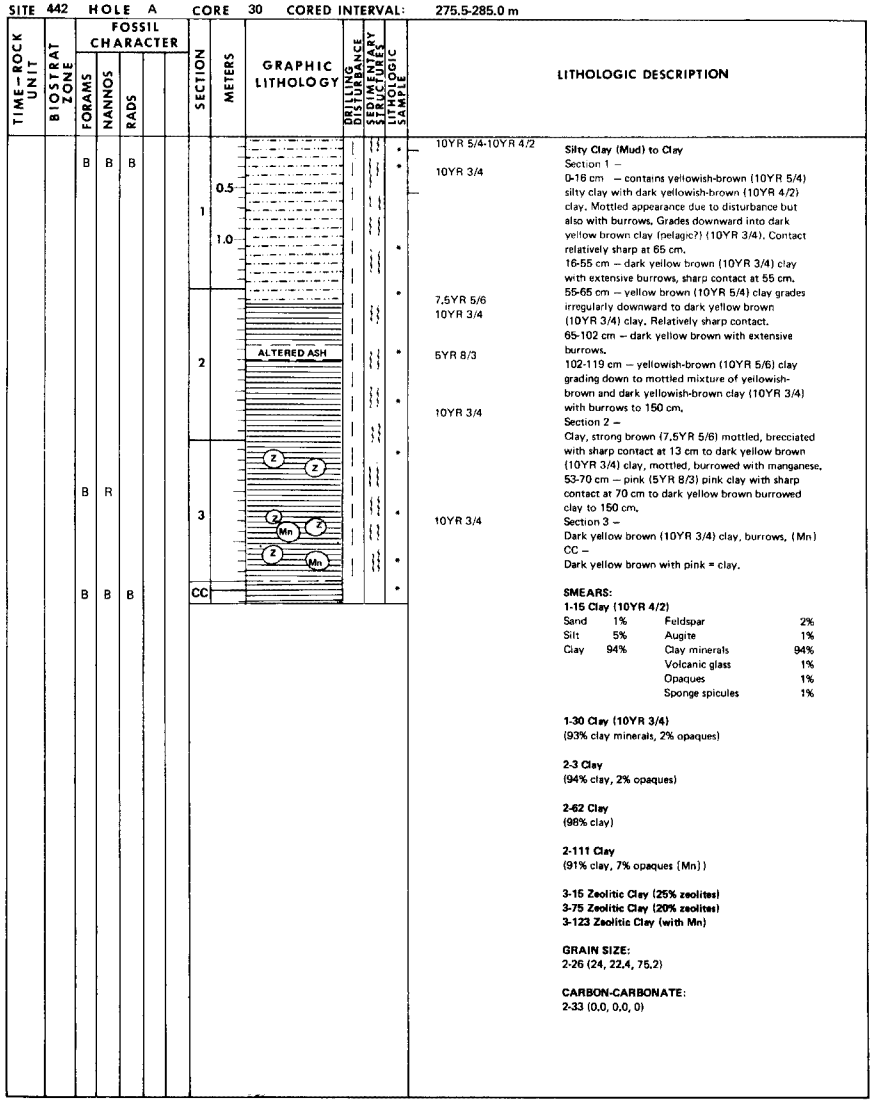
CC Clay
(92% clay, 2% volcanic glass, 3% pyrite with pumice)

GRAIN SIZE:
2-104 (1.2, 48.1, 50.7)

CARBON-CARBONATE:
2-103 (0.1, 0.0, 0)

CARBONATE BOMB:
3-4 (6)
3-137 (6)

SITE 442 HOLE A CORE 30 CORED INTERVAL: 275.5-285.0 m



10YR 5/4-10YR 4/2

10YR 3/4

7.5YR 5/6
10YR 3/4

5YR 8/3

10YR 3/4

10YR 3/4

Silty Clay (Mud) to Clay

Section 1 –
0-16 cm – contains yellowish-brown (10YR 5/4) silty clay with dark yellowish-brown (10YR 4/2) clay. Mottled appearance due to disturbance but also with burrows. Grades downward into dark yellow brown clay (pelagic?) (10YR 3/4). Contact relatively sharp at 65 cm.
16-55 cm – dark yellow brown (10YR 3/4) clay with extensive burrows, sharp contact at 55 cm.
55-65 cm – yellow brown (10YR 5/4) clay grades irregularly downward to dark yellow brown (10YR 3/4) clay. Relatively sharp contact.
65-102 cm – dark yellow brown with extensive burrows.
102-119 cm – yellowish-brown (10YR 5/6) clay grading down to mottled mixture of yellowish-brown and dark yellowish-brown clay (10YR 3/4) with burrows to 150 cm.
Section 2 –
Clay, strong brown (7.5YR 5/6) mottled, brecciated with sharp contact at 13 cm to dark yellow brown (10YR 3/4) clay, mottled, burrowed with manganese.
53-70 cm – pink (5YR 8/3) pink clay with sharp contact at 70 cm to dark yellow brown burrowed clay to 150 cm.
Section 3 –
Dark yellow brown (10YR 3/4) clay, burrows, (Mn)
CC –
Dark yellow brown with pink = clay.

SMEARS:

1-15 Clay (10YR 4/2)

Sand	1%	Feldspar	2%
Silt	5%	Augite	1%
Clay	94%	Clay minerals	94%
		Volcanic glass	1%
		Opaques	1%
		Sponge spicules	1%

1-30 Clay (10YR 3/4)
(93% clay minerals, 2% opaques)

2-3 Clay
(94% clay, 2% opaques)

2-62 Clay
(98% clay)

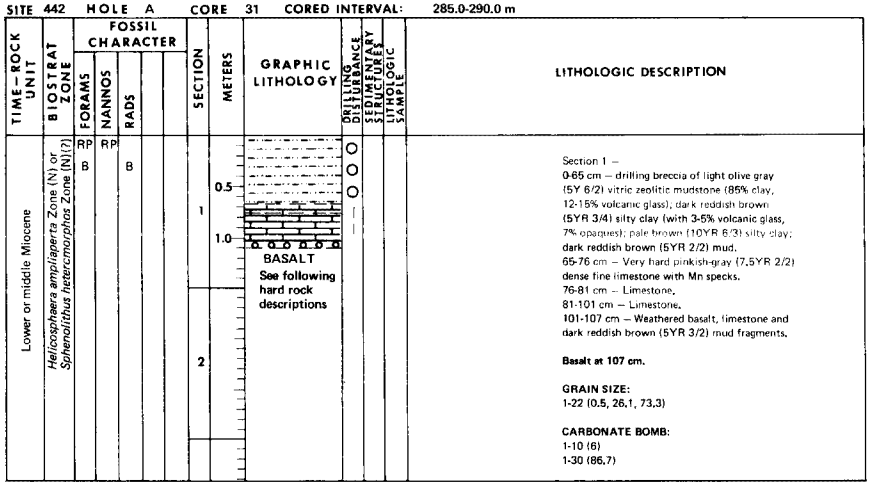
2-111 Clay
(91% clay, 7% opaques (Mn))

3-15 Zeolitic Clay (25% zeolites)
3-75 Zeolitic Clay (20% zeolites)
3-123 Zeolitic Clay (with Mn)

GRAIN SIZE:
2-26 (24, 22.4, 75.2)

CARBON-CARBONATE:
2-33 (0.0, 0.0, 0)

SITE 442 HOLE A CORE 31 CORED INTERVAL: 285.0-290.0 m

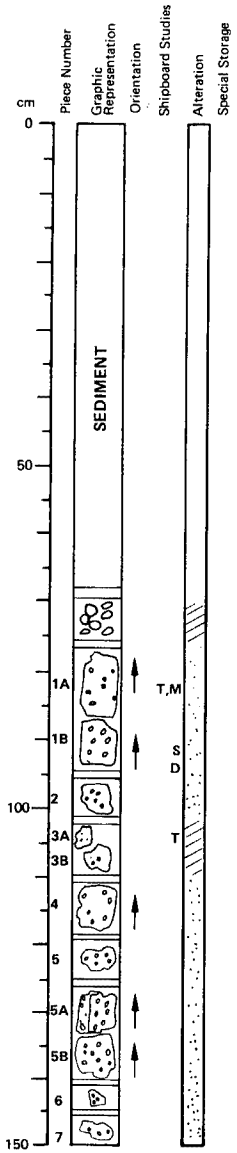


Section 1 –
0-65 cm – drilling breccia of light olive gray (5Y 6/2) vitric zeolitic mudstone (85% clay, 12-15% volcanic glass); dark reddish brown (5YR 3/4) silty clay (with 3-5% volcanic glass, 7% opaques); pale brown (10YR 6/3) silty clay; dark reddish brown (5YR 2/2) mud.
65-76 cm – Very hard pinkish-gray (7.5YR 2/2) dense fine limestone with Mn specks.
76-81 cm – Limestone.
81-101 cm – Limestone.
101-107 cm – Weathered basalt, limestone and dark reddish brown (5YR 3/2) mud fragments.

Basalt at 107 cm.

GRAIN SIZE:
1-22 (0.5, 26.1, 73.3)

CARBONATE BOMB:
1-10 (6)
1-30 (86.7)



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	A	3 1	1

Depth 286.0 to 286.5 m

Visual Description
35-70 cm: lithified calcareous ooze.
70-75 cm: lightly weathered aphyric basalt pebbles.
77-150 cm: lightly weathered to moderately weathered aphyric basalt (no phenocrysts), 40% fine vesicles (< 1 mm), 2% medium vesicles (> 1 mm) graded.
127-134 cm: alteration vein exposed on fracture surface at back of piece – mainly zeolites with some calcite, 1/2 to 1 mm thick.

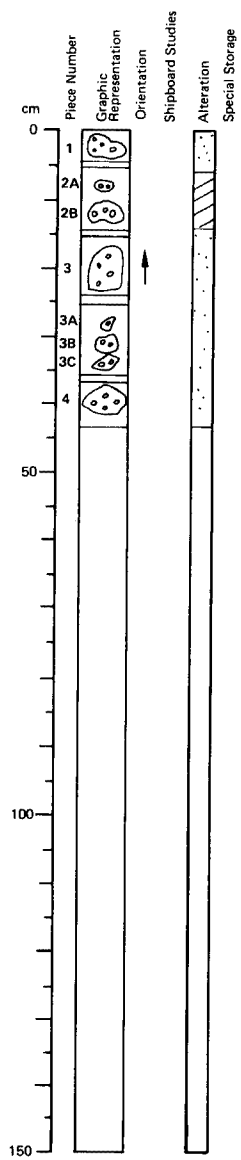
Thin Section Description – 90-92 cm
Groundmass: plagioclase 25%, 1/4 to 1 1/2 mm, An_{73}, lathes (Carlsbad twin); clinopyroxene 15%, 0.1 to 0.3 mm, augite, anhedral; magnetite 1%, 0.01 to 0.03 mm; other cryptocrystalline 24%.
Vesicles: 25%, 0.1 to 1.0 mm, round to irregular.
Texture: intersertal.
Alteration: 10% clays intergranular replacing groundmass.

Shipboard Data

Bulk Analysis:	**85 cm**
SiO_2	49.79
Al_2O_3	15.49
Fe_2O_3	1.14
FeO	7.54
MgO	6.76
CaO	13.58
Na_2O	3.10
K_2O	0.31
TiO_2	1.27
P_2O_5	0.16
MnO	0.14
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	220
Ni	45
Sr	188
Zr	84

Magnetic Data:	**90 cm**
Intensity (emu/cc)	118.1
Inclination before demag.	35.3
Stable Inclination	35.8

Physical Properties:	**89 cm**
$\bar{V}p$ (km/s)	4.54
Porosity (%)	21.13
Wet Bulk Density	2.52
Grain Density	2.92

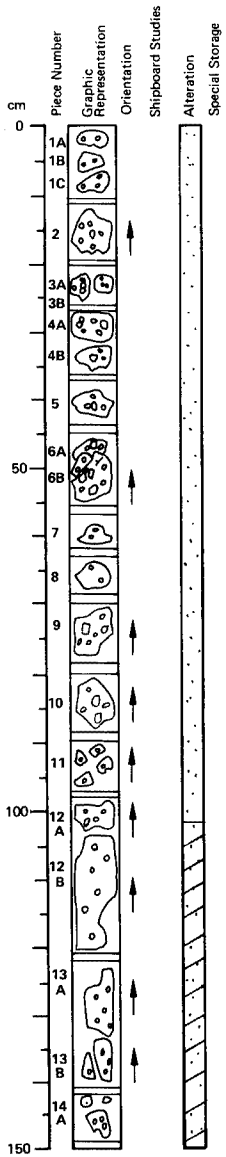


VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	A	3 1	2

Depth 286.5 to 286.9 m

Visual Description
0-41 cm: aphyric basalt, gray to dark gray; vesicular. Fine vesicles (40%); < 1 mm; medium vesicles (2%); > 1 up to 4 mm.
7-14 cm: moderately altered basalt.



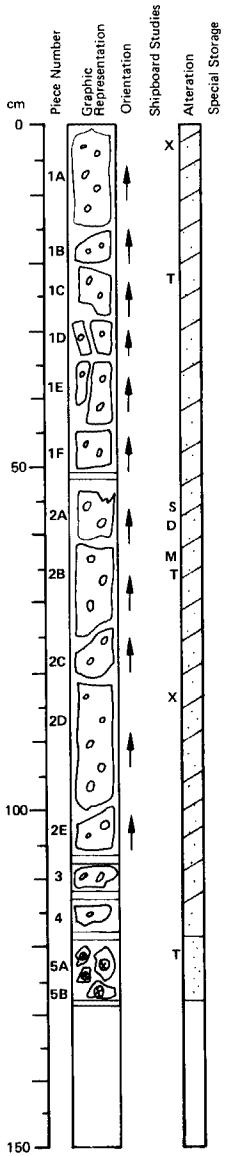
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	A	3 2	1

Depth 290.0 to 291.5 m

Visual Description

0-150 cm: aphyric basalt; dark gray; vesicular; slightly altered. Fine vesicles 40% (< 1 mm); medium vesicles ~2% (> 1 mm and partly up to 5-7 mm).
98-150 cm: vesicles (~50%) contain some secondary minerals.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	A	3 2	2

Depth 291.5 to 292.8 m

Visual Description

0-128 cm: aphyric basalt; dark gray, vesicular, lightly altered. Fine vesicles 40% (< 1 mm); medium vesicles (> 1 mm) occur in the 0-51 cm interval - 2%, 50% of the vesicles contain secondary minerals.
98-128 cm: vesicles are 20-30%.
128-138 cm: variolitic basalt gray to dark gray; varioles are an aggregate of plagioclase (30-40%) up to 20 mm in an aphanitic groundmass.

Thin Section Description — 62 cm

Groundmass: plagioclase 30%, 0.6 x 0.1 mm, An_{54}, subhedral; clinopyroxene 7%, 0.4 x 0.2 mm, augite, anhedral; glass 30%, interstitial.
Vesicles: 30%, 0.1-2.0 mm, round irregular.
Texture: intergranular-intersertal.
Alteration: 3% carbonate in vesicles.

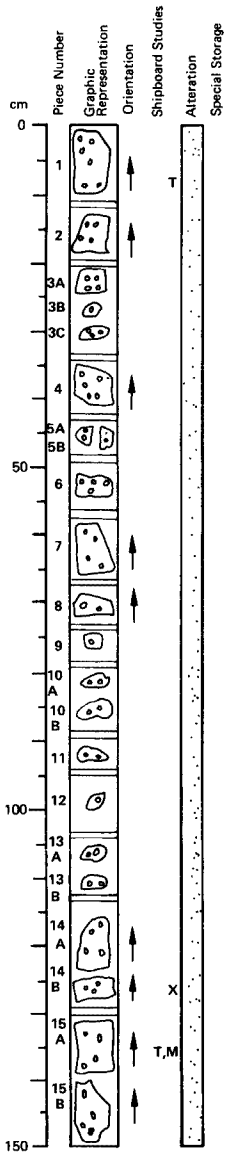
Thin Section Description — 126 cm

Groundmass: plagioclase 10%, 0.1-2 mm, An_{62}, euhedral, skeletal, light zonation; glass+py+pe+mt 50%, microlite (half crystalline).
Vesicles: 40%, 0.05-1.5 mm, round irregular, unfilled.
Texture: variolitic - intersertal.

Shipboard Data

Bulk Analysis:	**0 cm**	**80 cm**
SiO_2	48.80	49.60
Al_2O_3	14.82	15.17
Fe_2O_3	1.12	1.03
FeO	7.39	6.80
MgO	5.64	7.72
CaO	15.37	13.93
Na_2O	3.07	3.20
K_2O	0.47	0.30
TiO_2	1.15	1.19
P_2O_5	0.14	0.12
MnO	0.15	0.11
LOI	—	—
H_2O^+	—	—
H_2O^-	—	—
CO_2	—	—
Cr	234	240
Ni	57	130
Sr	183	182
Zr	86	86

Magnetic Data:	**62 cm**
Intensity (emu/cc)	104.2
Inclination before demag.	26.2
Physical Properties:	**54 cm**
$\bar{V}p$ (km/s)	4.05
Porosity (%)	23.60
Wet Bulk Density	2.50
Grain Density	2.97
Other Data:	**81 cm**
Therm. cond. (mcal/cm-s-° C)	3.73



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	442	A	33	1

Depth 294.5 to 296.0 m

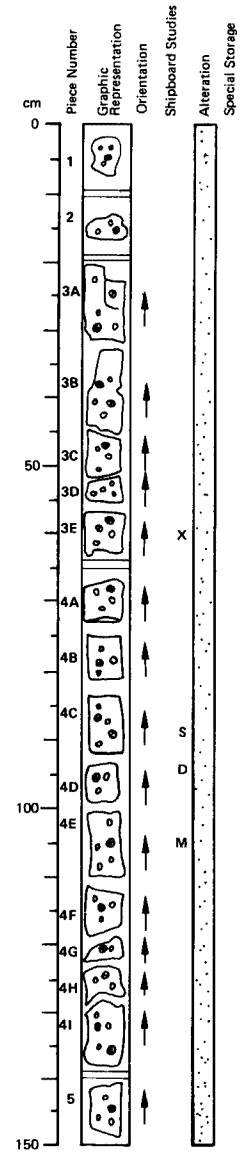
Visual Description
0-10 cm: light gray aphyric basalt 40% vesicles (<1 mm), 5% vesicles (>1 mm) calcite infilling of larger vesicles
10-150 cm: light gray aphyric basalt 30% vesicles (<1 mm), up to 5% vesicles (>1 mm) occasional calcite infilling of larger vesicles. Largest vesicles are approximately 2 to 3 mm across.
Alteration - light.

Thin Section Description – 9 cm
Groundmass: plagioclase 25%, 0.5-1.0 mm, An_{59}, laths; clinopyroxene 20%, 0.05-0.2 mm, anhedral; magnetite 3%; other 25%, cryptocrystalline matrix.
Vesicles: 25%, 0.1-1.0 mm.
Texture: intersertal.
Alteration: 1% carbonate in vesicles; 1% clays in vesicles.

Shipboard Data

Bulk Analysis:	124 cm
SiO_2	47.97
Al_2O_3	14.16
Fe_2O_3	1.08
FeO	7.16
MgO	6.80
CaO	16.93
Na_2O	2.75
K_2O	0.29
TiO_2	1.11
P_2O_5	0.14
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	216
Ni	53
Sr	186
Zr	82

Magnetic Data:	136 cm
Intensity (emu/cc)	346.5
Inclination before demag.	33.3
Stable Inclination	36.1



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	442	A	33	2

Depth 296.0 to 297.5 m

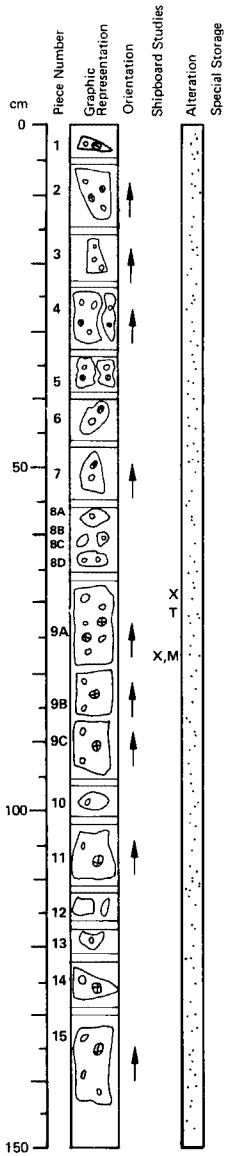
Visual Description
Light gray, vesicular, variolitic basalt. Vesicle approximately 30% (<1 mm) and 5% (>1 mm). Largest vesicles are up to 5 mm across. Infilling of vesicles by brown and light greenish-gray alteration products.
20-33 cm: (3A) - fracture with weathered surfaces.
129-137 cm: (4I) - at 132 cm large vesicle occurs with well-developed crystals of calcite(?).

Thin Section Description – 102 cm
Groundmass: plagioclase 35%, 0.1-3.0 mm, An_{60}, laths; clinopyroxene 25%, 0.1-0.5 mm, anhedral; magnetite 4%, 0.05-0.1 mm, granular; other 20%, cryptocrystalline matrix.
Vesicles: 15%, 0.3-1.0 mm.
Texture: intersertal.
Alteration: 1% clays lining vesicles.

Shipboard Data

Bulk Analysis:	57 cm
SiO_2	50.17
Al_2O_3	15.02
Fe_2O_3	1.22
FeO	8.08
MgO	7.36
CaO	11.54
Na_2O	3.18
K_2O	0.44
TiO_2	1.25
P_2O_5	0.13
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	233
Ni	49
Sr	189
Zr	86

Magnetic Data:	101 cm
Intensity (emu/cc)	109.6
Inclination before demag.	33.4
Stable Inclination	31.9
Physical Properties:	**97 cm**
$\bar{V}p$ (km/s)	4.66
Porosity (%)	16.28
Wet Bulk Density	2.60
Grain Density	2.91
Other Data:	**22 cm**
Therm. cond. (mcal/cm-s-°C)	3.34



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	A	3 3	3

Depth 297.5 to 299.0 m

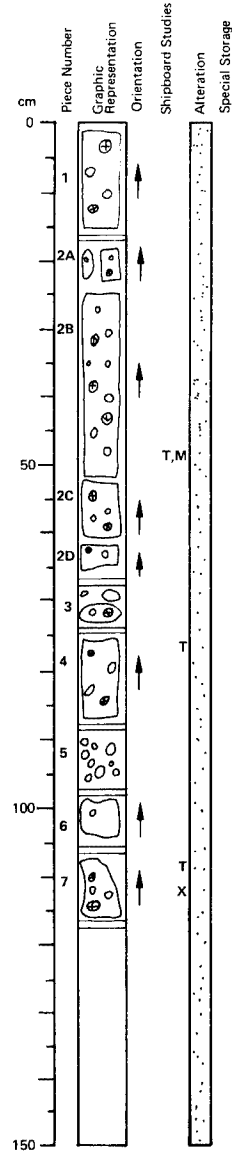
Visual Description
Light gray, vesicular, variolitic basalt. Vesicles approximately 20% to 30% (< 1 mm) and 2% to 10% (> 1 mm). Largest approximately 3 mm across. Some infilling of vesicles by brown alteration products.
24-32 cm: (4) - pieces split by heavily weathered fracture.
66-79 cm: (9a) - two distinct vesicle-rich zones at 66-68 cm and 71-73 cm.
130-141 cm: (15) - fracture at lower end with weathered surfaces.

Thin Section Description – 80 cm
Groundmass: plagioclase 30%, 0.1-1.0 mm, An_{59}, laths; clinopyroxene 20%, 0.1-0.5 mm, anhedral; magnetite 3%, <0.02 mm, granular; other 20%, cryptocrystalline matrix.
Vesicles: 25%, 0.05-1.0 mm.
Texture: intersertal.
Alteration: 1% carbonate filling vesicles; 1% clays lining vesicles.

Shipboard Data

Bulk Analysis:	68 cm
SiO_2	50.04
Al_2O_3	14.93
Fe_2O_3	1.18
FeO	7.80
MgO	8.31
CaO	11.68
Na_2O	3.25
K_2O	0.38
TiO_2	1.24
P_2O_5	0.12
MnO	0.12
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	245
Ni	77
Sr	182
Zr	89

Magnetic Data:	79 cm	
Intensity (emu/cc)	134.0	
Inclination before demag.	31.4	
Stable Inclination	34.6	
Other Data:	**72 cm**	**78 cm**
Therm. cond. (mcal/cm-s-°C)	3.33	3.16



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	A	3 3	4

Depth 299.0 to 300,2 m

Visual Description
Light gray, vesicular, variolitic basalt. Vesicles approximately 20% to 30% (< 1 mm) and 2% (> 1 mm). Some vesicles infilled by calcite. Alteration internally to olive green products (approximately 20%).
0-15 cm: (1) - 2 large vesicles at the base of this piece (14-15 cm) are lined by crystals of calcite and yellow brown palagonite(?).
24-52 cm: (2B) - large inclusion approximately 4 cm across at top (25-26 cm).
89-97 cm: (5) - drilling breccia.

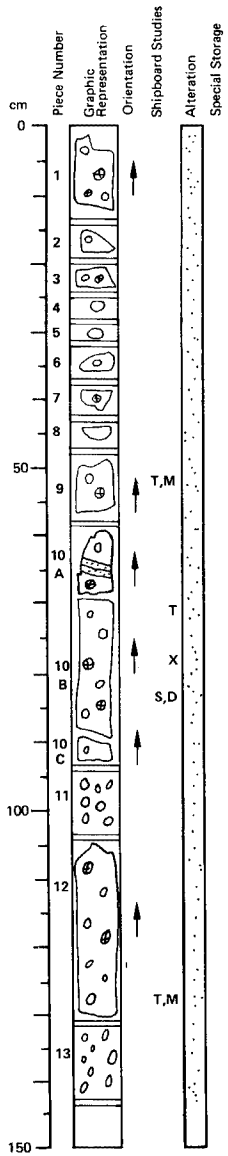
Thin Section Description – 53 cm
Groundmass: plagioclase 30%, 0.2-1.0 mm, An_{69}, laths; clinopyroxene 20%, 0.1-1.0 mm, anhedral; magnetite 2%, 0.02-0.1 mm, granular; other 25%, cryptocrystalline matrix.
Vesicles: 19%, 0.1-1.0 mm, anhedral.
Texture: intersertal.
Alteration: 2% carbonate infilling vesicles; 2% clays lining vesicles.

Thin Section Description – 109 cm
Groundmass: plagioclase 25%, 0.3-1.0 mm, An_{60}, laths, some in spherulitic groups; clinopyroxene 15%, 0.01-1.0 mm, anhedral, often fine-grained, not acicular; magnetite 2%, 0.01-0.2 mm, granules; other 8%, cryptocrystalline matrix.
Vesicles: 50%, 0.05-2.0 mm.
Texture: intersertal.

Shipboard Data

Bulk Analysis:	111 cm
SiO_2	50.09
Al_2O_3	13.90
Fe_2O_3	1.26
FeO	8.32
MgO	7.39
CaO	11.81
Na_2O	3.27
K_2O	0.60
TiO_2	1.23
P_2O_5	0.12
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	214
Ni	35
Sr	178
Zr	88

Magnetic Data:	52 cm
Intensity (emu/cc)	124.0
Inclination before demag.	29.0
Stable Inclination	30.0



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	2	A	3	4		1

Depth 304.0 to 305.4 m

Visual Description
Light gray, vesicular, variolitic basalt. Vesicles approximately 10% to 30% <1 mm and occasionally >1 mm.
59-69 cm: (10A) - fracture with weathered zone on either side (mainly palagonite).
93-103 cm: (11) - drilling breccia.
131-141 cm: (13) - drilling breccia.

Thin Section Description — 52 cm
Groundmass: plagioclase 5%, 0.05-1.0 mm, An_{56}, acicular; other 55%, cryptocrystalline matrix.
Vesicles: 40%, 0.02-3.0 mm.
Texture: variolitic.

Thin Section Description — 126 cm
Groundmass: plagioclase 21%, 0.05-1.5 mm, An_{67}, laths; clinopyroxene 21%, 0.05-0.5 mm, anhedral; magnetite 2%, 0.01-0.1 mm, granular; other 21%, cryptocrystalline matrix.
Vesicles: 30%, 0.1-2.0 mm.
Texture: intersertal.
Alteration: 1% carbonate infilling vesicles; 4% clays lining vesicles.

Shipboard Data

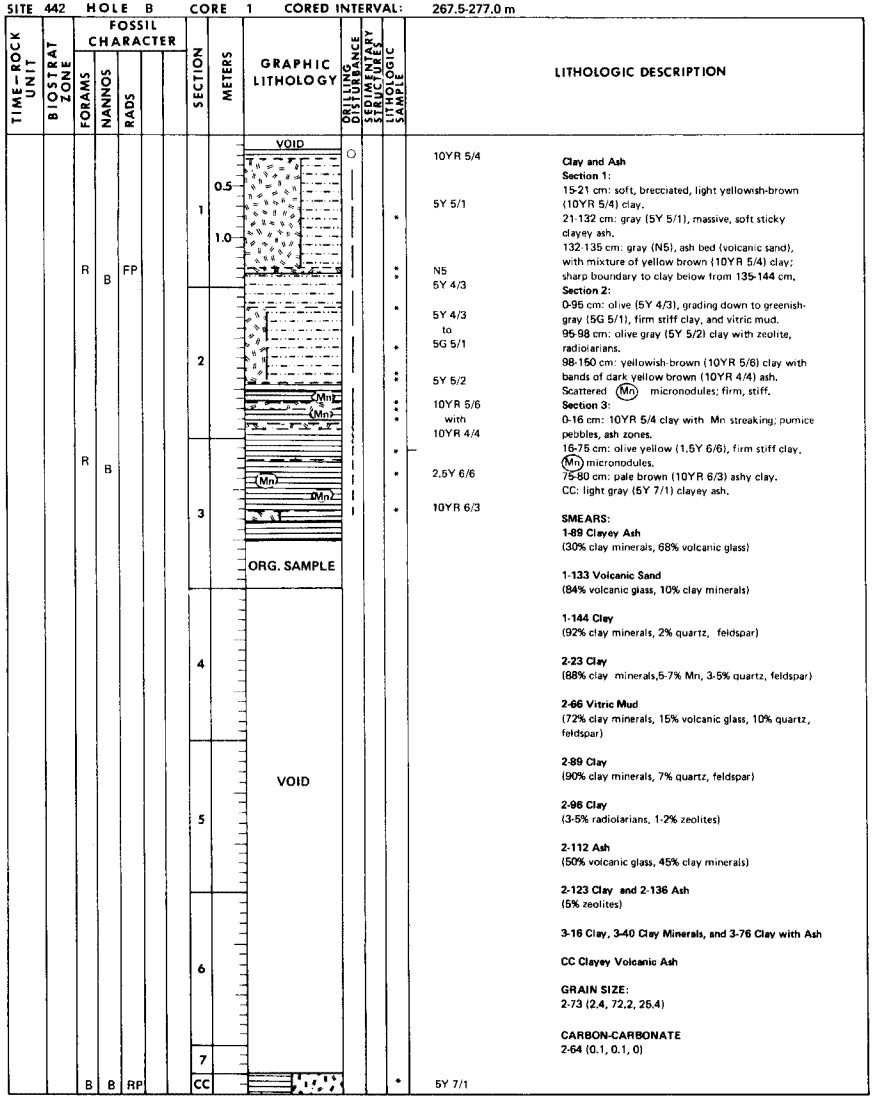
Bulk Analysis:	**78 cm**
SiO_2	49.96
Al_2O_3	15.44
Fe_2O_3	1.14
FeO	7.52
MgO	8.12
CaO	12.46
Na_2O	3.13
K_2O	0.28
TiO_2	1.17
P_2O_5	0.12
MnO	0.12
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	245
Ni	64
Sr	186
Zr	87

Magnetic Data:	**51 cm**	**125 cm**
Intensity (emu/cc)	424.7	300.6
Inclination before demag.	41.4	44.2
Stable Inclination	41.9	42.6

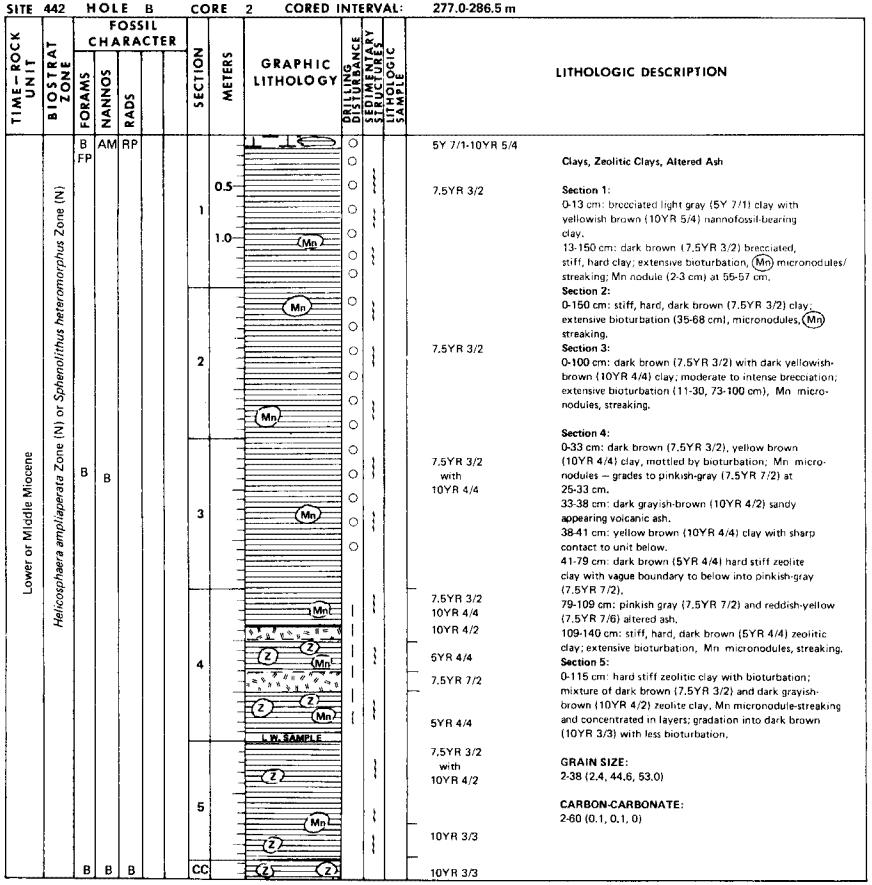
Physical Properties:	**73 cm**
$\overline{V}p$ (km/s)	3.98
Porosity (%)	24.78
Wet Bulk Density	2.43
Grain Density	2.91

Other Data:	**73 cm**
Therm cond. (mcal/cm-s-° C)	3.02

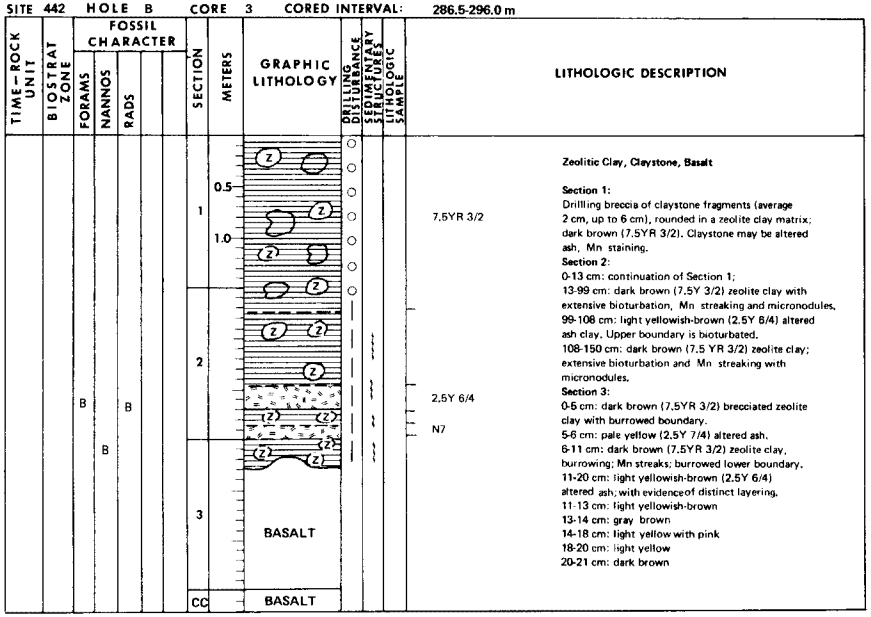
SITE 442 HOLE B CORE 1 CORED INTERVAL: 267.5-277.0 m



SITE 442 HOLE B CORE 2 CORED INTERVAL: 277.0-286.5 m



SITE 442 HOLE B CORE 3 CORED INTERVAL: 286.5-296.0 m

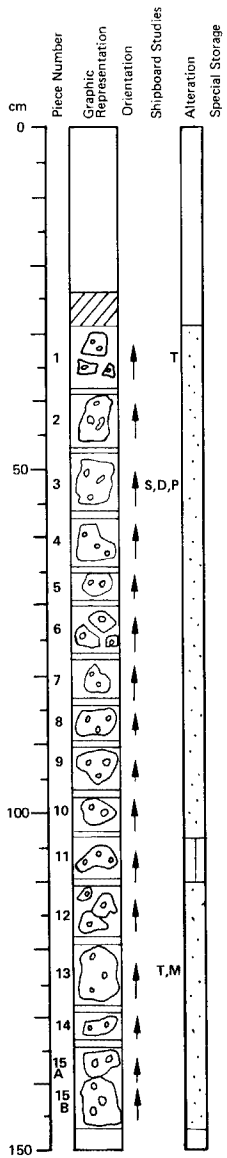


Zeolitic Clay, Claystone, Basalt

Section 1:
Drilling breccia of claystone fragments (average 2 cm, up to 6 cm), rounded in a zeolite clay matrix; dark brown (7.5YR 3/2). Claystone may be altered ash, Mn staining.

Section 2:
0-13 cm: continuation of Section 1;
13-99 cm: dark brown (7.5Y 3/2) zeolite clay with extensive bioturbation, Mn streaking and micronodules,
99-108 cm: light yellowish-brown (2.5Y 6/4) altered ash clay. Upper boundary is bioturbated.
108-150 cm: dark brown (7.5 YR 3/2) zeolite clay; extensive bioturbation and Mn streaking with micronodules.

Section 3:
0-5 cm: dark brown (7.5YR 3/2) brecciated zeolite clay with burrowed boundary.
5-6 cm: pale yellow (2.5Y 7/4) altered ash.
6-11 cm: dark brown (7.5YR 3/2) zeolite clay, burrowing; Mn streaks; burrowed lower boundary.
11-20 cm: light yellowish-brown (2.5Y 6/4) altered ash; with evidence of distinct layering.
11-13 cm: light yellowish-brown
13-14 cm: gray brown
14-18 cm: light yellow with pink
18-20 cm: light yellow
20-21 cm: dark brown



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.	
5	8	4	4	2	B			3		3

Depth: 289.5 to 291.0 m

Visual Description
0-23 cm: sedimentary rocks.
29-147 cm: basalt, aphyric, dark gray, vesicular, lightly altered. Vesicles about 30% (1 mm and less).
The 40-49 cm interval contains more vesicles (1 mm [up to 5-10 mm] - 1%).
103-109 cm: heavily altered basalt.
The 29-38 cm interval probably represents a cooling zone.

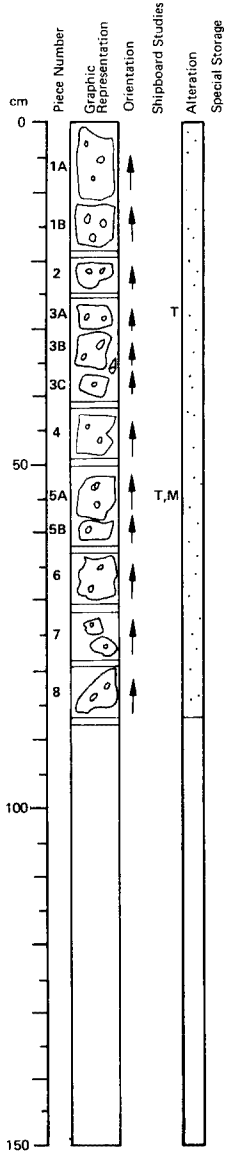
Thin Section Description – 115 cm
Groundmass: plagioclase = 30%, 0.1-3.0 mm, An_{65}, subhedral; clinopyroxene = 18%, 0.1-0.5 mm, euhedral; glass = 20%.
Vesicles: 30%, 0.05-0.1 mm, round irregular.
Texture: intergranular-intersertal.
Alteration: 1% carbonate in vesicles, 1% clays in vesicles.

Shipboard Data

Bulk Analysis:	40 cm	140 cm
SiO_2	50.66	50.23
Al_2O_3	15.05	16.03
Fe_2O_3	1.19	1.18
FeO	7.85	7.76
MgO	6.68	7.51
CaO	12.24	12.54
Na_2O	3.12	3.17
K_2O	0.42	0.34
TiO_2	1.40	1.26
P_2O_5	0.16	0.13
MnO	0.17	0.13
LOI	---	---
H_2O^+	---	---
H_2O^-	---	---
CO_2	---	---
Cr	193.00	247.00
Ni	44.00	57.00
Sr	192.00	186.00
Zr	98.00	89.00

Magnetic Data:	118 cm
Intensity (emu/cc)	537.7
Inclination before demag.	27.7

Physical Properties:	49 cm
$\overline{V}p$ (km/s)	3.95
Porosity (%)	29.50
Wet Bulk Density	2.37
Grain Density	2.94



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.	
5	8	4	4	2	B			3		4

Depth 291.0 to 291.9 m

Visual Description
0-86 cm: basalt, aphyric, dark gray, vesicular, lightly altered. Vesicles (1 mm or less) about 30-40%.
26-35 cm: a few vesicles, but some have sizes up to 7-10 mm with yellow secondary minerals.
26-31 cm: probable chill zone.

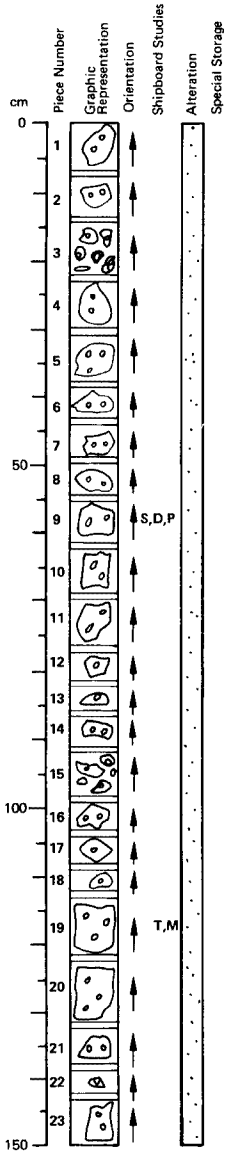
Thin Section Description – 54 cm
Phenocrysts: plagioclase < 1%, 0.4-1.5 mm, euhedral.
Groundmass: plagioclase 30%, 0.05-1.0 mm, An_{60}, subhedral; clinopyroxene 20%, 0.05-0.1 mm, augite, anhedral; glass + mt 20%.
Vesicles: 25%, round irregular.
Texture: intersertal.
Alteration: 1% carbonate in vesicles and 1% clays in vesicles.

Shipboard Data

Bulk Analysis:	13 cm
SiO_2	50.33
Al_2O_3	15.06
Fe_2O_3	1.25
FeO	8.24
MgO	7.14
CaO	11.77
Na_2O	3.35
K_2O	0.39
TiO_2	1.30
P_2O_5	0.13
MnO	0.14
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	221.00
Ni	52.00
Sr	180.00
Zr	96.00

Magnetic Data:	54 cm
Intensity (emu/cc)	301.1
Inclination before demag.	39.0

Other Data:	0 cm
Therm. cond. (mcal/cm-s-°C)	1.63



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	2	B	4	1

Depth: 296.0 to 297.5 m

Visual Description

0-150 cm: basalt - aphyric, gray to dark gray, vesicular, lightly altered. Vesicles (<1 mm) 40%; in some places. Vesicles are 1-5 mm, 1-2%, partly filled with calcite(?).
88-102 cm: chill zone.

Thin Section Description – 116 cm

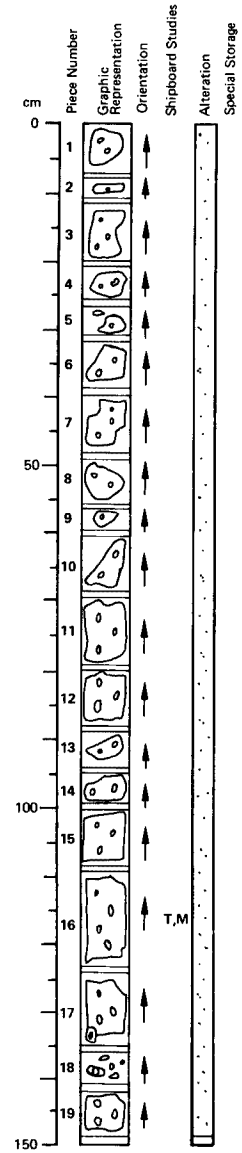
Groundmass: plagioclase 30%, 0.1-0.5 mm, An_{60}, subhedral; clinopyroxene 20%, 0.03-0.1 mm, augite, anhedral; glass + mt 20%.
Vesicles: 28%, 0.01-0.1 mm
Texture: intersertal.
Alteration: 1% carbonate in vesicles.

Shipboard Data

Bulk Analysis:	**57 cm**
SiO_2	49.72
Al_2O_3	15.99
Fe_2O_3	1.16
FeO	7.66
MgO	6.57
CaO	12.93
Na_2O	3.32
K_2O	0.37
TiO_2	1.21
P_2O_5	0.15
MnO	0.15
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	258.00
Ni	60.00
Sr	189.00
Zr	89.00

Magnetic Data:	**117 cm**
Intensity (emu/cc)	420.6
Inclination before demag.	50.8
Stable inclination	51.8

Physical Properties:	**57 cm**
$\bar{V}p$ (km/s)	4.15
Porosity (%)	27.29
Wet Bulk Density	2.40
Grain Density	2.93



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	2	B	4	2

Depth 297.5 to 299.0 m

Visual Description

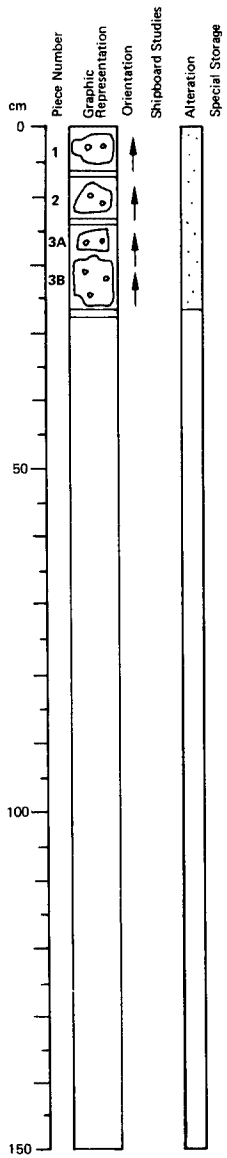
0-149 cm: basalt-aphyric, dark gray, vesicular, lightly altered.
0-80 cm: vesicles (<1 m) 40%.
80-149 cm: vesicles 40%, including ones more than 1 mm across (15%). Vesicles partly contain a white mineral (calcite?).

Shipboard Data

Bulk Analysis:	**110 cm**
SiO_2	50.55
Al_2O_3	15.19
Fe_2O_3	1.16
FeO	7.69
MgO	7.25
CaO	12.07
Na_2O	3.49
K_2O	0.39
TiO_2	1.22
P_2O_5	0.12
MnO	0.11
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	222.00
Ni	42.00
Sr	187.00
Zr	85.00

Magnetic Data:	**118 cm**
Intensity (emu/cc)	119.9
Inclination before demag.	32.0
Stable inclination	50.8

Other Data:	**109 cm**
Therm. cond. (mcal/cm-s-°C)	4.01



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	2	B	4	3

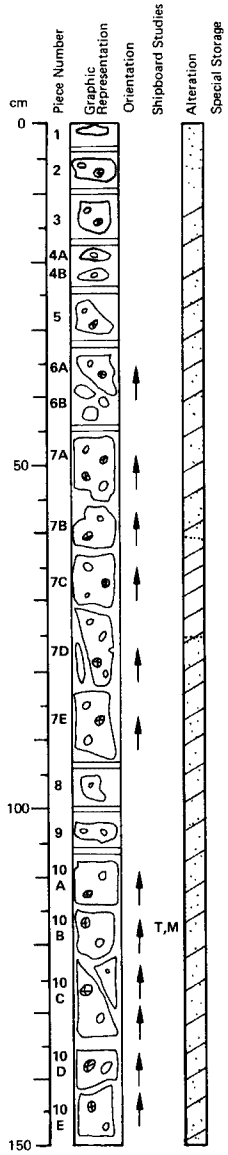
Depth: 299.0 to 299.9 m

Visual Description

0-27 cm: basalt-aphyric, dark gray, vesicular, lightly altered. Vesicles (1 mm and less) 40%.

Shipboard Data

Bulk Analysis:	**21 cm**
SiO_2	49.63
Al_2O_3	14.96
Fe_2O_3	1.18
FeO	7.82
MgO	7.52
CaO	12.52
Na_2O	3.79
K_2O	0.35
TiO_2	1.21
P_2O_5	0.12
MnO	0.13
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	216.00
Ni	53.00
Sr	184.00
Zr	90.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	2	B	5	1

Depth 305.5 to 307.0 m

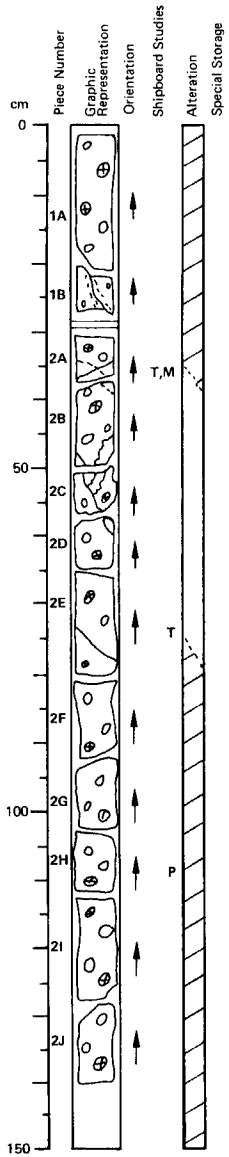
Visual Description

Light gray, vesicular, aphyric basalt. Green tinge increasing with weathering. Vesicles approximately 30 to 40% < 1 mm and 2 to 10% > 1 mm, some infilling by smectite (light olive green) and brown (stain?), clay, occasional calcite.
34-40 cm (6A): weathered surface on angled side, olive yellow alteration products.
64 cm (Top 7C): weathered surface, brown alteration products.
108 cm (Top 10A): yellow brown alteration products.
120-134 cm (10B through 10C): cross cutting fracture with weathered surfaces; light olive brown alteration products and calcite.

Shipboard Data

Bulk Analysis:	**120 cm**
SiO_2	50.27
Al_2O_3	15.25
Fe_2O_3	1.15
FeO	7.58
MgO	8.79
CaO	11.68
Na_2O	3.33
K_2O	0.30
TiO_2	1.31
P_2O_5	0.12
MnO	0.12
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	222.00
Ni	84.00
Sr	188.00
Zr	89.00

Magnetic Data:	**116 cm**
Intensity (emu/cc)	224.0
Inclination before demag.	40.6
Stable inclination	41.0



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	5	2

Depth 307.0 to 308.4 m

Visual Description

0-37 cm: green-gray, weathered vesicular, aphyric basalt. Smectite and calcite infilling of vesicles. Fracture from 18-28 cm is lined by calcite and brown alteration zone. White calcite vein at 34-36 cm, cuts into lower fresh zone.

37-77 cm: gray, vesicular, variolitic basalt cut by white calcite veins. Some infilling of vesicles mainly by calcite.

77-140 cm: green-gray, weathered, vesicular variolitic basalt. Smectite and calcite infilling of vesicles. At 126-132 cm between 2I and 2J — fracture with weathered surface and 1-2 mm wide weathered zone.

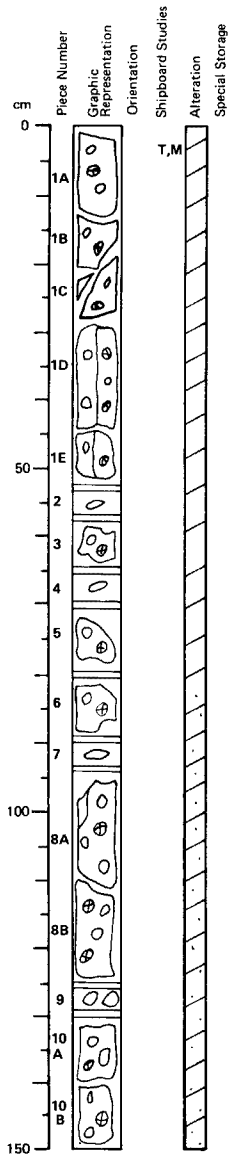
Sharp boundary between fresh and weathered basalt. Thin section at 75 cm and covers lower boundary. Vesicles throughout approximately 30-40% < 1 mm and up to 5% > 1 mm.

Shipboard Data

Bulk Analysis:	1 cm	60 cm	106 cm
SiO_2	50.10	50.65	50.01
Al_2O_3	15.04	15.06	14.92
Fe_2O_3	1.13	1.14	1.12
FeO	7.44	7.54	7.40
MgO	9.01	9.45	8.54
CaO	11.50	11.17	12.40
Na_2O	3.42	3.22	3.21
K_2O	0.29	0.26	0.40
TiO_2	1.26	1.28	1.18
P_2O_5	0.11	0.11	0.10
MnO	0.10	0.10	0.11
LOI	—	—	—
H_2O^+	—	—	—
H_2O^-	—	—	—
CO_2	—	—	—
Cr	237.00	232.00	244.00
Ni	103.00	157.00	80.00
Sr	183.00	179.00	178.00
Zr	91.00	91.00	84.00

Magnetic Data:	1 cm
Intensity (emu/cc)	186.8
Inclination before demag.	45.5
Stable inclination	46.5

Physical Properties:	106 cm	109 cm
$\bar{V}p$ (km/s)	4.16	—
Porosity (%)	—	25.69
Wet Bulk Density	—	2.40
Grain Density	—	2.89



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	5	3

Depth 308.4 to 309.9 m

Visual Description

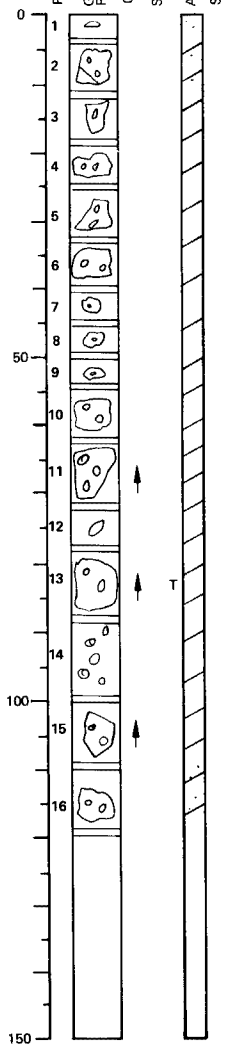
Green-gray, vesicular, aphyric basalt. Smectite and/or calcite lining of some vesicles. Vesicles approximately 30 to 40% < 1 mm and approximately 2% > 1 mm. Fracture in Pieces 1D through 1E (29-51 cm) along zone of vesicles. Brown weathered surface.

Shipboard Data

Bulk Analysis:	94 cm
SiO_2	49.77
Al_2O_3	14.48
Fe_2O_3	1.14
FeO	7.50
MgO	7.63
CaO	12.95
Na_2O	3.19
K_2O	0.37
TiO_2	1.20
P_2O_5	0.12
MnO	0.12
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	226.00
Ni	74.00
Sr	179.00
Zr	90.00

Magnetic Data:	37 cm
Intensity (emu/cc)	386.7
Inclination before demag.	44.2

Other Data:	96 cm
Therm. cond. (mcal/cm-s-°C)	3.319



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	5	4

Depth: 309.9 to 311.1 m

Visual Description

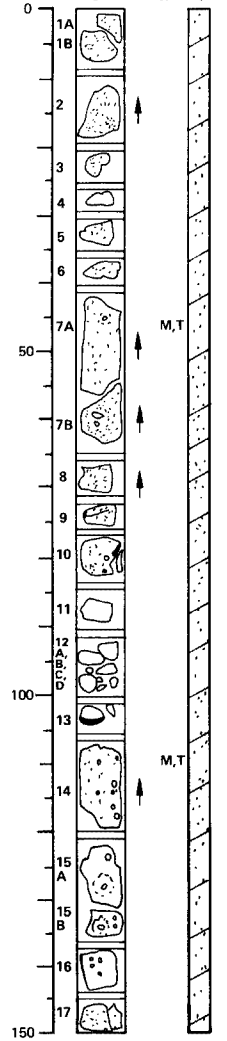
Gray, vesicular, aphyric basalt, green tinge. Vesicles approximately 30 to 40% <1 mm up to 5% >1 mm. Some calcite and smectite infilling of vesicles.

5-12 cm (3): calcite filled vein.

88-100 cm (14): drilling breccia.

Shipboard Data

Bulk Analysis:	**79 cm**
SiO_2	49.82
Al_2O_3	15.21
Fe_2O_3	1.17
FeO	7.73
MgO	7.38
CaO	12.91
Na_2O	3.11
K_2O	0.27
TiO_2	1.20
P_2O_5	0.12
MnO	0.12
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	233.00
Ni	60.00
Sr	185.00
Zr	84.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	6	1

Depth: 315.0 to 316.5 m

Visual Descriptions

0-100 cm: light to moderately weathered aphyric fine-grained basalt, 30% fine vesicles (<1.0 mm), 3% medium and coarse vesicles and vugs up to 1 cm across, 1% calcite filled amygdules. Gray, large vug at center of 2 1/2 x 4 cm dark patch.

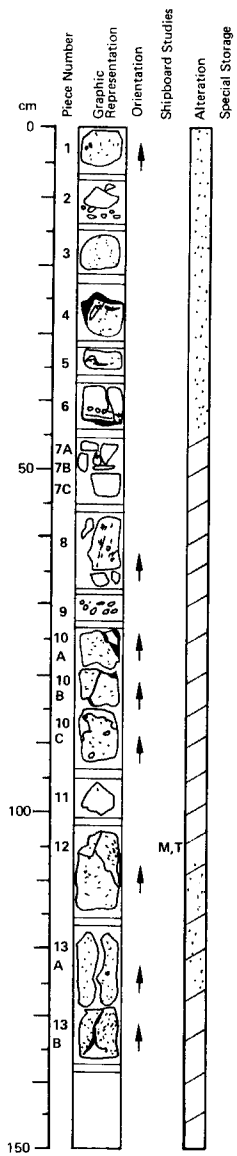
101-105 cm: chilled margin (no orientation), 2 mm thick glassy zone.

106-150 cm: same basalt as 0-100 cm interval, larger vugs surrounded by 1 cm path of dark discoloration — probably a reaction zone with contents of vug during cooling; 1-2% calcite amygdules.

Shipboard Data

Bulk Analysis:	**53 cm**
SiO_2	49.95
Al_2O_3	14.46
Fe_2O_3	1.17
FeO	7.71
MgO	7.89
CaO	13.05
Na_2O	3.20
K_2O	0.30
TiO_2	1.21
P_2O_5	0.13
MnO	0.12
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	237.00
Ni	64.00
Sr	130.00
Zr	88.00

Magnetic Data:	**48 cm**	**110 cm**
Intensity (emu/cc)	272.2	552.6
Inclination before demag.	63.4	55.6
Stable Inclination	6.5	56.7



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	6	2

Depth: 316.5 to 318.0 m

Visual Description

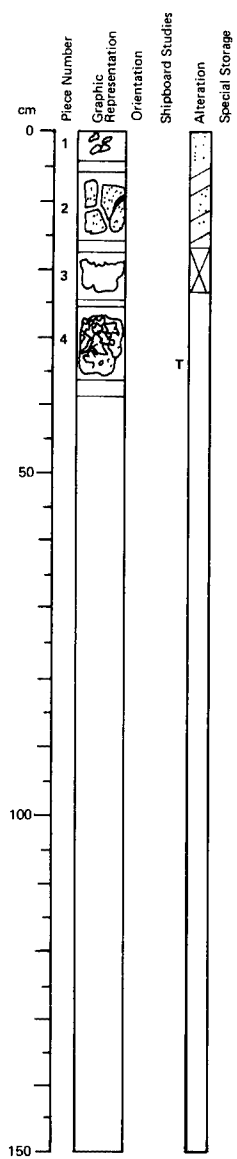
0-24 cm: gray aphyric vesicular basalt. Fine grained, 20-30% fine vesicles, 1-2% medium vesicles, 3% calcite filled amygdules.
24-31 cm: quench or chill zone with thin glass rind, aphyric vesicular basalt similar to 0-24 cm interval. Flow structures parallel to rind.
30-36 cm: fine-grained aphyric basalt with flow structures. Basalt similar to above.
38-44 cm: chill zone with 3 mm glassy zone and variolitic zone grading into aphanitic basalt. ~5-10% very fine vesicles in basalt. Basalt has distinct orange red cast to gray color.
46-56 cm: loose basalt fragments.
56-68 cm: variolitic basalt, fine-grained greenish gray ~15% fine vesicles.
70-73 cm: loose basalt fragments.
74-150 cm: aphyric vesicular basalt, gray colored with slight greenish cast. Fine-grained - 40% fine vesicles, 1-2% medium vesicles. Calcite filled alteration veins with iron oxide staining where calcite is absent and at margins of veins.

Shipboard Data

Bulk Analysis:	**32 cm**	**147 cm**
SiO_2	50.04	50.38
Al_2O_3	14.88	15.66
Fe_2O_3	1.13	1.09
FeO	7.45	2.20
MgO	8.02	9.84
CaO	12.99	11.02
Na_2O	3.14	3.13
K_2O	0.31	0.24
TiO_2	1.22	1.26
P_2O_5	0.13	0.11
MnO	0.11	0.13
LOI	--	--
H_2O^+	--	--
H_2O^-	--	--
CO_2	--	--
Cr	277.00	247.00
Ni	71.00	82.00
Sr	152.00	183.00
Zr	86.00	83.00

Magnetic Data	**110 cm**
Intensity (emu/cc)	568.8
Inclination before demag.	49.2

Physical Properties:	**40 cm**
$\overline{V}p$ (km/s)	3.85
Porosity (%)	29.15
Wet Bulk Density	2.33
Grain Density	2.88



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	6	3

Depth: 318.0 to 318.36 m

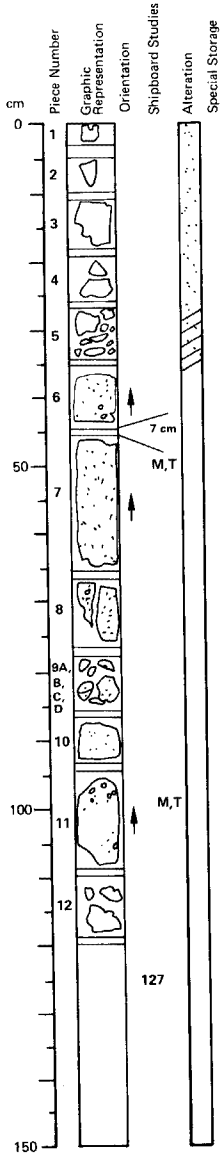
Visual Description

0-16 cm: dark gray to brownish gray basalt, light to moderate weathering, fine vesicles.
18-24 cm: drilling breccia cemented with rock flour paste.
27-30 cm: splotchy variolitic basalt grading upper 1/2 mottled dark and light gray. White calcite vein 1.0-2.0 mm. Vesicles. Fresh.

Shipboard Data

Bulk Analysis:	**28 cm**
SiO_2	50.38
Al_2O_3	15.66
Fe_2O_3	1.09
FeO	7.2
MgO	8.2
CaO	11.98
Na_2O	3.45
K_2O	0.34
TiO_2	1.26
P_2O_5	0.12
MnO	0.13
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	232.00
Ni	49.00
Sr	185.00
Zr	89.00

Magnetic Data:	**28 cm**
Intensity (emu/cc)	105.3
Inclination before demag.	67.7
Stable Inclination	47.7



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	7	1

Depth: 324.5 to 375.7 m

Visual Description

0-25 cm: gray aphyric basalt. Orangish cast, grades downwards from aphanitic to fine-grained. Vesicular: 10-20% fine, 2% medium. Apparently chill margin for underlying basalt.
26-34 cm: basalt fragments.
36-86 cm: fresh basalt – fine-grained, approaching diabase, 5-10% medium vesicles, 5-10% fine vesicles.
86-93 cm: drilling debris and basalt fragments and rock powder.
94-108 cm: fine-grained gray aphyric basalt. Upper 1/3 has 4% medium vesicles. Vesicles scarce to absent in lower 2/3. Otherwise is similar to 36-86 cm interval.
100-107 cm: drilling debris and rock powder.
45-52 cm: same as rest in 36-86 cm.

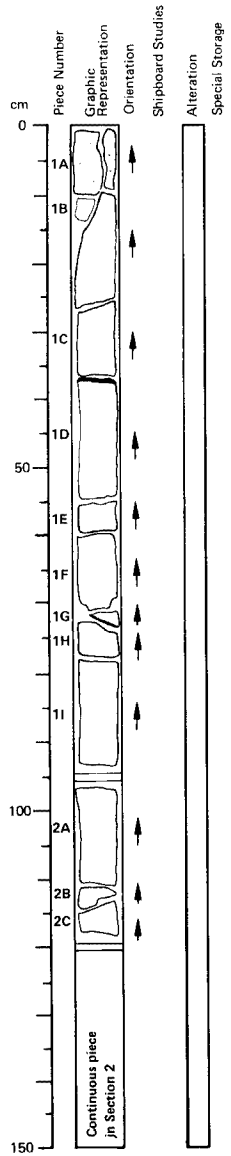
Shipboard Data

Bulk Analysis:	46 cm	110 cm
SiO_2	50.73	50.57
Al_2O_3	14.77	10.48
Fe_2O_3	1.25	1.26
FeO	8.24	8.32
MgO	9.47	8.92
CaO	10.23	10.55
Na_2O	3.24	3.20
K_2O	0.24	0.20
TiO_2	1.22	1.38
P_2O_5	0.14	0.11
MnO	0.16	0.16
LOI	—	—
H_2O^+	—	—
H_2O^-	—	—
CO_2	—	—
Cr	209.00	211.00
Ni	59.00	201.00
Sr	161.00	135.00
Zr	93.00	67.00

Magnetic Data:	59 cm	106 cm
Intensity (emu/cc)	211.3	164.8
Inclination before demag.	55.0	60.3
Stable Inclination	—	54.6

Physical Properties:	49 cm
$\bar{V}p$ (km/s)	4.13
Porosity (%)	23.96
Wet Bulk Density	2.50
Grain Density	2.98

Other Data:	
Therm. cond. (mcal/cm-s-° C)	3.84



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	8	1

Depth 334.0 to 335.2 m

Visual Description

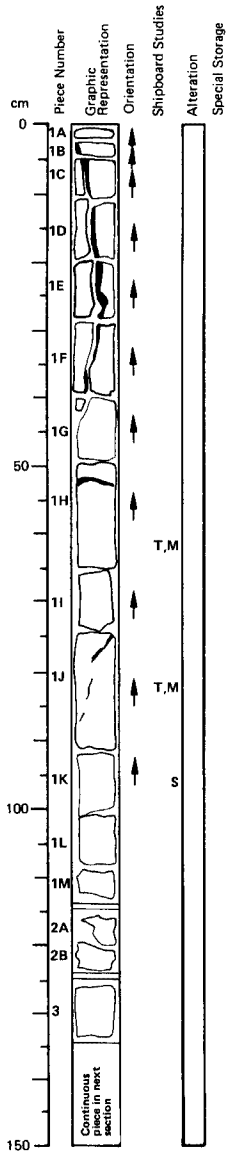
0-117 cm: gray aphyric diabase, 1% vesicles at top and less than that through rest of Section. Larger vesicles have free growing glomerocrysts of pyrite and calcite (Piece 2C). At 36 cm, white calcite vein and at several other breaks in core. Pyrites found along vein surfaces where exposed. Fresh-little evidence of any weathering. Grain size fairly uniform down section. Between 23-39 cm ~1-3 mm phenocrysts which could be slightly altered plagioclase which stands out rather than phenocrysts.

Shipboard Data

Bulk Analysis:	32 cm
SiO_2	48.03
Al_2O_3	13.24
Fe_2O_3	1.25
FeO	8.24
MgO	15.26
CaO	9.39
Na_2O	2.38
K_2O	0.14
TiO_2	0.94
P_2O_5	0.09
MnO	0.18
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	412.00
Ni	201.00
Sr	135.00
Zr	67.00

Magnetic Data:	47 cm
Intensity (emu/cc)	456.4
Inclindation before demag.	50.9
Stable Inclination	51.9

Other Data:	80 cm
Therm. cond. (mcal/cm-s-° C)	4.20



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	2	B			8	2

Depth 335.2 to 336.6 m

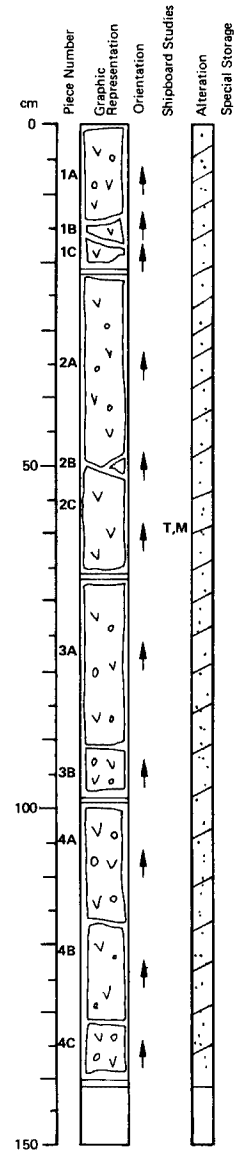
Visual Description

Gray aphyric diabse — < 1% vesicles. Calcite veins common and core has fractured along these (particularly between 0 and 45 cm). Pyrites also found on vein surfaces. Rock is fresh, but much of plagioclase has a greenish cast which may indicate alteration medium grained.

Shipboard Data

Magnetic Data:	**24 cm**
Intensity (emu/cc)	902.7
Inclination before demag.	47.8

Physical Properties:	**92 cm**
$\overline{V}p$ (km/s)	4.92
Porosity (%)	12.50
Wet Bulk Density	2.70
Grain Density	2.95



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	2	B			8	3

Depth: 336.6 to 338.0 m

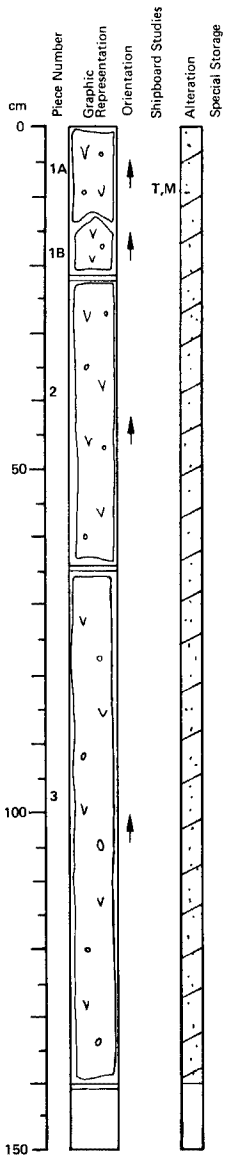
Visual Description

0-140 cm: diabase identical to that described for Sections 1 and 2. Diabase, dense, dark greenish-gray, vesicular, moderately altered. Vesicles 5%, 1-3 mm, all filled with calcite and chlorite.

22-80 cm: vesicles, up to 5 mm in diameter. Diabase-aphyric, fine-grained.

Shipboard Data

Magnetic Data:	**55 cm**
Intensity (emu/cc)	465.7
Inclination before demag.	48.9
Stable Inclination	50.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	8	4

Depth: 338.0 to 339.4 m

Visual Description

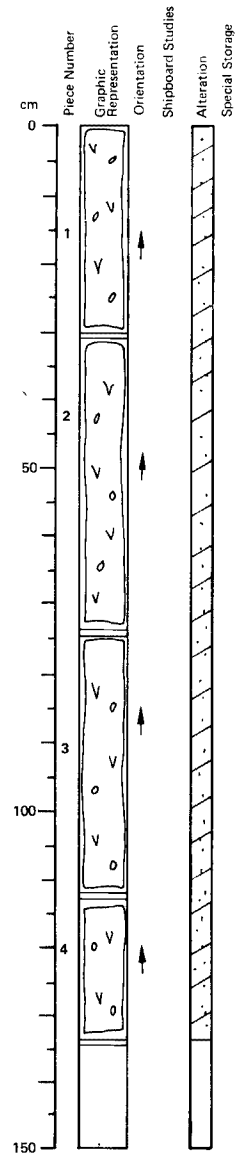
0-140 cm: identical to diabase of Sections 1, 2, 3. Diabase, dense, dark greenish-gray, vesicular, moderately altered. Vesicles 5-10%, <1 mm, vesicles in diameter (vugs) 3-5 mm filled with secondary minerals.
0-28 cm: vugs filled by calcite with chlorite (the same at 115-140 cm).
28-115 cm: vugs filled by chlorite. Diabase-aphyric, fine-grained.

Thin Section Description – 3 cm

Phenocrysts: plagioclase 27%, 1-5 mm, An_{70}, euhedral, subhedral, partly skeletal; clinopyroxene 20%, 1-5 mm, augite, anhedral.
Groundmass: magnetite 1-2%, 0.7-1 mm, skeletal, isometric, mainly in groundmass.
Vesicles: 1-2%, 0.1-0.5 mm round, border of chlorites and zeolites.
Texture: intersertal, partly ophitic.
Alteration: Few carbonate in vesicles and 50% zeolites (in vesicles) and chlorite (in groundmass and vesicles).

Shipboard Data

Magnetic Data:	**3 cm**
Intensity (emu/cc)	255.0
Inclination before demag.	52.2
Stable Inclination	50.0



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	8	5

Depth: 339.4 to 340.7 m

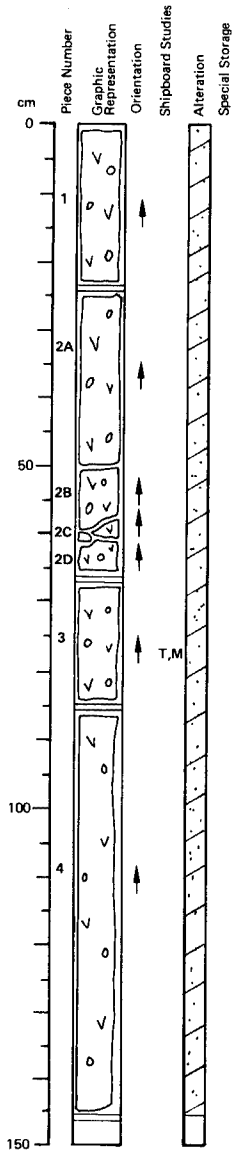
Visual Description

0-133 cm: same diabase, as in Sections 1-4. Diabase, dense, aphyric, dark greenish gray, moderately altered, vesicular. Vesicles 5-10%, <1 mm, vuggy 3-5%, vugs as large as 3-7 mm filled with secondary minerals.
0-50 cm and 120-133 cm: vugs filled by calcite with chlorite and at 50-120 cm by chlorite. Vesicles unfilled.

Shipboard Data

Bulk Analysis:	**74 cm**
SiO_2	49.57
Al_2O_3	14.39
Fe_2O_3	1.21
FeO	8.00
MgO	10.87
CaO	10.38
Na_2O	3.03
K_2O	0.15
TiO_2	1.18
P_2O_5	0.11
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	255.00
Ni	100.00
Sr	159.00
Zr	84.00

Magnetic Data:	**23 cm**
Intensity (emu/cc)	446.8
Inclination before demag.	48.7
Stable Inclination	51.3
Other Data:	**127 cm**
Therm. cond. (mcal/cm-s-°C)	3.744



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	8	6

Depth: 340.7 to 342.1 m

Visual Description

The rocks in this sections is identical to the diabase of Sections 1-5. Diabase, aphyric, vesicular. There is difference between the two parts of the section.

0-65 cm: is identical to the diabase of Section 5. Vesicles 5-10°, <1 mm and 3-5%, 1-3 mm, filled with calcite and chlorite.

65-145 cm: vesicles are open, unfilled. It is the freshest part of the core.

Thin Section Description – 84 cm

Groundmass: plagioclase 40%, 0.5-5 mm, An_{60}, euhedral, subhedral; clinopyroxene 25%, 1-4 mm, augite, anhedral; magnetite 1%, 0.1-0.6 mm

Vesicles: 5%, 0.7-6.0 mm, round, on the walls rims chlorites and zeolites.

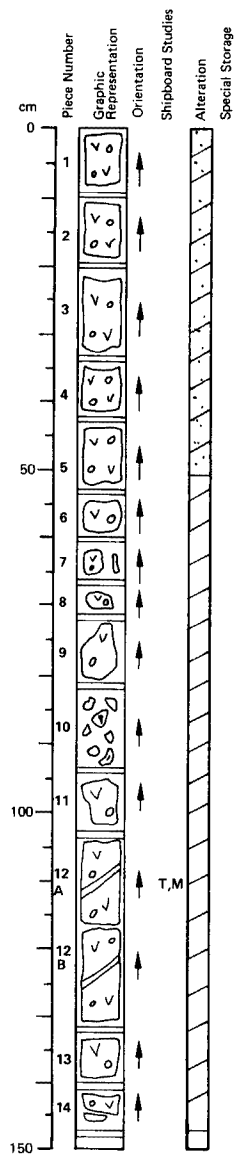
Texture: subophitic.

Alteration: 30% zeolites (in groundmass replacing vesicles) and chlorite (in vesicles replacing groundmass).

Shipboard Data

Bulk Analysis:	**141 cm**
SiO_2	49.64
Al_2O_3	13.82
Fe_2O_3	1.20
FeO	7.92
MgO	11.47
CaO	10.17
Na_2O	3.11
K_2O	0.18
TiO_2	1.26
P_2O_5	0.14
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	258.00
Ni	105.00
Sr	169.00
Zr	91.00

Magnetic Data:	**84 cm**
Intensity (emu/cc)	381.4
Inclination before demag.	45.5



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	8	7

Depth: 342.1 to 343.6 m

Visual Description

0-50 cm: upper 50 cm appears identical to diabase described in this core, Sections 1-6. In comparison with the lower part of Section 6, the vesicles are filled with calcite and chlorite.

50-146 cm: another type of alteration of the same diabase. Color returns to a yellow-gray. Vesicles are filled with clay minerals. Calcite vein observed in Pieces 12A and 12B (thickness 1-3 mm).

146-147 cm: reddish color. In this part and above (4-5 cm) the diabase is dense. Probably it is the top of a lava flow.

Thin Section Description – 107 cm

Groundmass: plagioclase 45%, 1-4 mm, An_{60}, subhedral, skeletal; clinopyroxene 35%, 1-3 mm, augite, anhedral; magnetite 1%, 0.1-0.5 mm, skeletal, rectangle

Vesicles: 10%, 1-3 mm, round.

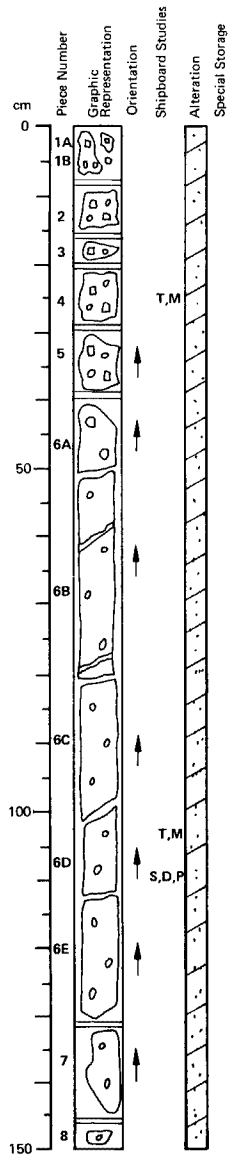
Texture: ophytic.

Alteration: 10% zeolites (in vesicles) and chlorite (in vesicles, groundmass replacing groundmass), partly colored by hydro iron oxide.

Shipboard Data

Bulk Analysis:	
SiO_2	50.57
Al_2O_3	15.26
Fe_2O_3	1.16
FeO	7.68
MgO	8.70
CaO	10.78
Na_2O	3.74
K_2O	0.43
TiO_2	1.23
P_2O_5	0.12
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	228.00
Ni	66.00
Sr	154.00
Zr	94.00

Magnetic Data:	**107 cm**
Intensity (emu/cc)	261.3
Inclination before demag.	48.0
Stable Inclination	48.3



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	9	1

Depth: 343.5 to 345.0 m

Visual Description

0-49 cm: basalt, glomerophyric yellow-gray, vesicular, altered. Vesicles 15% (1-2 mm and less) are open and contain a few iron oxides. Aggregates of plagioclase (diameter 1-1.5 mm) 25-30%.

49-150 cm: basalt, aphyric, dense, yellow-gray, vesicular, altered. Vesicles less than 0.5 mm (5-10%) partly filled with calcite and iron oxide.

65-80 cm: two calcite veins with oxidized ore minerals (probably pyrite).

Thin Section Description — 24 cm

Phenocrysts: plagioclase 50%, 0.3-3 mm, An_{58}, subhedral, sometimes light zonation; clinopyroxene 20%, 0.5-2 mm, augite, euhedral.
Groundmass: groundmass substitute by secondary minerals.
Vesicles: 3%, 0.1-1.5 mm.
Texture: glomerophyric, intersertal, subophitic.
Alteration: clays, zeolites, chlorite — 25% in groundmass, groundmass partly filled vesicles.

Thin Section Description — 103 cm

Groundmass: plagioclase 20%, 0.2-1 mm, An_{60}, subhedral, needles; clinopyroxene 25%, 0.2-3 mm, augite, anhedral; magnetite < 1, 0.04-0.08; glass 50% , microlite, Pl+Py+Mt.
Vesicles: 5%, 0.2-1.0 mm, partly filled carbonate and clay.
Texture: intersertal.
Alteration: 3% carbonate in vesicles and 2% clays in vesicles.

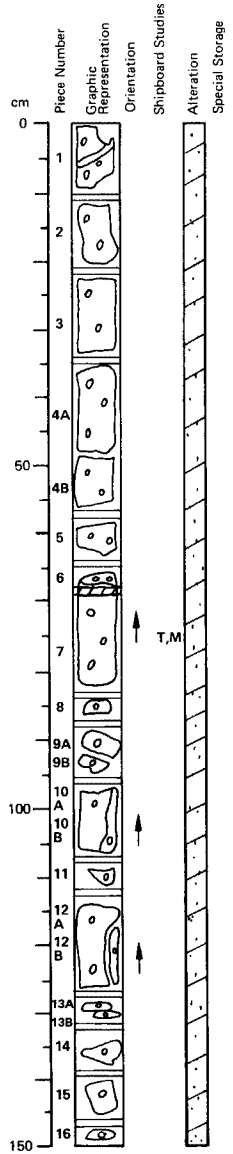
Shipboard Data

Bulk Analysis:	34 cm	107 cm
SiO_2	49.46	49.31
Al_2O_3	15.42	13.18
Fe_2O_3	1.10	1.19
FeO	7.35	7.82
MgO	9.22	9.02
CaO	11.03	12.60
Na_2O	2.97	3.05
K_2O	0.30	0.59
TiO_2	1.16	1.11
P_2O_5	0.11	0.11
MnO	0.14	0.13
LOI	—	—
H_2O^+	—	—
H_2O^-	—	—
CO_2	—	—
Cr	300.00	282.00
Ni	118.00	100.00
Sr	164.00	173.00
Zr	79.00	84.00

Magnetic Data:	24 cm	33 cm	103 cm
Intensity (emu/cc)	455.8	448.9	544.8
Inclination before demag.	− 1.2	− 3.1	53.8
Stable Inclination	− 3.7	− 2.1	56.3

Physical Properties:	110 cm
$\bar{V}p$ (km/s)	4.16
Porosity (%)	28.02
Wet Bulk Density	2.41
Grain Density	2.96

Other Data:	67 cm
Therm. cond. (mcal/cm-s-° C)	3.66



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	9	2

Depth: 345.0 to 346.5 m

Visual Description

0-150 cm: basalt is identical to that described at the base of Section 1. Aphyric, dark gray, vesicular, altered. Vesicles, 0.5 mm and less than 10%.

114-150 cm: basalt more dense and has 1% vesicles (1-3 mm).

114-126 cm: vesicles partly filled with calcite.

0-10 cm: a calcite vein occurs with small iron oxides (Piece 1).

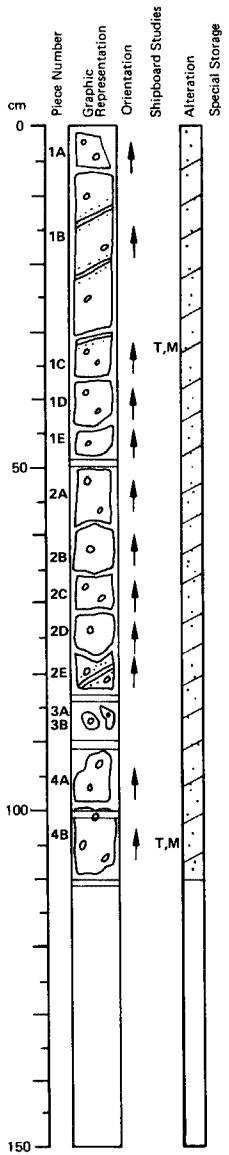
Thin Section Description — 73 cm

Phenocrysts: plagioclase 10%, 0.4-1 mm, An_{60}?, needles.
Groundmass: glass 50%, microlites, Py+Pl+glass.
Vesicles: 40%, 0.1-1.0 mm, unfilled, round
Texture: intersertal.

Shipboard Data

Bulk Analysis:	37 cm
SiO_2	49.32
Al_2O_3	14.04
Fe_2O_3	1.12
FeO	7.42
MgO	7.66
CaO	14.12
Na_2O	3.13
K_2O	0.39
TiO_2	1.16
P_2O_5	0.12
MnO	0.12
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	270.00
Ni	100.00
Sr	173.00
Zr	84.00

Magnetic Data:	73 cm
Intensity (emu/cc)	1940.1
Inclination before demag.	47.6
Stable Inclination	47.8



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	9	3

Depth: 346.5 to 347.6 m

Visual Description

0-110 cm: basalt, aphyric, dark gray, vesicular, altered. More vesicles than in the basalt of Section 2 (10-15%, <1 mm). Partly filled with calcite and iron oxides.

In Pieces 1B, 1C, and 2E: a calcite vein occurs with an altered zone next to it (iron oxide alteration).

Thin Section Description – 32 cm

Groundmass: plagioclase 30%, 0.5-2 mm, An_{68}, needles, partly laths; clinopyroxene 20%, 0.2-1.5 mm, augite, subhedral, euhedral; glass 45%, mixrolites, Pl+Py+Mt.

Vesicles: 3%, 0.2-2.0 mm, partly filled by calcite.

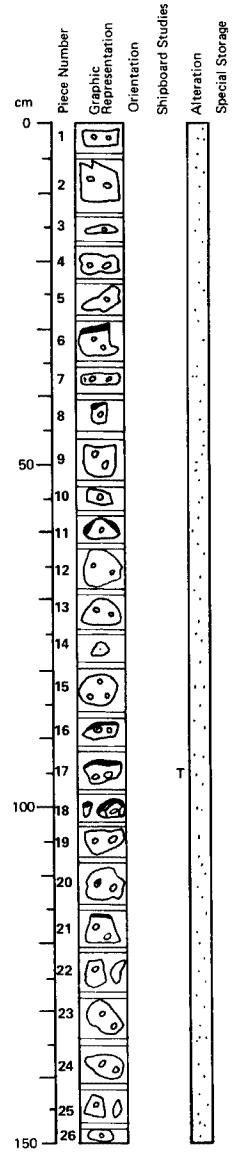
Texture: subophitic - intersertal.

Alteration: 1% carbonate, at 0.2-1.5 mm replacing vesicles.

Shipboard Data

Bulk Analysis:	**54 cm**
SiO_2	50.61
Al_2O_3	13.44
Fe_2O_3	1.34
FeO	8.87
MgO	9.33
CaO	10.06
Na_2O	3.42
K_2O	0.35
TiO_2	1.42
P_2O_5	0.15
MnO	0.14
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	251.00
Ni	118.00
Sr	177.00
Zr	106.00

Magnetic Data:	**32 cm**	**105 cm**
Intensity (emu/cc)	768.1	437.6
Inclination before demag.	45.7	43.2
Stable Inclination	45.8	49.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 0	1

Depth: 353.0 to 354.5 m

Visual Description

Light gray, vesicular, aphyric, aphanitic basalt (approximately 10% vesicles). Glassy margins at 30 cm (6), 41 cm (8), 60 cm (11), 87 cm (16), 92 cm (17), 97 cm (18), and 116 cm (21). Vesicles generally <1 mm across and collect in zones approximately 1 cm below glassy margins, some infilling by clay minerals and occasional calcite.

97-101 cm (18): several fractures infilled by alteration products (clays?).

Thin Section Description – 94 cm

Groundmass: plagioclase 10%, 0.02-0.2 mm, laths or acicular, microlites; glass 70% and cryptocrystalline material 20%.

Texture: glassy.

Thin Section Description – 94 cm

Phenocrysts: plagioclase 0.5%, 0.2-1 mm, An_{58}, laths.

Groundmass: cryptocrystalline matrix 68.5%.

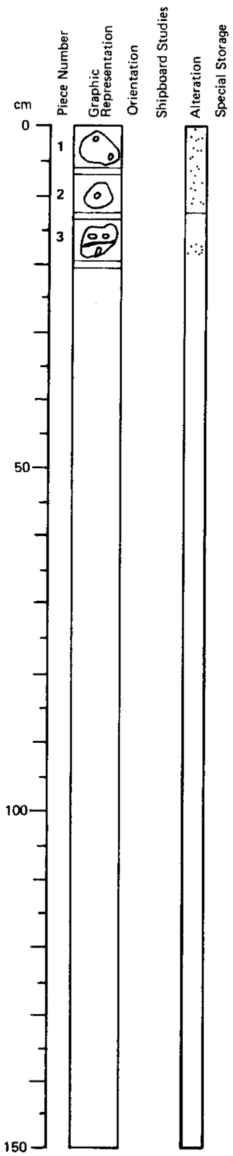
Vesicles: 20%, 0.02-1 mm

Texture: sparsely phyric.

Alteration: 1% clays in vesicles.

Shipboard Data

Bulk Analysis:	**110 cm**
SiO_2	50.16
Al_2O_3	15.21
Fe_2O_3	1.33
FeO	8.79
MgO	5.47
CaO	12.27
Na_2O	3.33
K_2O	0.40
TiO_2	1.58
P_2O_5	0.19
MnO	0.17
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	150.00
Ni	50.00
Sr	162.00
Zr	105.00



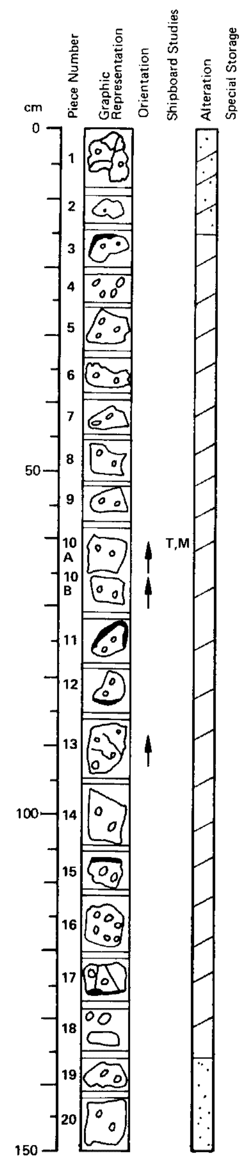
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	442	B	10	2

Depth: 354.5 to 354.7 m

Visual Description

0-14 cm: light gray, vesicular, aphyric, aphanitic, basalt, approximately 10% vesicles.
14-20 cm (3): glassy margin material, brecciated and cemented by white (8/2) chalk or limestone.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	442	B	11	1

Depth 362.5 to 364.0 m

Visual Description

Sample 1 – pillow bed with radiating pipe vesicles.

1) 0-14 cm: light gray, vesicular, aphyric aphanitic basalt.
   0-8 cm (Piece 1): surrounded by glassy margin and dark zone from 1 to 5 mm thick. Vesicular zone 1 cm from surface. Linear groups of vesicles normal to surface, some lined by smectite, some fractures containing calcite.
2) 14-128 cm: light gray-green, vesicular, aphyric basalt except for dark gray zones next to glassy margins (approximately 5 mm thick).
   86-95 cm and 113-121 cm (Piece 16): abundant large (1-3 mm) infilled vesicles - possibly formed by accretion of small vesicles (< 1 mm).
3) 128-150 cm: light gray, vesicular, aphyric basalt. Vesicles generally < 1 mm (approximately 30%.
   143-150 (Piece 20): 2 linear groups of larger vesicles line by alteration products.

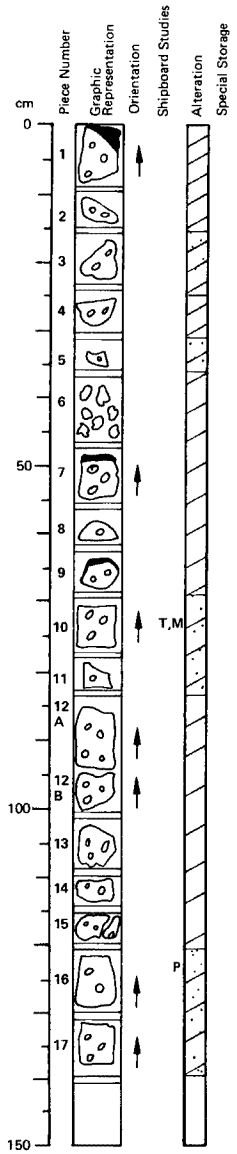
Thin Section Description – 61 cm

Phenocrysts: spinel 0.1 mm, rounded, triangle, 1 piece red-brown.
Groundmass: plagioclase 20%, 0.2-1 mm, acicular, some with plumose texture (pyroxene features); other 39%, cryptocrystalline matrix
Vesicles: 40%, 0.1-0.5 mm.
Texture: intersertal.
Alteration: 1% clays lining fracture and replacing some crytocrystalline material.

Shipboard Data

Bulk Analysis:	**146 cm**
SiO_2	48.97
Al_2O_3	15.87
Fe_2O_3	1.40
FeO	9.27
MgO	4.36
CaO	12.53
Na_2O	3.05
K_2O	0.48
TiO_2	1.55
P_2O_5	0.28
MnO	0.19
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	192.00
Ni	58.00
Sr	185.00
Zr	114.00

Magnetic Data:	**60 cm**
Intensity (emu/cc)	108.2
Inclination before demag.	33.3
Stable Inclination	28.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	442	B	11	2

Depth 364.0 to 365.4 m

Visual Description

Light gray, vesicular, aphyric basalt when lightly to moderately weathered green-gray where moderately weathered.
0-2 cm (Piece 1): glassy zone showing alteration to yellow palagonite.
87-88 cm (Piece 12A): glassy zone completely replaced by yellow palagonite and chilled margin, altered.
Some vesicles lined by brown alteration product others by light olive green smectite.
37-47 cm (Piece 6): drilling breccia.

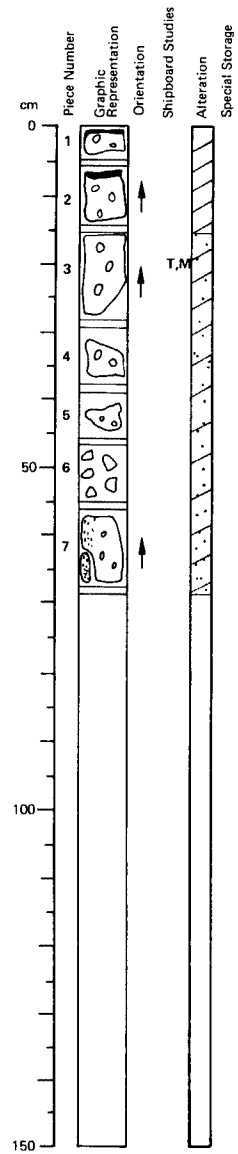
Thin Section Description – 28 cm

Groundmass: plagioclase 25%, 0.02-1 mm, An_{62}, elongate laths; clinopyroxene 10%, 0.02-0.5 mm, acicular; magnetite 2%, <0.02 mm, granular; other 28%.
Vesicles: 35%, 0.05-0.5 mm, rounded.
Texture: intersertal.

Shipboard Data

Bulk Analysis:	70 cm
SiO_2	49.99
Al_2O_3	15.38
Fe_2O_3	1.28
FeO	8.48
MgO	6.41
CaO	12.05
Na_2O	3.25
K_2O	0.39
TiO_2	1.50
P_2O_5	0.21
MnO	0.16
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	192.00
Ni	58.00
Sr	185.00
Zr	114.00

Magnetic Data:	127 cm
Intensity (emu/cc)	57.3
Inclination before demag.	48.8
Physical Properties:	**121 cm**
$\bar{V}p$ (km/s)	4.13



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	442	B	11	3

Depth: 365.4 to 366.1 m

Visual Description

Light gray, vesicular, aphyric basalt gray-green when moderately weathered. Vesicles approximately 20% < 1 mm.
10-20 cm: several large vesicles 3 mm to 10 mm across, lined by light gray or brown material.
55-67 cm: alteration zone (brown coloration) through Piece 7.
46-54 cm(Piece 6): drilling breccia.

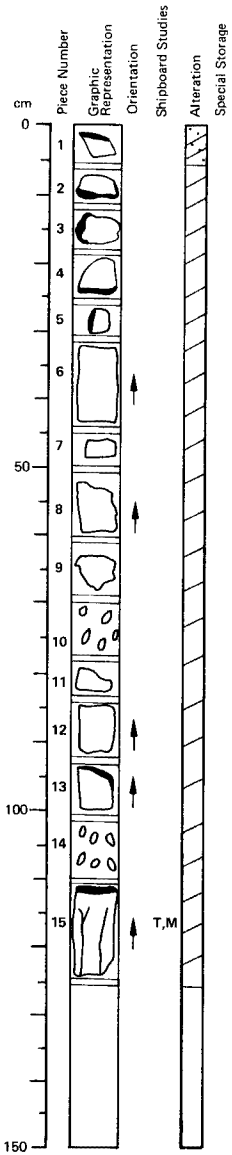
Thin Section Description – 19 cm

Phenocrysts: plagioclase 1%, 0.3-1.20 mm, laths, euhedral.
Groundmass: plagioclase 30%, 0.2-0.5 mm, An_{69}, acicular laths, microlites; magnetite 0.5%, 0.01-0.02%, granular; other, cryptocrystalline matrix.
Vesicles: 35%, 0.02-1 mm.
Texture: very sparsely phyric (aphyric)
Alteration: 1% clays lining vesicles.

Shipboard Data

Bulk Analysis:	24 cm
SiO_2	49.98
Al_2O_3	15.74
Fe_2O_3	1.28
FeO	8.48
MgO	5.19
CaO	12.26
Na_2O	3.30
K_2O	0.38
TiO_2	1.54
P_2O_5	0.21
MnO	0.18
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	267.00
Ni	71.00
Sr	178.00
Zr	115.00

Magnetic Data:	18 cm
Intensity (emu/cc)	112.0
Inclination before demag.	43.7
Stable Inclination	42.1



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 2	1

Depth: 372.0 to 373.3 m

Visual Description

Light gray, vesicular, aphyric basalt, gray-green when moderately weathered, chill zones below glass (relatively fresh).

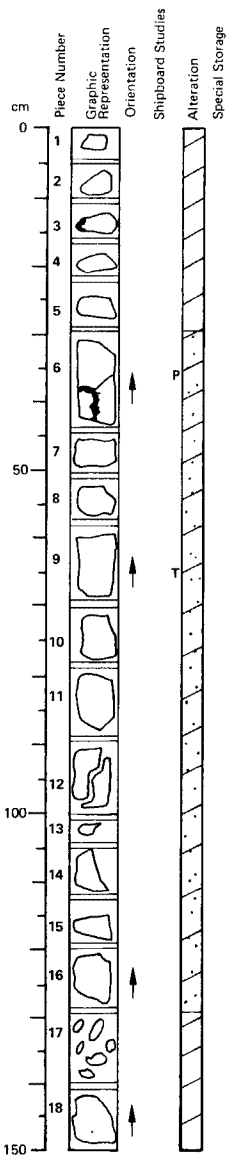
0-5 cm (Piece 1), 33-39 cm (Top of Piece 6), 96-99 cm (Bottom of Piece 13), and 113-125 cm (Piece 15 below chilled margin): all regions with large vesicles 1 mm to 5 mm across. In above regions 30-40% vesicles, otherareas approximately 10% vesicles generally <1 mm. Vesicles are lined by smectite, calcite or brown material.

71-77 cm and 102-110 cm: drilling breccia.

Shipboard Data

Bulk Analysis:	52 cm
SiO_2	49.27
Al_2O_3	15.66
Fe_2O_3	1.38
FeO	9.11
MgO	4.58
CaO	12.21
Na_2O	2.97
K_2O	0.58
TiO_2	1.55
P_2O_5	0.31
MnO	0.19
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	194.00
Ni	67.00
Sr	181.00
Zr	120.00

Magnetic Data:	40 cm	114 cm
Intensity (emu/cc)	90.96	89.80
Inclination before demag.	31.7	32.6
Stable Inclination	27.3	29.8



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 3	1

Depth: 381.5 to 383.0 m

Visual Description

0-30 cm: moderately weathered, green-gray aphanitic, vesicular, aphyric basalt, 20-30% vesicles mainly <1 mm up to 10% >1 mm.

30-130 cm: light to moderately weathered, green tinged, light gray, vesicular, aphyric basalt. No glass margins or chilled zones in this section, uniform texture.

130-139 cm: drilling breccia, includes glass fragments.

139-150 cm: moderately weathered, green-gray vesicular, aphyric, aphanitic basalt, 10% vesicles of which 7.5% are between 1 mm and 5 mm across.

Thin Section Description – 61 cm

Groundmass: plagioclase 25%, 0.2-1 mm, An_{59}, laths; clinopyroxene 25%, 0.1-0.5 mm, anhedral; magnetite 0.5%, <0.02 mm, granular.

Other: 34.5%, cryptocrystalline matrix.

Vesicles: 15%, 0.2-0.5 mm.

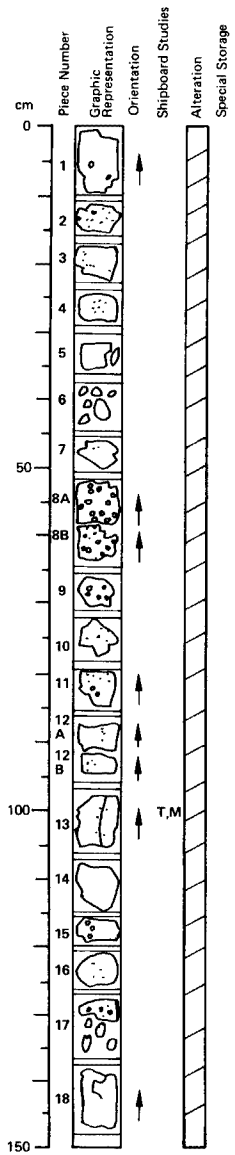
Texture: intersertal.

Shipboard Data

Bulk Analysis:	34 cm
SiO_2	50.12
Al_2O_3	15.38
Fe_2O_3	1.33
FeO	8.79
MgO	5.97
CaO	12.09
Na_2O	3.16
K_2O	0.42
TiO_2	1.68
P_2O_5	0.24
MnO	0.19
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	201.00
Ni	66.00
Sr	171.00
Zr	124.00

Magnetic Data:	60 cm
Intensity (emu/cc)	102.3
Inclination before demag.	52.6
Stable Inclination	38.1

Physical Properties:	32 cm
$\bar{V}p$ (km/s)	3.93
Porosity (%)	27.04
Wet Bulk Density	2.42
Grain Density	2.95



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4	B	1 3	2

Depth: 381.5 to 383.0 m

Visual Description

Moderately weathered pillow basalt. Aphyric, fine-grained to aphanitic. Plagioclase laths just visible, 0-15% vesicles, mostly fine. Calcite veins in center of Piece 17, side of Pieces 1, 2, 3, 4, 5, 8, 10, and 11. May be additional mineral in veins – zeolite?.

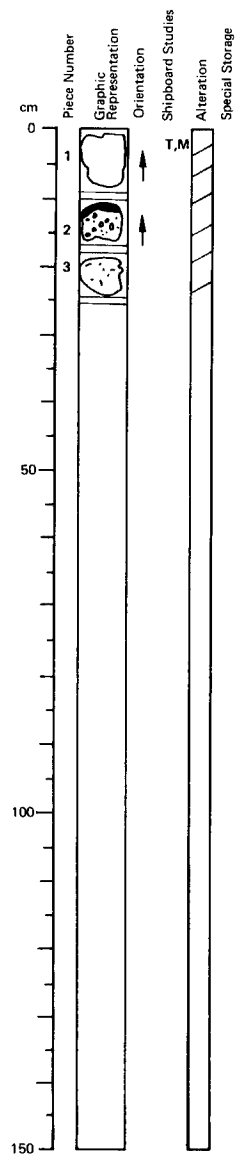
Piece 17, 127-130 cm: has glassy chill margin.

Pieces 8, 16, and 17: have composite vesicles containing highly vesicular darker basalt. ≪1% amygdules; calcite filled.

Shipboard Data

Bulk Analysis:	92 cm
SiO_2	49.38
Al_2O_3	15.36
Fe_2O_3	1.37
FeO	9.03
MgO	4.56
CaO	2.55
Na_2O	3.14
K_2O	0.45
TiO_2	1.60
P_2O_5	0.33
MnO	0.16
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	197.00
Ni	48.00
Sr	186.00
Zr	114.00

Magnetic Data:	100 cm
Intensity (emu/cc)	93.97
Inclination before demag.	37.7
Stable Inclination	34.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4	B	1 3	3

Depth: 383.0 to 383.3 m

Visual Description

0-10 cm: aphyric fine-grained basalt. Cracks contain some calcite, ≪1% calcite amygdules, <1% vesicles.

10-15 cm: vesicular aphyric basalt with glass rind. Composite vesicles with highly vesicular dark basalt in their interiors.

18-25 cm: fine-grained basalt, 3% fine vesicles. A few amygdules – (possibly iddingsitized olivine, ≪1% small 3x1 mm plagioclase phenocrysts.

Thin Section Description – 3 cm

Groundmass: plagioclase 33%, 0.1-1 mm, An_{60}, acicular, microlites; magnetite, trace, very fine-grained; other 33%, cryptocrystalline matrix.

Vesicles: 33%, 0.1-0.4 mm.

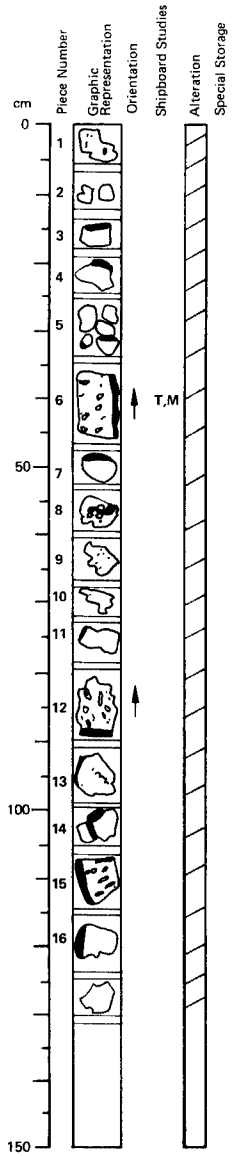
Texture: intersertal.

Alteration: 1% clays replacing cryptocrystalline matrix.

Shipboard Data

Bulk Analysis:	19 cm
SiO_2	49.63
Al_2O_3	15.39
Fe_2O_3	1.32
FeO	8.71
MgO	5.38
CaO	12.36
Na_2O	3.21
K_2O	0.46
TiO_2	1.53
P_2O_5	0.35
MnO	0.14
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	195.00
Ni	51.00
Sr	182.00
Zr	115.00

Magnetic Data:	2 cm
Intensity (emu/cc)	156.4
Inclination before demag.	22.7
Stable Inclination	20.4



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 4	1

Depth: 391.0 to 392.3 m

Visual Description

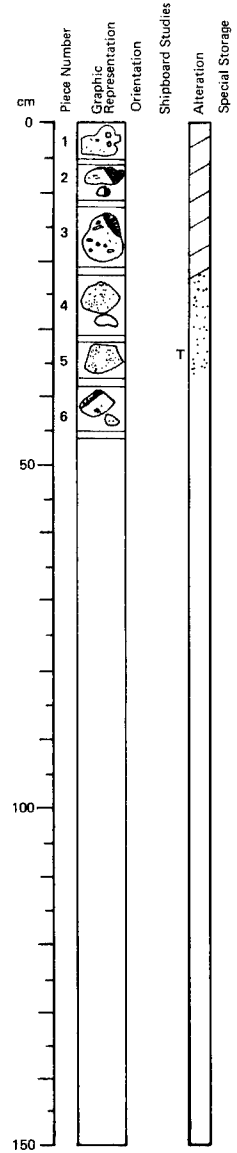
Fine-grained to aphanitic basalt. Moderately weathered, calcite amygdules common but <1%. Vesicles from <1% to 10%. Many samples have pipe vesicles at right angles to chill margins; these are generally composite vesicles filled with dark gray highly vesicular basalt.

Glass chill zones.

Calcite veins and coatings common on many samples.

Shipboard Data

Magnetic Data:	**38 cm**
Intensity (emu/cc)	111.6
Inclination before demag.	47.0
Stable Inclination	45.4



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 4	2

Depth: 392.3 to 392.7 m

Visual Description

0-21 cm: aphyric basalt. Composit vesicles filled with dark highly vesicular basalt – medium to coarse vesicles – 3-5%. Calcite veins, and amygdules present. Glass zone in Piece 2 has outer 1 cm thick palagonite zone.

23-38 cm: fine-grained, highly vesicular aphyric basalt, numerous brown vesicular inclusions Fine vesicles ~30%. Gray colored, lightly to moderately weathered.

40-45 cm: glassy chill zone on fine-grained aphyric nonvesicular basalt.

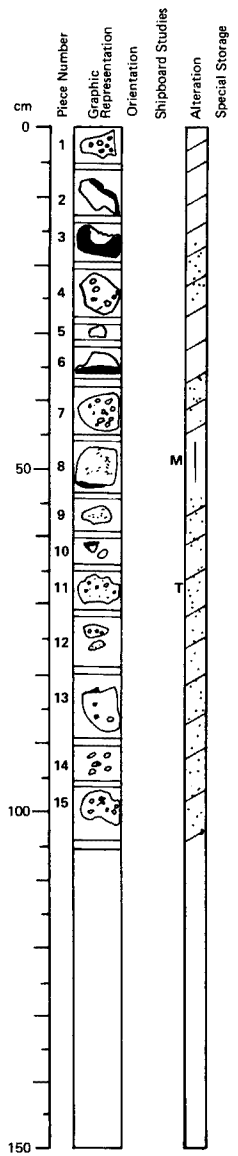
Thin Section Description – 35 cm

Phenocrysts: plagioclase 0.5 mm, lath, 1 only 0.5 x 0.2 mm; spinel <0.02 mm, euhedral, odd grains in pyroxene

Groundmass: plagioclase 20%, 0.1-0.5 mm, An_{59}, acicular or elongate laths; clinopyroxene 10%, 0.1-0.3 mm, anhedral, poorly developed; magnetite <0.01 mm, disseminated in odd areas; other 20% cryptocrystalline matrix and 20% glassy spheres with plagioclase microlites.

Vesicles: 30%, 0.02-0.5 mm.

Texture: aphyric, intersertal.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 5	1

Depth:

Visual Description

Aphyric pillow basalt. Pillow rinds common and appear to zone from glass (nonvesicular) to dense brown (moderately weathered) basalt which is aphanitic to fine-grained into dark gray lightly weathered highly vesicular basalt. Vesicular basalt has ~30% vesicles, brown to moderately weathered zone has ~5% vesicles (generally medium sized) and glass generally has no vesicles. Gray basalt has brown vesicular inclusions ~1/2 cm across. Four glassy chill margins. Exterior of pillow rind of Piece 2 is coated with 1 mm thick coating of crystalline calcite.

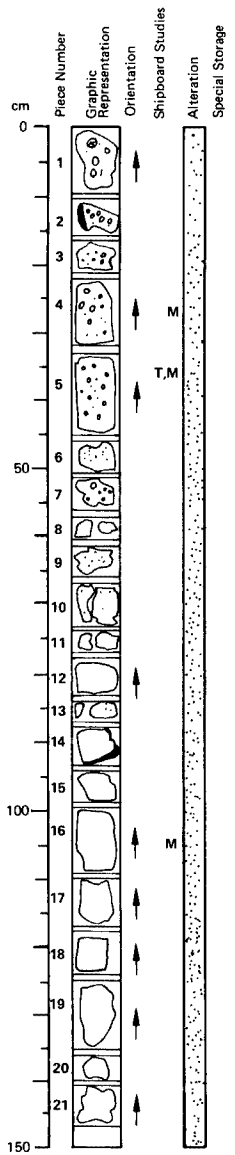
Thin Section Description — 69 cm

Groundmass: plagioclase 20%, 0.05-0.5 mm, An_{55}, acicular or elongate laths; clinopyroxene 15%, 0.05-0.4 mm; magnetite <0.02 mm, trace; other 30%.
Vesicles: 35%, 0.1-1.5 mm .
Texture: intersertal.

Shipboard Data

Bulk Analysis:	40 cm
SiO_2	49.91
Al_2O_3	15.76
Fe_2O_3	1.25
FeO	8.24
MgO	5.85
CaO	12.76
Na_2O	2.80
K_2O	0.45
TiO_2	1.26
P_2O_5	0.40
MnO	0.16
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	49.00
Ni	32.00
Sr	219.00
Zr	88.00

Physical Properties:	77 cm
$\overline{V}p$ (km/s)	4.14
Porosity (%)	24.46
Wet Bulk Density	2.42
Grain Density	2.88



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 6	1

Depth: 410.0 to 411.5 m

Visual Description

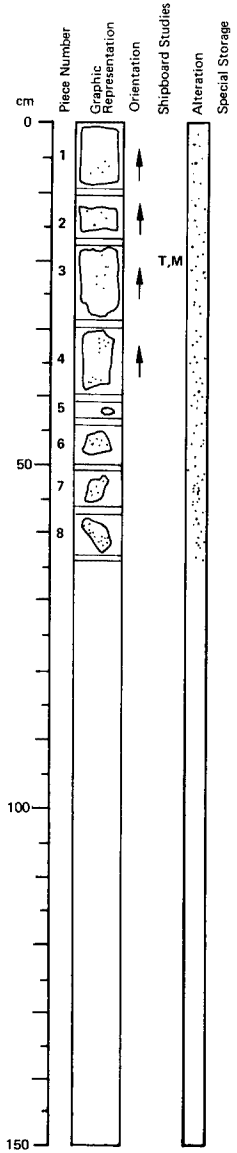
10-15 cm: pillow rind, oriented vertically, only glass in core.
0-10 cm: lightly weathered aphyric vesicular basalt. Composite vesicles of highly vesicular brown basalt in gray basalt. Fine vesicles ~20% coarse ~3%. Fine-grained.
10-45 cm: dark gray aphyric vesicular basalt, pillow rind on upper fragment. Fine vesicles ~10%, medium ~7%. Fine-grained.
46-40 cm: gray brown aphyric vesicular basalt. Fine vesicles 20%, no medium vesicles.
51-56 cm: reddish gray vesicular basalt with chill margin. Composite vesicles. Medium vesicles ~10% fine ~2%.
57-146 cm: fine-grained aphyric basalt, <1% fine vesicles at top, none at base of section.

Shipboard Data

Bulk Analysis:	24 cm	47 cm	111 cm
SiO_2	50.21	49.85	50.55
Al_2O_3	16.35	16.20	15.67
Fe_2O_3	1.31	1.24	1.14
FeO	8.63	8.15	7.58
MgO	5.95	5.84	7.77
CaO	11.78	12.78	12.24
Na_2O	3.26	2.73	2.96
K_2O	0.55	0.44	0.35
TiO_2	1.34	1.25	1.16
P_2O_5	0.18	0.21	0.12
MnO	0.16	0.17	0.12
LOI	—	—	—
H_2O^+	—	—	—
H_2O^-	—	—	—
CO_2	—	—	—
Cr	35.00	52.00	50.00
Ni	39.00	42.00	59.00
Sr	208.00	210.00	200.00
Zr	95.00	88.00	81.00

Magnetic Data:	29 cm	35 cm	105 cm
Intensity (emu/cc)	504.8	154.6	349.2
Inclination before demag.	–47.4	–42.2	–45.2
Stable Inclination	—	–43.5	–46.6

Physical Properties:	120 cm
$\overline{V}p$ (km/s)	4.47
Porosity (%)	17.65
Wet Bulk Density	2.54
Grain Density	2.87



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 6	2

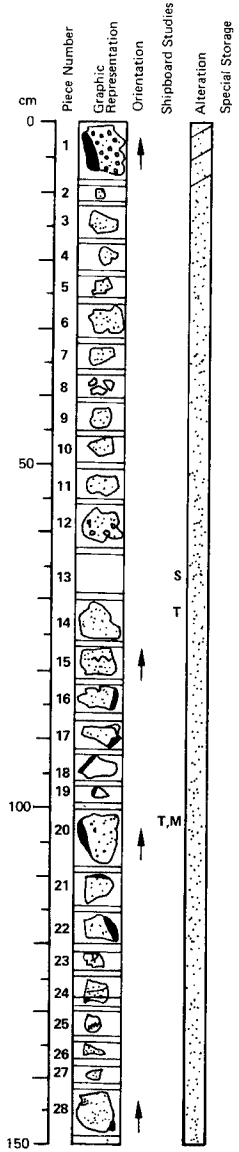
Depth: 411.5 to 411.7 m

Visual Description

0-65 cm: light gray basalt similar to that in the bottom interval of the last section. Vesicularity increases towards base from ≪1% to ~5%, fine vesicles.

Shipboard Data

Bulk Analysis:	**15 cm**
SiO_2	49.52
Al_2O_3	14.86
Fe_2O_3	1.20
FeO	7.92
MgO	6.96
CaO	11.37
Na_2O	3.00
K_2O	0.49
TiO_2	1.29
P_2O_5	0.14
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	42.00
Ni	39.00
Sr	204.00
Zr	93.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 7	1

Depth: 417.0 to 418.5 m

Visual Description

Aphyric fine-grained to aphanitic, gray basalt, 10-25% vesicles, ≪1% very small plagioclase phenocrysts. Some samples have composite vesicles, lightly weathered.

Glass at Pieces 1, 16, 17, 18, 19, 20, 21, 22, 23, 28.

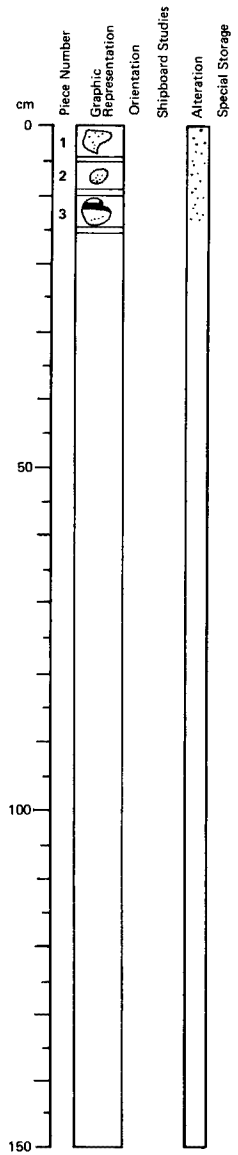
Piece 1 has crystalline calcite covering glass rind, and rind has a thick palagonite zone 2-3 mm thick.

Piece 17 has indurated sediment with palagonite fragments adhering to fracture surface of the basalt.

Shipboard Data

Bulk Analysis:	**14 cm**	**64 cm**	**142 cm**
SiO_2	49.74	50.46	50.60
Al_2O_3	16.10	17.07	14.39
Fe_2O_3	1.26	1.21	1.34
FeO	8.32	8.00	8.87
MgO	5.89	5.64	6.19
CaO	12.76	13.06	12.03
Na_2O	2.71	3.10	3.07
K_2O	0.43	0.55	0.39
TiO_2	1.27	1.24	1.59
P_2O_5	0.20	0.18	0.24
MnO	0.15	0.16	0.17
LOI	—	—	—
H_2O^+	—	—	—
H_2O^-	—	—	—
CO_2	—	—	—
Cr	57.00	58.00	59.00
Ni	43.00	50.00	47.00
Sr	211.00	210.00	185.00
Zr	94.00	87.00	121.00

Magnetic Data:	**104 cm**
Intensity (emu/cc)	491.2
Inclination before demag.	− 59.9
Stable Inclination	− 60.4
Physical Properties:	**104 cm**
$\bar{V}p$ (km/s)	4.19



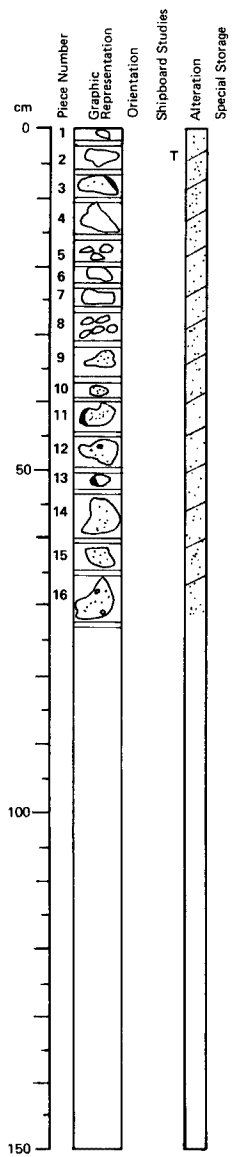
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 7	2

Depth: 418.5 to 418.7 m

Visual Description

Aphyric aphanitic vesicular basalt pillow rinds, <1% very small plagioclase phenocrysts.
Pieces 3 and 1 have sediment/palagonite rim 1 cm thick, lightly altered.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 8	1

Depth:

Visual Description

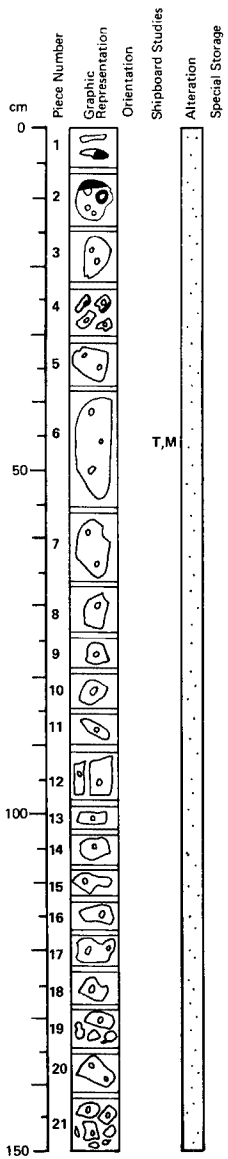
Vesicular gray aphyric pillow basalt and rubble. Talux nature of zone clearly indicated by presence of angular fragments of basalt covered with free growing crystalline calcite on all sides: Pices 2, 4, 13. Glass rinds on Pieces 3 and 13, 1-20% vesicles.

Thin Section Description – 4 cm

Phenocrysts: plagioclase 0.5 x 0.2 mm, laths, zoned; clinopyroxene 0.2 x 0.3 mm, subhedral, hour glass zoning.
Groundmass: plagioclase 25%, 0.1-1 mm, acicular or elongate laths; clinopyroxene 25%, 0.01-0.1 mm, anhedral, mainly finely crystalline; magnetite 0.5%, <0.01 mm, granular; other 9.5%, cryptocrystalline matrix.
Texture: intersertal, very sparsely phyric.

Shipboard Data

Bulk Analysis:	**46 cm**
SiO_2	50.56
Al_2O_3	15.23
Fe_2O_3	1.27
FeO	8.40
MgO	5.87
CaO	12.40
Na_2O	3.24
K_2O	0.34
TiO_2	1.57
P_2O_5	0.25
MnO	0.16
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	59.00
Ni	48.00
Sr	189.00
Zr	123.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 9	1

Depth: 436.0 to 437.5 m

Visual Description

0-145 cm: basalt representing top of lava flow. Aphyric, fine-grained. Pieces 1 and 2 have glass on the one side on the surface. The glass is dark, the rock – dark-gray, the border is gray (1-2 mm). Vesicular, lightly altered. Vesicles about 5-10% (<1 mm). Vesicles 1-2 mm, 2%.
14-150 cm: basalt, aphyric, dark gray, vesicular, lightly altered. Vesicles 10-15% (<1 mm), unfilled.
100-150 cm: dense basalt.

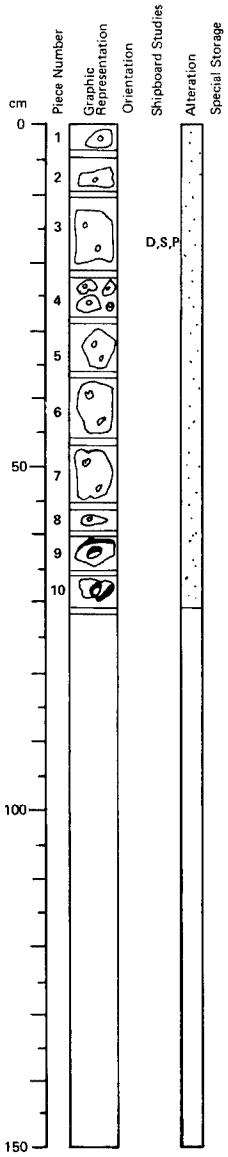
Thin Section Description – 42 cm

Groundmass: plagioclase 25%, 0.2-1.5 mm, An_{64}, euhedral, subhedral; clinopyroxene 30%, 0.03-0.5 mm, augite, anhedral; glass + Mt 20%, in groundmass and around vesicles.
Vesicles: 25%, 0.1-2.0 mm, round irregular.
Texture: intergranular-intersertal.
Alteration: very few zeolites.

Shipboard Data

Bulk Analysis:	45 cm
SiO_2	51.65
Al_2O_3	14.87
Fe_2O_3	1.28
FeO	8.48
MgO	6.64
CaO	11.48
Na_2O	3.75
K_2O	0.37
TiO_2	1.60
P_2O_5	0.16
MnO	0.15
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	58.00
Ni	59.00
Sr	173.00
Zr	123.00

Magnetic Data:	43 cm
Intensity (emu/cc)	217.2
Inclination before demag.	-31.0
Stable Inclination	-34.3



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 2	B	1 9	2

Depth: 437.5 to 438.2 m

Visual Description

0-28 cm: upper 28 cm appears identical to that described at the base of Section 1.
28-60 cm: similar basalt but more vesicular. Aphyric, dark gray, lightly altered. Vesicles <0.5 mm, 15%.
60-70 cm: pillow lava. Pieces 9 and 10 with glass on the one side of surface. Basalt is dense (fine-grained) dark gray, lightly altered. Vesicles <2 mm, 5-10%. Basalt close to that of top of lava flow 0-14 cm, Section 1), but fresher.

Thin Section Description – 62 cm

Phenocrysts: plagioclase 3%, 0.7-0.1 mm, An_{60}, euhedral; clinopyroxene 1%, 0.5-0.1 mm, augite, subhedral.
Groundmass: plagioclase mictolite; clinopyroxene mictolite.
Vesicles: 30%, 0-1.5 mm, round, irregular, unfilled.
Texture: variolitic.

Shipboard Data

Bulk Analysis:	36 cm	51 cm
SiO_2	50.93	50.65
Al_2O_3	15.78	15.46
Fe_2O_3	1.26	1.28
FeO	8.32	8.48
MgO	5.64	5.76
CaO	12.35	12.22
Na_2O	3.56	3.62
K_2O	0.38	0.44
TiO_2	1.59	1.53
P_2O_5	0.20	0.18
MnO	0.16	0.19
LOI	--	--
H_2O^+	--	--
H_2O^-	--	--
CO_2	--	--
Cr	59.00	60.00
Ni	57.00	63.00
Sr	189.00	188.00
Zr	129.00	123.00

Magnetic Data:	62 cm
Intensity (emu/cc)	182.8
Inclination before demag.	-27.8
Stable Inclination	-36.4

Physical Properties:	12 cm
$\bar{V}p$ (km/s)	5.25
Porosity (%)	9.11
Wet Bulk Density	2.80
Grain Density	2.97

SITE SUMMARY SHEET

SITE 443

Date occupied	December 28, 1977
Date departed	January 4, 1978
Time on hole	6 days
Position: latitude	29° 19.65'N
longitude	137° 26.43'E
Water depth (sea level)	4372.0 corrected meters, echo sounding
Water depth (rig floor)	4386.0 corrected meters, echo sounding
Bottom felt at	4386.0 meters, drill pipe
Penetration	581.5 meters
Number of holes	1
Number of cores	64
Total length of cored section	581.5 meters
Total core recovered	304.05 meters
Percentage core recovery	52%

Oldest Sediment Cored

Depth sub-bottom	457.0 meters
Nature	mudstone
Age	early middle Miocene (15 m.y.B.P.)
Measured velocity	1.56 km/s

Basement

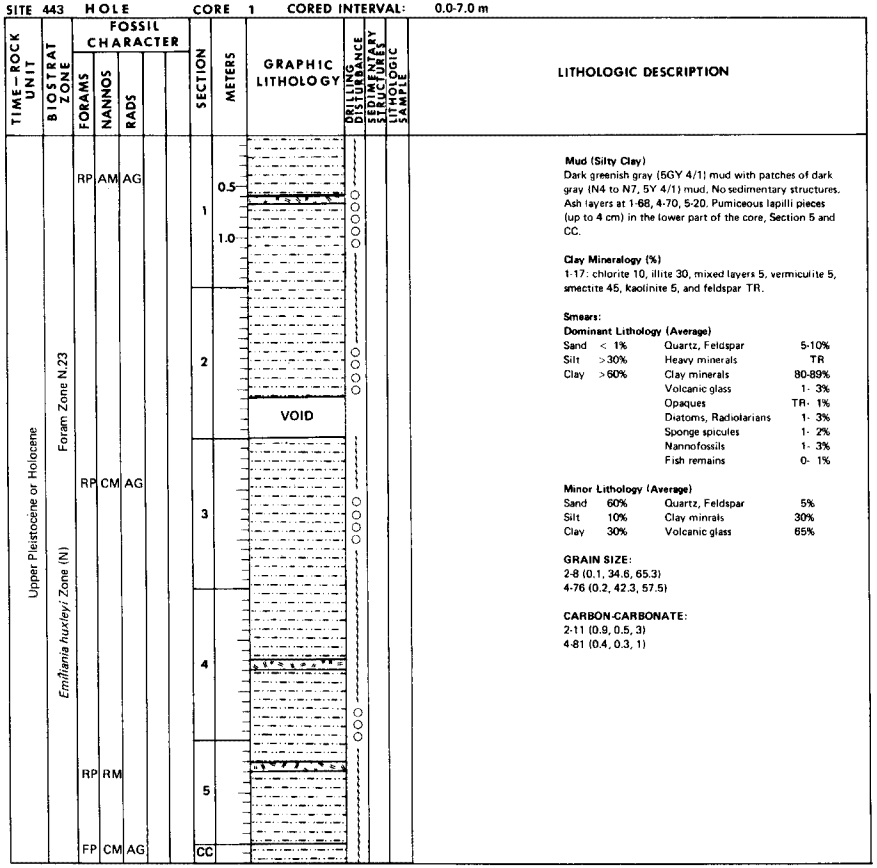
Depth sub-bottom	581.5 meters
Nature	basalt
Velocity range	3.82-5.82 km/s

Principal Results:

Site 443 is located in the east-central part of the Shikoku Basin. The stratigraphic section consists of 44 meters late Pleistocene mud, 76 meters early Pleistocene nanno clay, clayey nanno ooze and ash, 57 meters late Pliocene ash and clay, 29 meters early Pliocene mud, 57 meters late Miocene mud and nanno ooze, 31 meters of late Miocene mudstone, 45 meters of middle Miocene nanno chalk and mudstone, 98 meters of early middle Miocene claystone, mudstone, ash and chalk, 35 meters phyric olivine basalt flow, with hydrothermal veins, 34 meters pillow lava flows, and 47 meters interbedded phyric basalt flows and pillow lava flows.

Continuous sedimentation started with middle Miocene re-sedimentation of volcaniclastic, hemipelagic and pelagic sediments and was then dominated by post-middle Miocene hemipelagic processes slightly above the CCD. Age of oldest sediment is 15 m.y.B.P., providing a basement age at variance with the magnetic anomaly age. Magnetic inclination of basalts shows a combination of reversed polarity and normal polarity with both high and low inclinations.

SITE 443 HOLE CORE 1 CORED INTERVAL: 0.0-7.0 m



LITHOLOGIC DESCRIPTION

Mud (Silty Clay)
Dark greenish gray (5GY 4/1) mud with patches of dark gray (N4 to N7, 5Y 4/1) mud. No sedimentary structures. Ash layers at 1-68, 4-70, 5-20. Pumiceous lapilli pieces (up to 4 cm) in the lower part of the core, Section 5 and CC.

Clay Mineralogy (%)
1-17: chlorite 10, illite 30, mixed layers 5, vermiculite 5, smectite 45, kaolinite 5, and feldspar TR.

Smears:
Dominant Lithology (Average)

Sand	< 1%	Quartz, Feldspar	5-10%
Silt	>30%	Heavy minerals	TR
Clay	>60%	Clay minerals	80-89%
		Volcanic glass	1- 3%
		Opaques	TR- 1%
		Diatoms, Radiolarians	1- 3%
		Sponge spicules	1- 2%
		Nannofossils	1- 3%
		Fish remains	0- 1%

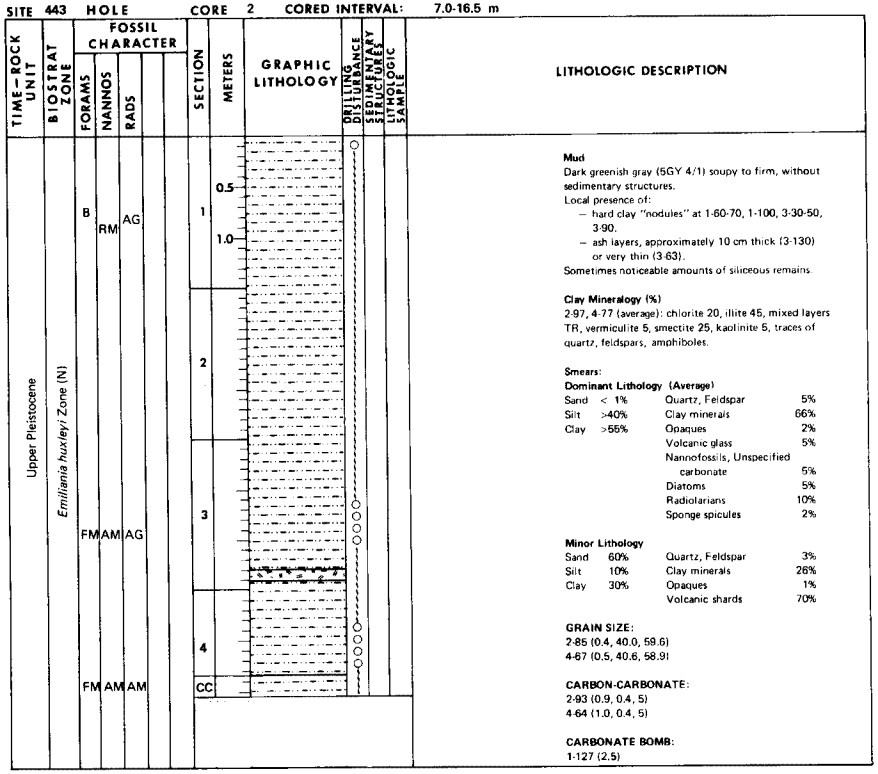
Minor Lithology (Average)

Sand	60%	Quartz, Feldspar	5%
Silt	10%	Clay minrals	30%
Clay	30%	Volcanic glass	65%

GRAIN SIZE:
2-8 (0.1, 34.6, 65.3)
4-76 (0.2, 42.3, 57.5)

CARBON-CARBONATE:
2-11 (0.9, 0.5, 3)
4-81 (0.4, 0.3, 1)

SITE 443 HOLE CORE 2 CORED INTERVAL: 7.0-16.5 m



LITHOLOGIC DESCRIPTION

Mud
Dark greenish gray (5GY 4/1) soupy to firm, without sedimentary structures.
Local presence of:
- hard clay "nodules" at 1-60-70, 1-100, 3-30-50, 3-90.
- ash layers, approximately 10 cm thick (3-130) or very thin (3-63).

Sometimes noticeable amounts of siliceous remains.

Clay Mineralogy (%)
2-97, 4-77 (average): chlorite 20, illite 45, mixed layers TR, vermiculite 5, smectite 25, kaolinite 5, traces of quartz, feldspars, amphiboles.

Smears:
Dominant Lithology (Average)

Sand	< 1%	Quartz, Feldspar	5%
Silt	>40%	Clay minerals	66%
Clay	>55%	Opaques	2%
		Volcanic glass	5%
		Nannofossils, Unspecified carbonate	5%
		Diatoms	5%
		Radiolarians	10%
		Sponge spicules	2%

Minor Lithology

Sand	60%	Quartz, Feldspar	3%
Silt	10%	Clay minerals	26%
Clay	30%	Opaques	1%
		Volcanic shards	70%

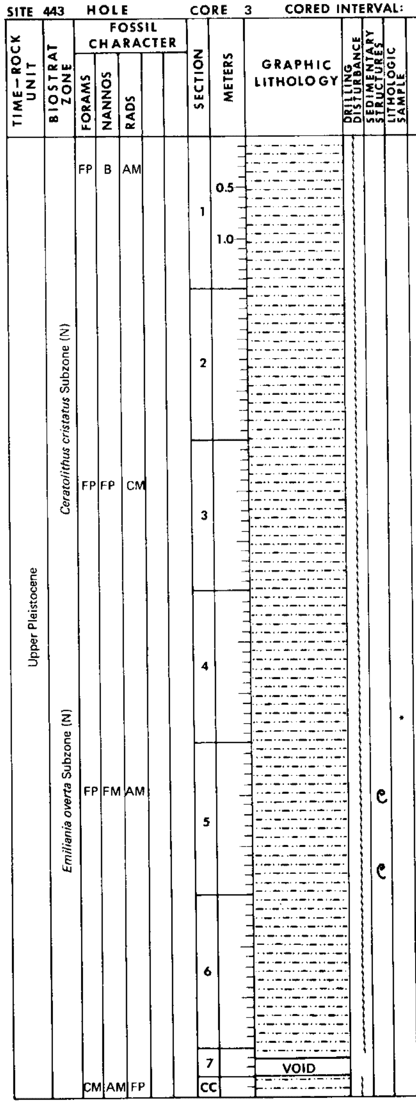
GRAIN SIZE:
2-85 (0.4, 40.0, 59.6)
4-67 (0.5, 40.6, 58.9)

CARBON-CARBONATE:
2-93 (0.9, 0.4, 5)
4-64 (1.0, 0.4, 5)

CARBONATE BOMB:
1-127 (2.5)

MGG 1505 5028

SITE 443 HOLE CORE 3 CORED INTERVAL: 16.5-26.0 m



LITHOLOGIC DESCRIPTION

Mud

Dark greenish gray (5GY 4/1) to dark gray (5Y 4/1, N4) mud; with rare hard clay "nodules" (1-60, 4-30-70) and ash patches (1-60). Presence of either carbonates, siliceous fossils or ash in the silt fraction.

Clay Mineralogy (%)

2-72, 4-92: chlorite 15-20, illite 30-45, mixed layers TR-10, vermiculite 5, smectite 20, kaolinite 5, traces of quartz, feldspars, amphiboles.

Smears:

Dominant Lithology (Average)

Sand	< 1%	Quartz, Feldspar	5%
Silt	>40%	Micas	TR
Clay	>40%	Clay minerals	69-75%
		Opaques	2- 3%
		Volcanic glass	1- 2%
		Carbonate unspecified	<5%
		Foraminifers	1- 2%
		Nannofossils	2- 5%
		Siliceous fossils	0- 8%

Minor Lithology (Ashy Mud) 4-130

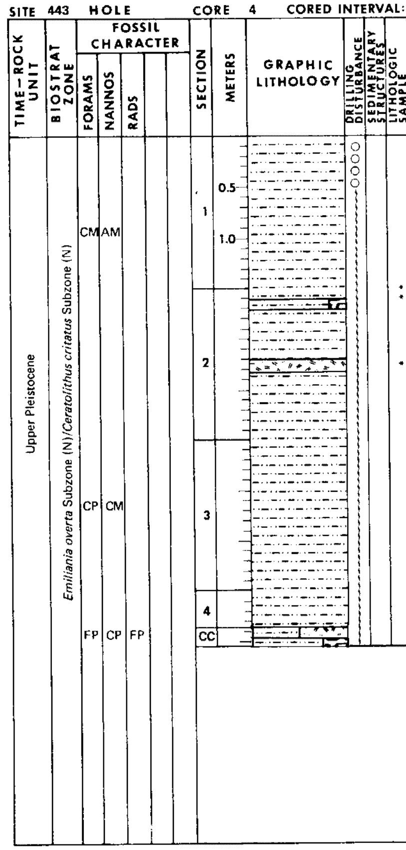
Sand	30%	Quartz, Feldspar	5%
Silt	20%	Clay minerals	60%
Clay	50%	Volcanic glass	20%
		Opaques	1%
		Carbonate unspecified	8%
		Siliceous fossils	3%

GRAIN SIZE:
2-68 (0.5, 44.0, 55.5)
4-10 (0.6, 62.4, 37.0)

CARBON-CARBONATE:
2-16 (0.3, 0.2, 1)
4-16 (0.7, 0.3, 3)

CARBONATE BOMB:
5-120 (4.5)

SITE 443 HOLE CORE 4 CORED INTERVAL: 26.0-35.5 m



LITHOLOGIC DESCRIPTION

Mud to Ashy Mud

Mainly dark grayish green (5GY 4/1) with minor color changes (5BG 4/1, N5). Mud to ashy mud, intensely deformed with firmer "crumbly" streaks and numerous clay "nodules". Local presence of carbonate mud.

Clay Mineralogy (%)

2-100: chlorite 15, illite 30, mixed layers 5, vermiculite TR, smectite 45, kaolinite 5, traces of quartz and feldspar.

Smears:

Dominant Lithology 2-5

Sand	< 1%	Quartz, Feldspar	5%
Silt	>45%	Heavy minerals	TR
Clay	>50%	Clay minerals	82%
		Opaques	1%
		Volcanic glass	2%
		Carbonate unspecified	7%
		Siliceous fossils	3%

Minor Lithology 2-15

Sand	5%	Quartz, Feldspar	3%
Silt	25%	Clay minerals	70%
Clay	70%	Opaques	1%
		Carbonate unspecified	15%
		Foraminifers	1%
		Nannofossils	5%
		Siliceous fossils	5%

Minor Lithology 2-80

Sand	50%	Quartz, Feldspar	1%
Silt	10%	Clay minerals	42%
Clay	40%	Opaques	1%
		Volcanic glass (65% in CC)	50%
		Sponge spicules	1%

GRAIN SIZE:
2-39 (0.3, 45.4, 54.3)
4-3 (0.4, 45.5, 54.1)

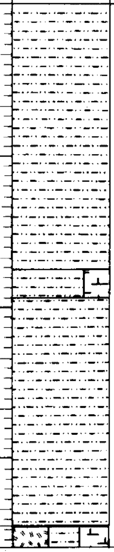
CARBON-CARBONATE:
2-12 (1.2, 0.3, 8)
4-8 (0.8, 0.4, 3)

CARBONATE BOMB:
2-15 (7)

SITE 443 HOLE CORE 5 CORED INTERVAL: 35.5-45.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS
Upper Pleistocene	*Emiliania ovata* Subzone (N)	FP	RP		1	0.5, 1.0
					2	
		FP	CP		3	
					4	
		RP	FM	FP	CC	

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

Mud
Dark greenish gray (5GY 4/1, locally 5G 4/1, 5BG 4/1, N4); with numerous clay "nodules", intensely deformed mud. Local occurrence of carbonate mud or volcanic ash.

Clay Mineralogy (%)
2-57, 4-12: chlorite 10, illite 30-45, mixed layers 10, vermiculite TR-10, smectite 20-45, kaolinite 5, presence of quartz and feldspar.

Smears:
Dominant Lithology 2-85

Sand	< 1%	Quartz, Feldspar	2%
Silt	>40%	Clay minerals	89%
Clay	>50%	Opaques	1%
		Volcanic glass	2%
		Carbonate unspecified	3%
		Foraminifers, Nannofossils	TR
		Radiolarians	1%

Minor Lithology (Nanno Mud)

Sand	5%	Quartz, Feldspar	2%
Silt	20%	Clay minerals	47%
Clay	75%	Opaques	10%
		Volcanic glass	3%
		Carbonate unspecified	5%
		Foraminifers	2%
		Nannofossils	30%
		Siliceous fossils	1%

Minor Lithology (Volcanic Ash)

Sand	55%	Quartz, Feldspar	2%
Silt	10%	Clay minerals	30%
Clay	35%	Volcanic glass	67%
		Siliceous fossils	1%

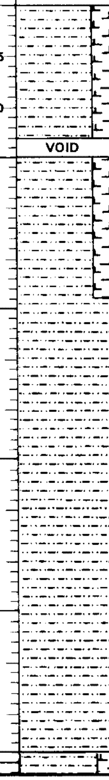
GRAIN SIZE:
2-20 (0.6, 43.1, 56.4)
4-20 (0.3, 42.2, 57.4)

CARBON-CARBONATE:
2-69 (0.9, 0.4, 5)
4-27 (0.5, 0.3, 2)

SITE 443 HOLE CORE 6 CORED INTERVAL: 45.0-54.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS
Lower Pleistocene	*Crenalithus doronicoides* Zone (N)	FP	FP		1	0.5, 1.0
			AP		2	
		FP	B		3	
	Foram Zone (N.22)				4	
		RM	R		5	
		RP	CP	B	CC	

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

Mud and Nanno Mud
Dark greenish gray (5GY 4/1) intensely deformed, soft to firm mud with nannofossils and unspecified carbonates, with frequent clay "nodules" (5BG 4/1 to 5B 4/1). No sedimentary structures.

Clay Mineralogy (%)
2-50: chlorite 15, illite 35, mixed layers 15, smectite 35, kaolinite TR, quartz very rare.

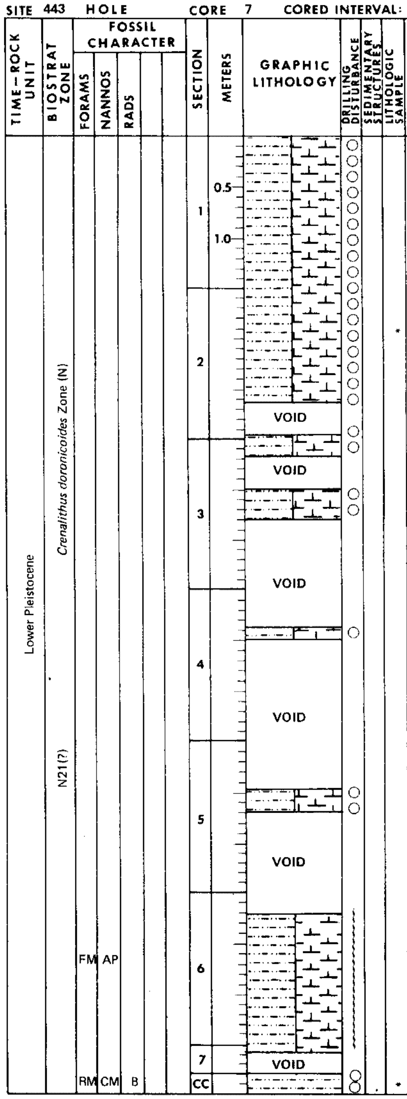
Smears:
2-75

Sand	< 1%	Quartz, Feldspar	5%
Silt	>45%	Mica	1%
Clay	>50%	Heavy minerals	TR
		Clay minerals	63%
		Opaques	1%
		Volcanic glass	1%
		Carbonate unspecified	7%
		Nannofossils	20%
		Siliceous fossils	1%

GRAIN SIZE:
2-22 (0.3, 46.0, 53.8)
4-26 (1.4, 48.5, 50.1)

CARBON-CARBONATE:
2-63 (1.1, 0.2, 7)
4-36 (0.3, 0.2, 1)

SITE 443 HOLE CORE 7 CORED INTERVAL: 54.5-64.0 m



LITHOLOGIC DESCRIPTION

Nanno Mud
Dark greenish gray (5GY 4/1), locally dark gray (5Y 4/1) or greenish gray (5GY 5/1) mud rich in nannofossils, without sedimentary structures. Locally clayey nanno ooze or mud. Sections 1 to 5 show very high disturbances. Section 6 is a little better preserved.

Clay Mineralogy (%)
6-120: chlorite 10, illite 40, mixed layers TR, smectite 45, kaolinite 5, very rare quartz.

Smears:
Dominant Lithology 2-45

Sand	1%	Quartz, Feldspar	3%
Silt	45%	Clay minerals	47%
Clay	54%	Opaques	1%
		Volcanic glass	1%
		Carbonate unspecified	7%
		Foraminifers	1%
		Nannofossils	40%
		Siliceous fossils	TR

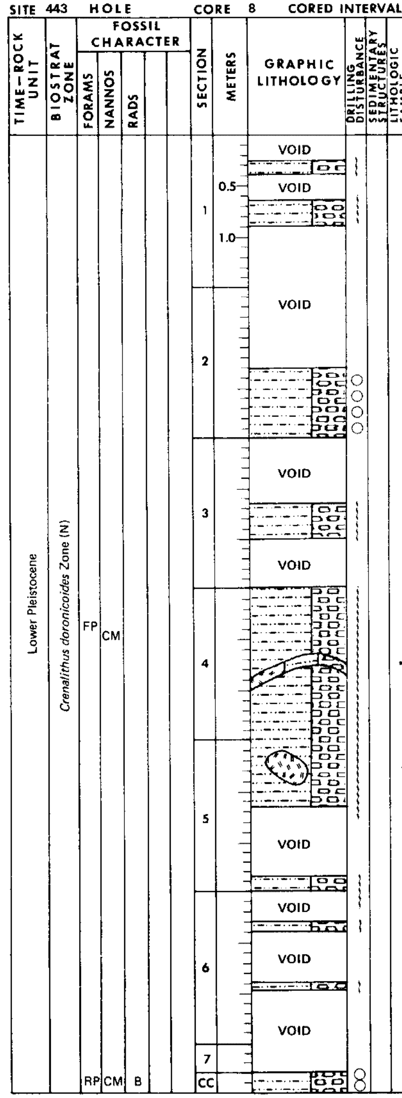
Minor Lithology (Mud) CC

Sand	7%	Quartz, Feldspar	5%
Silt	23%	Mica	TR
Clay	70%	Heavy minerals	1%
		Clay minerals	86%
		Opaques	1%
		Volcanic glass	1%
		Carbonate unspecified	5%
		Siliceous fossils	1%

GRAIN SIZE:
6-98 (1.1, 45.1, 53.8)

CARBON-CARBONATE:
6-82 (1.9, 0.2, 15)

SITE 443 HOLE CORE 8 CORED INTERVAL: 64.0-73.5 m



LITHOLOGIC DESCRIPTION

Carbonate Mud
Dark greenish gray (5GY 4/1) to dark gray (N4) drilling breccias or soupy mud, except in Sections 4 and 5 (soft to firm mud). No sedimentary structures. Thin ash layers or streaks (i.e. 4-135, 5-30).

Clay Mineralogy (%)
4-120: chlorite 15, illite 40, mixed layers TR, smectite 45, kaolinite TR.

Smears:
Dominant Lithology 4-75

Sand	1%	Quartz, Feldspar	3%
Silt	39%	Heavy minerals	TR
Clay	60%	Clay minerals	71%
		Opaques	3%
		Volcanic glass	TR
		Carbonate unspecified	10%
		Foraminifers	2%
		Nannofossils	10%
		Sponge spicules	1%

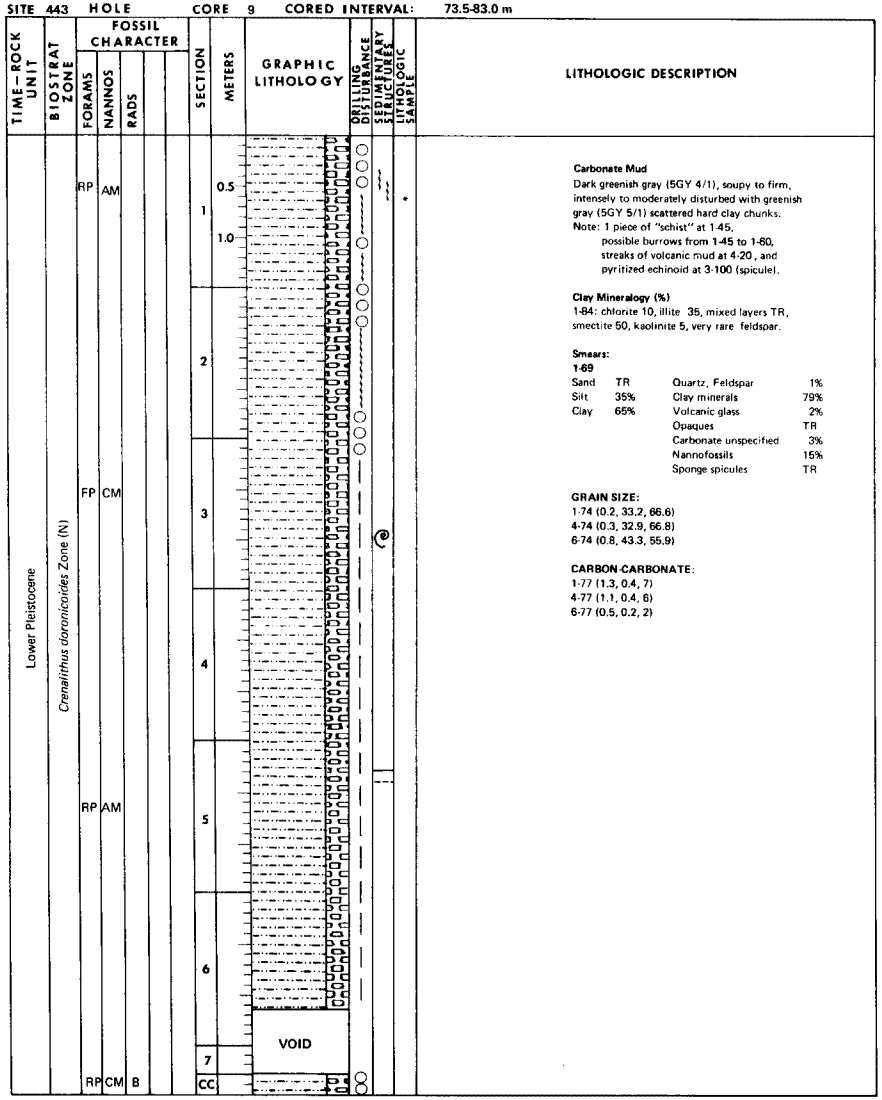
Minor Lithology (Ashy Sandy Mud) 5-30

Sand	40%	Quartz, Feldspar	2%
Silt	20%	Heavy minerals	TR
Clay	40%	Clay minerals	40%
		Opaques	2%
		Volcanic glass	40%
		Carbonate unspecified	5%
		Siliceous fossils	1%

GRAIN SIZE:
4-66 (0.1, 39.3, 60.6)

CARBON-CARBONATE:
4-70 (0.6, 0.4, 2)

SITE 443 HOLE CORE 9 CORED INTERVAL: 73.5-83.0 m



LITHOLOGIC DESCRIPTION

Carbonate Mud
Dark greenish gray (5GY 4/1), soupy to firm, intensely to moderately disturbed with greenish gray (5GY 5/1) scattered hard clay chunks.
Note: 1 piece of "schist" at 1-45,
possible burrows from 1-45 to 1-60,
streaks of volcanic mud at 4-20, and
pyritized echinoid at 3-100 (spicule).

Clay Mineralogy (%)
1-84: chlorite 10, illite 35, mixed layers TR, smectite 50, kaolinite 5, very rare feldspar.

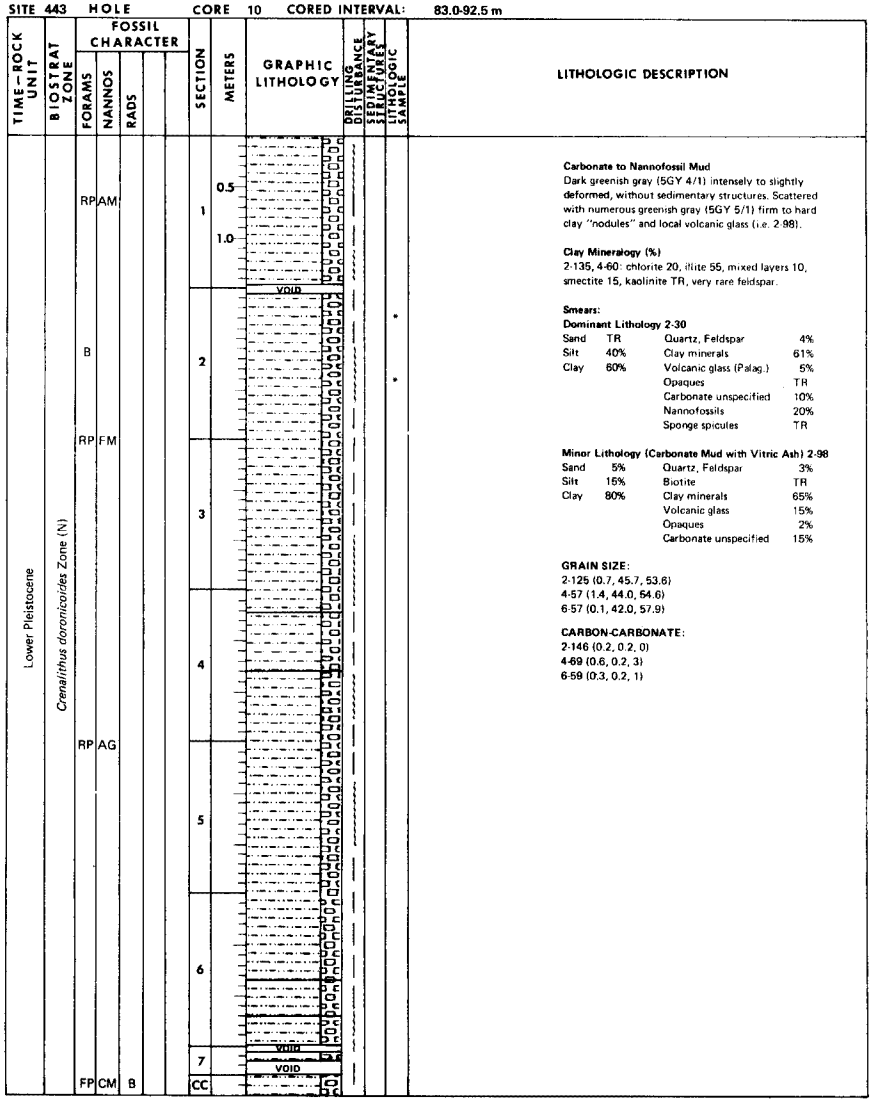
Smears:
1-69

Sand	TR	Quartz, Feldspar	1%
Silt	35%	Clay minerals	79%
Clay	65%	Volcanic glass	2%
		Opaques	TR
		Carbonate unspecified	3%
		Nannofossils	15%
		Sponge spicules	TR

GRAIN SIZE:
1-74 (0.2, 33.2, 66.6)
4-74 (0.3, 32.9, 66.8)
6-74 (0.8, 43.3, 55.9)

CARBON-CARBONATE:
1-77 (1.3, 0.4, 7)
4-77 (1.1, 0.4, 6)
6-77 (0.5, 0.2, 2)

SITE 443 HOLE CORE 10 CORED INTERVAL: 83.0-92.5 m



LITHOLOGIC DESCRIPTION

Carbonate to Nannofossil Mud
Dark greenish gray (5GY 4/1) intensely to slightly deformed, without sedimentary structures. Scattered with numerous greenish gray (5GY 5/1) firm to hard clay "nodules" and local volcanic glass (i.e. 2-98).

Clay Mineralogy (%)
2-135, 4-60: chlorite 20, illite 55, mixed layers 10, smectite 15, kaolinite TR, very rare feldspar.

Smears:
Dominant Lithology 2-30

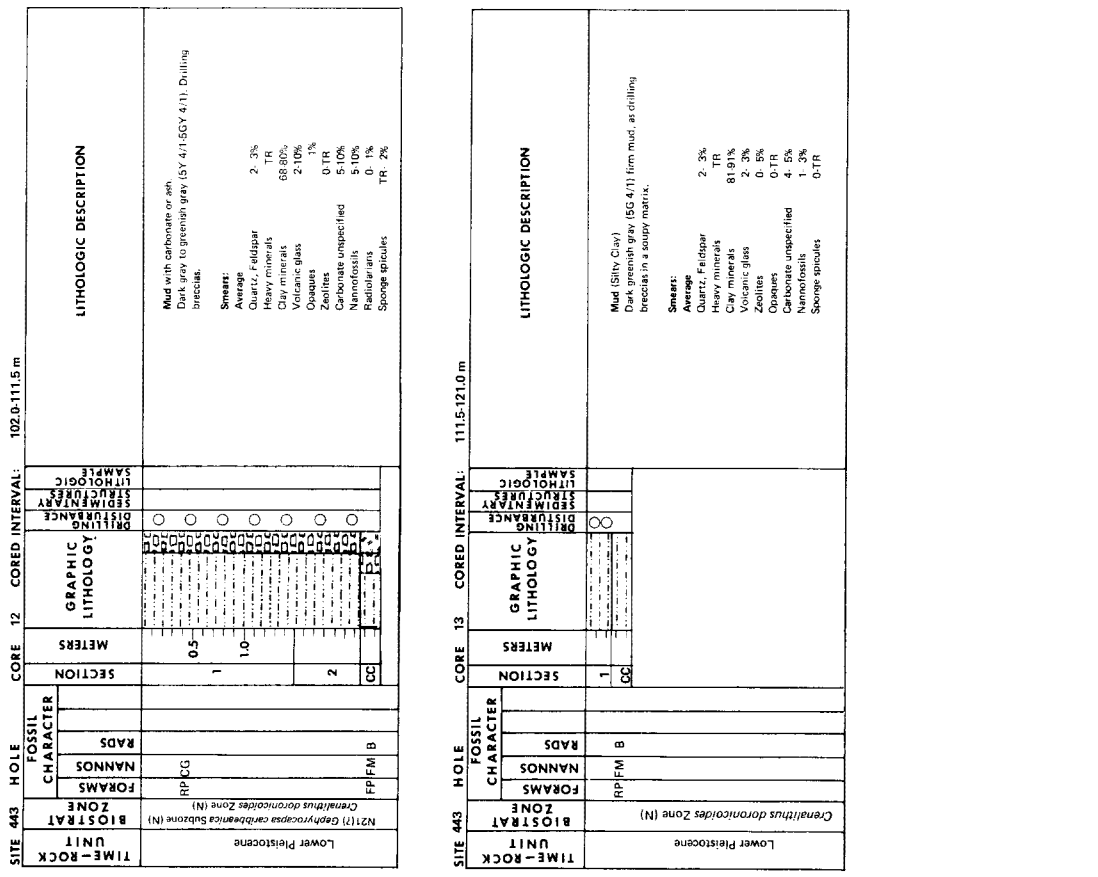
Sand	TR	Quartz, Feldspar	4%
Silt	40%	Clay minerals	61%
Clay	60%	Volcanic glass (Palag.)	5%
		Opaques	TR
		Carbonate unspecified	10%
		Nannofossils	20%
		Sponge spicules	TR

Minor Lithology (Carbonate Mud with Vitric Ash) 2-98

Sand	5%	Quartz, Feldspar	3%
Silt	15%	Biotite	TR
Clay	80%	Clay minerals	65%
		Volcanic glass	15%
		Opaques	2%
		Carbonate unspecified	15%

GRAIN SIZE:
2-125 (0.7, 45.7, 53.6)
4-57 (1.4, 44.0, 54.6)
6-57 (0.1, 42.0, 57.9)

CARBON-CARBONATE:
2-146 (0.2, 0.2, 0)
4-69 (0.6, 0.2, 3)
6-59 (0.3, 0.2, 1)



SITE 443 HOLE CORE 14 CORED INTERVAL: 121.0-130.5 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Upper Pliocene or Lower Pleistocene		B	B		1	0.5				•	**Mud with Volcanic Glass and or Carbonates** Gray (5Y 5/1) with spots of dark gray (2.5Y N3) brecciated or deformed mud containing ash glass and locally noticeable amounts of unspecified carbonates (3-15). Note: Bottom of Section 6 (99-102) grayish green (5G 4/2) to reddish (10R 3/1) thin laminations. **Clay Mineralogy (%)** 5-50: chlorite 20, illite 50, mixed layers 15, smectite 15, kaolinite TR, very rare quartz and feldspar. **Smears:** **Dominant Lithology 1-75** Sand 2% — Quartz, Feldspar 2% Silt >40% — Heavy minerals (augite) 1% Clay >50% — Clay minerals 78% Volcanic glass 13% Opaques 1% Carbonate unspecified 3% Nannofossils 2% **Minor Lithology 4-112** Sand 1% — Quartz, Feldspar 2% Silt 12% — Heavy minerals 1% Clay 87% — Clay minerals 83% Volcanic glass 12% Opaques TR Carbonate unspecified 2% **GRAIN SIZE:** 4-80 (0.4, 48.0, 51.6) **CARBON-CARBONATE:** 4-83 (0.2, 0.2, 0)
					2	1.0					
					3						
					4					•	
					5						
		B	B		6						
					7		VOID				
		R	B		CC		VOID				

SITE 443 HOLE CORE 15 CORED INTERVAL: 130.5-140.0 m

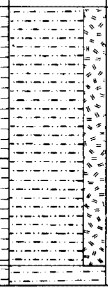
TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Upper Pliocene or Lower Pleistocene					1	0.5					**Ashy Mud** Gray (5Y 5/1) to greenish gray (5GY 5/1) brecciated to moderately deformed firm ashy mud. Frequent dark spots in the lower part of the core (ash patches). **Clay Mineralogy (%)** 4-50: chlorite 10, illite 35, mixed layers 15, smectite 35, kaolinite 65, very rare quartz and feldspar. **Smears:** **2-48** Sand < 1% — Quartz, Feldspar 2% Silt >30% — Heavy minerals TR Clay >60% — Clay minerals 84% Volcanic glass 10% Palagonite TR Opaques 1% Carbonate unspecified 3% Nannofossils TR **GRAIN SIZE:** 2-24 (0.2, 35.8, 64.0) 4-24 (0.1, 34.5, 65.4) 7-18 (1.9, 47.4, 50.8) **CARBON-CARBONATE:** 2-28 (0.4, 0.2, 1) 4-28 (0.9, 0.3, 5) 7-22 (0.2, 0.2, 0)
					2	1.0					
					3						
		B	B		4					•	
					5						
		B	B		6						
					7						
		B	B	B	CC						

SITE 443 HOLE CORE 16 CORED INTERVAL: 140.0-149.5 m

TIME-ROCK UNIT: Upper Pliocene or Lower Pleistocene

FOSSIL CHARACTER (CC): FORAMS B, NANNOS RM, RADS B

SECTIONS: 1, 2, CC



DRILLING DISTURBANCE: ○ ○ ○ ○ ○ ○ ○ ○

LITHOLOGIC SAMPLE: • (Section 1, ~1.0 m)

LITHOLOGIC DESCRIPTION

Ashy Mud
Greenish gray (5GY 5/1) to gray (5Y 5/1) firm brecciated mud. Intense deformation. No sedimentary structures.
Note: Core Catcher 3.0 x 0.5 cm pyritic tube filled with clay.

Smears:
1-104

Quartz, Feldspar	3%
Heavy minerals	TR
Clay minerals	81%
Volcanic glass	10%
Opaques	TR
Carbonate unspecified	3%
Nannofossils	1%
Sponge spicules	2%

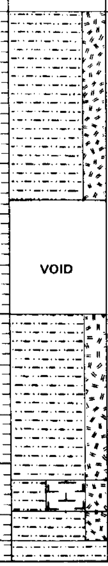
SITE 443 HOLE CORE 17 CORED INTERVAL: 149.5-159.0 m

TIME-ROCK UNIT: Upper Pliocene

BIOSTRAT ZONE: *Discoaster tamalis* Subzone (N)

FOSSIL CHARACTER: NANNOS B (Section 1); NANNOS RM (Section 3); FORAMS RP, NANNOS CP (Section 4); FORAMS B, NANNOS FP, RADS B (CC)

SECTIONS: 1, 2, 3, 4, CC



VOID (Section 2)

DRILLING DISTURBANCE: ○ ○ ○ ○ ○ ○ (Sections 1–2); ○ ○ ○ ○ — — — (Sections 3–4)

LITHOLOGIC SAMPLE: • • (Section 4)

LITHOLOGIC DESCRIPTION

Ashy Mud
Greenish gray (5GY 5/1) to gray (5Y 5/1) firm ashy mud, with dark gray patches in Section 4 (19-25 cm, 34-35 cm). Local occurrence of ashy calcareous mud.

Clay Mineralogy (%)
4-48: chlorite 5, illite 45, mixed layers 15, vermiculite 5, smectite 25, kaolinite 5, very rare quartz and feldspar.

Smears:
Dominant Lithology 3-142

Sand	< 1%	Quartz, Feldspar	2%
Silt	>45%	Heavy minerals	TR
Clay	>50%	Clay minerals	75%
		Volcanic glass	10%
		Palagonite	TR
		Opaques	1%
		Carbonate unspecified	5%
		Nannofossils	7%

Minor Lithology 4-20

Sand	5%	Volcanic glass	10%
Silt	35%	Carbonate unspecified	10%
Clay	60%	Nannofossils	20%
		Clay minerals	58%
		Quartz, Feldspar	2%

GRAIN SIZE:
4-33 (0.7, 45.6, 53.7)

CARBON-CARBONATE:
4-38 (0.5, 0.2, 3)

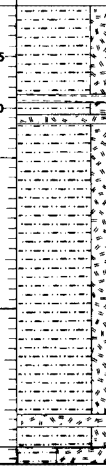
SITE 443 HOLE CORE 18 CORED INTERVAL: 159.0-168.5 m

TIME-ROCK UNIT: Lower Pliocene

BIOSTRAT ZONE: *Discoaster asymmetrical* Subzone (N)

FOSSIL CHARACTER: FORAMS RP, NANNOS RP (Section 1); NANNOS AP (Section 3); FORAMS B, NANNOS B, RADS B (CC)

SECTIONS: 1, 2, 3, CC



LITHOLOGIC SAMPLE: • • (Section 1)

LITHOLOGIC DESCRIPTION

Ashy Mud
Chiefly greenish gray (5GY 5/1), locally gray (5GY 5/2, 5Y 5/1), moderately ashy mud with thin ashy mud with thin layer of clay or clayey volcanic sand.

Clay Mineralogy (%)
2-70: chlorite 5, illite 40, mixed layers 20, vermiculite 10, smectite 20, kaolinite 5, very rare feldspar.

Smears:
1-75

Sand	< 1%	Quartz, Feldspar	2%
Silt	>50%	Heavy minerals	1%
Clay	>40%	Clay minerals	81%
		Volcanic glass	12%
		Opaques	1%
		Carbonate unspecified	3%

Minor Lithology (Clay) 1-92

Sand	1%	Clay minerals	91%
Silt	6%	Volcanic glass	5%
Clay	93%	Carbonate unspecified	2%
		Quartz, Feldspar	2%

Minor Lithology (Clayey Volcanic Sand) 1-105

Sand	50%	Clay minerals	30%
Silt	25%	Volcanic glass	68%
Clay	25%	Feldspar, Heavy minerals	2%

GRAIN SIZE:
2-46 (0.9, 50.0, 49.0)

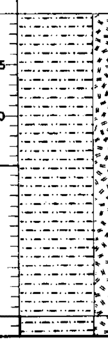
CARBON-CARBONATE:
2-51 (0.3, 0.2, 0)

SITE 443 HOLE CORE 19 CORED INTERVAL: 168.5-178.0 m

BIOSTRAT ZONE: Age assignment by nannofossil is impossible due to heavy contamination.

FOSSIL CHARACTER: FORAMS B, NANNOS RM (Section 1); FORAMS B, NANNOS FM, RADS B (CC)

SECTIONS: 1, 2, CC



DRILLING DISTURBANCE: ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

LITHOLOGIC DESCRIPTION

Ashy Mud
Drilling breccias of dark greenish gray (5GY 4/1) ashy mud.

Smears:
Average

Quartz, Feldspar	2-15%
Heavy minerals	TR- 1%
Clay minerals	27-82%
Opaques	1- 3%
Volcanic glass	7-15%
Siliceous fossils	TR

SITE 443 HOLE CORE 20 CORED INTERVAL: 178.0-187.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Age determination by nannofossil is impossible due to heavy contamination.		B	FM		1	0.5		○		
						1.0		○		
					2			○		
		B	FM		3			○		
		B	R	B	CC			○		•

Mud
Gray (5Y 5/1) to dark greenish gray (5GY 4/1) brecciated or strongly deformed mud. Firm in a soupy matrix. Local clay occurrence in Core Catcher.

Smears:
Dominant Lithology CC

Quartz, Feldspar	10%
Heavy minerals	1%
Clay minerals	78%
Opaques	1%
Volcanic glass	5%
Zeolites	TR
Carbonate unspecified	TR

Minor Lithology CC

Quartz, Feldspar	3%
Clay minerals	93%
Opaques	2%
Volcanic glass	2%
Carbonate unspecified	TR
Nannofossils	TR
Siliceous fossils	TR

SITE 443 HOLE CORE 21 CORED INTERVAL: 187.5-197.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Miocene(?)		B	B		1	0.5		○		•
						1.0		○		
					2			○		
		B	B	B	CC			○		

Mud (Silty Clay)
Gray (5Y 5/1), hard stiff, brecciated mud. No sedimentary structures.

Clay Mineralogy (%)
1-31: chlorite 5, illite 20, mixed layers 20, vermiculite 5, smectite 35, kaolinite 5, very rare quartz and feldspar.

Smears:
1-80

Sand	< 1%	Quartz, Feldspar	8%
Silte	>25%	Clay minerals	92%
Clay	<75%	Volcanic glass	1%
		Zeolite, Carbonate unspecified, Sponge spicules	1%

GRAIN SIZE:
1-31 (0.2, 26.4, 73.5)

CARBON-CARBONATE:
1-33 (0.3, 0.2, 1)

SITE 443 HOLE CORE 22 CORED INTERVAL: 197.0-206.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Miocene or Lower Pliocene	*Triquetrorhabdulus rugosus* Subzone (N) / *Ceratolithus acutus* or *C. rugosus* Subzone (N)	B	FM		1	0.5		○		
						1.0		○		
					2			○		•
		B	AP					○		
		RP	AP	FP	CC			○		**

Nanno Mud
Dark greenish gray (5GY 4/1) brecciated mud, rich in nannofossils. Locally (2-120-150 approximately), gray (5Y 5/1) ashy nannofossil mud to volcanic sand.

Smears:
Dominant Lithology 2-101

Sand	< 5%	Quartz, Feldspar	1%
Silt	>30%	Clay minerals	79%
Clay	>40%	Opaques	2%
		Volcanic glass	5%
		Carbonate unspecified	3%
		Nannofossils	10%

Dominant Lithology (Nannofossil Mud) 2-145

Sand	> 5%	Quartz, Feldspar	2%
Silt	>50%	Clay minerals	55%
Clay	>40%	Volcanic glass, Opaques	2%
		Carbonate unspecified	5%
		Nannofossils	36%

Minor Lithology (Volcanic Sand) 2-140

Sand	60%	Quartz, Feldspar	5%
Silt	30%	Clay minerals	10%
Clay	10%	Volcanic glass	85%

GRAIN SIZE:
2-125 (3.2, 52.0, 44.8)

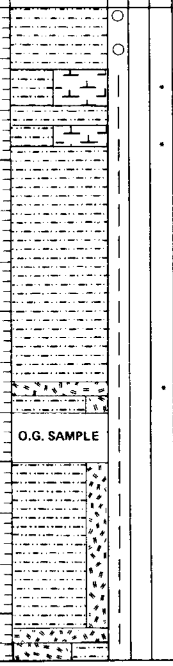
CARBON-CARBONATE:
2-132 (0.8, 0.1, 6)

SITE 443 HOLE CORE 23 CORED INTERVAL: 206.5-216.0 m

Time-Rock Unit: Upper Miocene
Biostrat Zone: *Ceratolithus primus* Subzone (N)

Fossil Character (Forams / Nannos / Rads): Section 1: B CP; Section 3: RP AP; Section 4: B B; CC: B FP

Sections: 1, 2, 3, 4, 5, CC



LITHOLOGIC DESCRIPTION

Mud with Ash
Yellowish brown (10YR 5/4) soft to stiff, slightly deformed, homogeneous silty clay (mud).
Minor lithologies consist of:
ash beds = Section 3-78-85, 3-95; Section 4-40 and below and Section 5-18.
nanno clay = Section 1.

Clay Mineralogy (%)
1-62: chlorite 10, illite 40, mixed layers 15, vermiculite 5, smectite 25, kaolinite 5, very rare feldspar.

Smears:
Dominant Lithology 1-140

Sand	10%	Quartz	5%
Silt	40%	Opaques	2%
Clay	40%	Volcanic glass	10%
		Zeolites	TR
		Carbonate unspecified	2%
		Sponge spicules	2%
		Clay minerals	79%

Minor Lithology (Nanno Clay) 1-80

Sand	2%	Quartz	1%
Silt	5%	Clay minerals	43%
Clay	93%	Volcanic glass	5%
		Nannofossils	50%
		Carbonate unspecified	1%

Minor Lithology (Volcanic Sand) 3-80

Sand	60%	Quartz, Feldspar	5%
Silt	10%	Clay minerals	24%
Clay	30%	Opaques	1%
		Volcanic glass	70%

GRAIN SIZE:
2-25 (0.7, 33.4, 65.9)
4-32 (9.1, 43.1, 47.8)

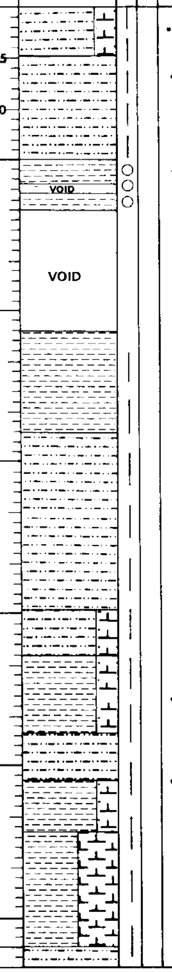
CARBON-CARBONATE:
2-15 (0.3, 0.1, 1)
4-15 (0.2, 0.1, 1)

SITE 443 HOLE CORE 24 CORED INTERVAL: 216.0-225.5 m

Time-Rock Unit: Upper Miocene
Biostrat Zone: *Ceratolithus primus* Subzone (N)

Fossil Character (Forams / Nannos / Rads): Section 1: B FP; Section 3: B CP; Section 5: B B; CC: RP CP RP

Sections: 1, 2, 3, 4, 5, 6, 7, CC



LITHOLOGIC DESCRIPTION

Clay to Clayey Nannofossil Ooze, Mud
Various lithologies accompanied by changing colors, mainly dark grayish brown to grayish brown (2.5Y 4/2-2.5Y 5/2). Mud or clay with more or less nannofossils. Presence of pumice lapilli in Section 1-110-150 cm. Black powdery streaks of Mn in Section 4, Section 5-40-90 and Section 6-25-110.

Clay Mineralogy (%)
4-134: chlorite 5, illite 35, mixed layers 10, vermiculite 5, smectite 4, kaolinite 5, very rare quartz and feldspar.

Smears:
1-25 (Nannofossil Mud)

Sand	< 2%	Quartz, Feldspar	3%
Silt	30%	Clay minerals	50%
Clay	>60%	Opaques	3%
		Volcanic glass	5%
		Carbonate unspecified	5%
		Nannofossils	25%
		Siliceous fossils	9%

1-75 (Mud)

Sand	< 2%	Quartz, Feldspar	2%
Silt	30%	Clay minerals	88%
Clay	>60%	Opaques	2%
		Volcanic glass	1%
		Carobnate unspecified	5%
		Siliceous fossils	2%

2-15 (Clay)

Sand	0%	Quartz, Feldspar	1%
Silt	10%	Clay minerals	95%
Clay	90%	Opaques	1%
		Volcanic glass	TR
		Carbonate unspecified	3%
		Siliceous fossils	TR

5-85 (Nannofossil Clay)

Sand	0%	Quartz, Feldspar	2%
Silt	10%	Mica	TR
Clay	90%	Clay minerals	42%
		Opaques	5%
		Volcanic glass	5%
		Nannofossils	40%
		Diatoms	1%
		Radiolarians	2%

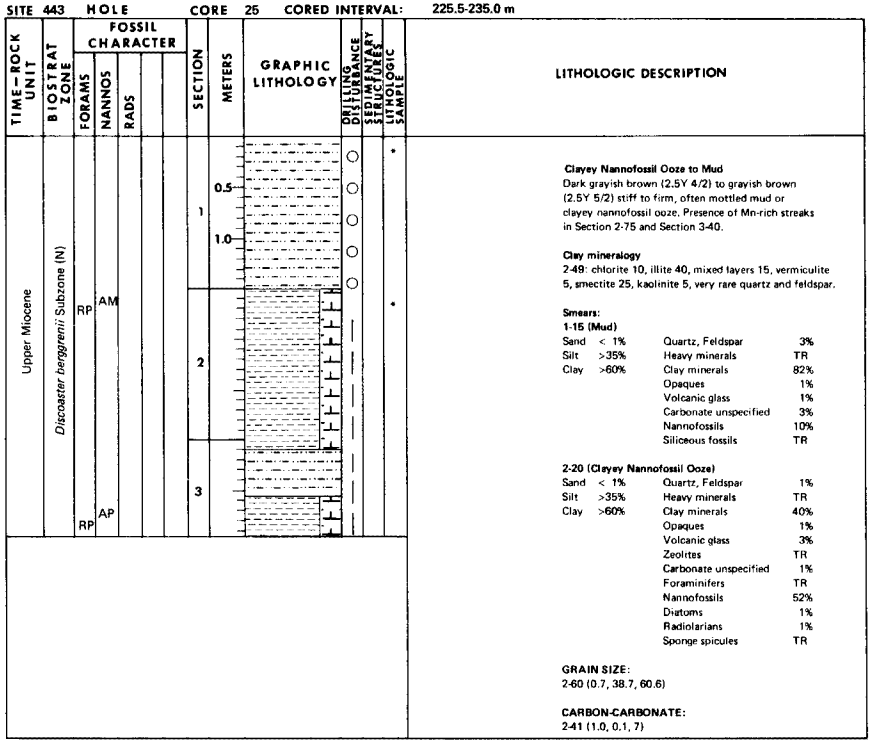
6-20 (Clayey Nannofossil Ooze)

Sand	0%	Quartz, Feldspar	1%
Silt	5%	Clay minerals	15%
Clay	95%	Opaques	TR
		Volcanic glass	TR
		Nannofossils	84%

GRAIN SIZE:
3-36 (2.0, 40.6, 57.4)
4-127 (0.5, 29.9, 69.6)
6-83 (0.5, 32.7, 66.8)

CARBON-CARBONATE:
3-22 (0.7, 0.1, 5)
4-110 (0.2, 0.1, 1)
6-109 (2.0, 0.1, 15)

SITE 443 HOLE CORE 25 CORED INTERVAL: 225.5-235.0 m



LITHOLOGIC DESCRIPTION

Clayey Nannofossil Ooze to Mud
Dark grayish brown (2.5Y 4/2) to grayish brown (2.5Y 5/2) stiff to firm, often mottled mud or clayey nannofossil ooze. Presence of Mn-rich streaks in Section 2-75 and Section 3-40.

Clay mineralogy
2-49: chlorite 10, illite 40, mixed layers 15, vermiculite 5, smectite 25, kaolinite 5, very rare quartz and feldspar.

Smears:

1-15 (Mud)

Sand	< 1%	Quartz, Feldspar	3%
Silt	>35%	Heavy minerals	TR
Clay	>60%	Clay minerals	82%
		Opaques	1%
		Volcanic glass	1%
		Carbonate unspecified	3%
		Nannofossils	10%
		Siliceous fossils	TR

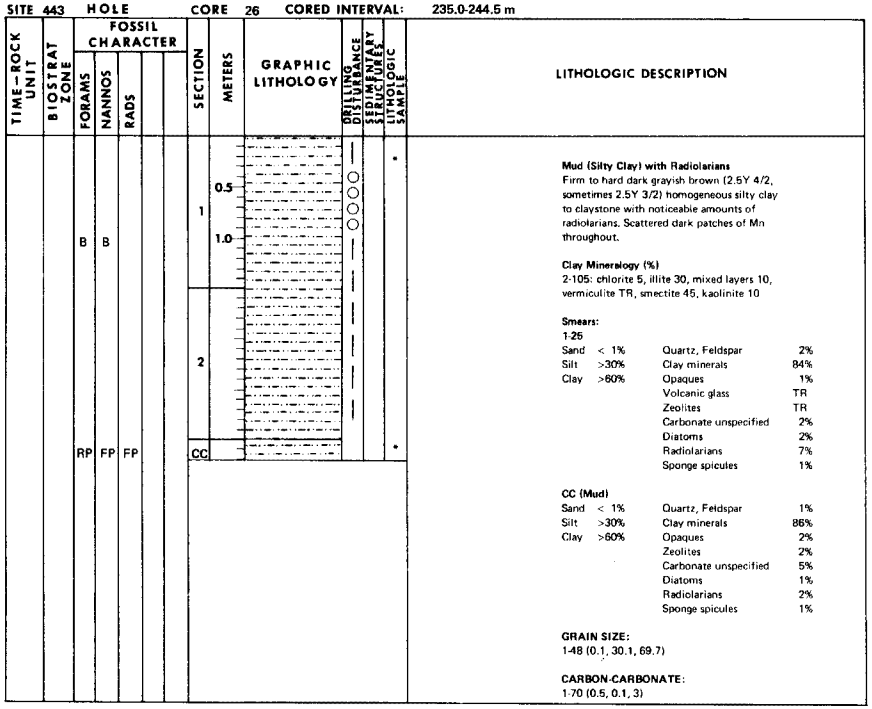
2-20 (Clayey Nannofossil Ooze)

Sand	< 1%	Quartz, Feldspar	1%
Silt	>35%	Heavy minerals	TR
Clay	>60%	Clay minerals	40%
		Opaques	1%
		Volcanic glass	3%
		Zeolites	TR
		Carbonate unspecified	1%
		Foraminifers	TR
		Nannofossils	52%
		Diatoms	1%
		Radiolarians	1%
		Sponge spicules	TR

GRAIN SIZE:
2-60 (0.7, 38.7, 60.6)

CARBON-CARBONATE:
2-41 (1.0, 0.1, 7)

SITE 443 HOLE CORE 26 CORED INTERVAL: 235.0-244.5 m



LITHOLOGIC DESCRIPTION

Mud (Silty Clay) with Radiolarians
Firm to hard dark grayish brown (2.5Y 4/2, sometimes 2.5Y 3/2) homogeneous silty clay to claystone with noticeable amounts of radiolarians. Scattered dark patches of Mn throughout.

Clay Mineralogy (%)
2-105: chlorite 5, illite 30, mixed layers 10, vermiculite TR, smectite 45, kaolinite 10

Smears:

1-25

Sand	< 1%	Quartz, Feldspar	2%
Silt	>30%	Clay minerals	84%
Clay	>60%	Opaques	1%
		Volcanic glass	TR
		Zeolites	TR
		Carbonate unspecified	2%
		Diatoms	2%
		Radiolarians	7%
		Sponge spicules	1%

CC (Mud)

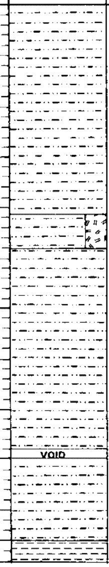
Sand	< 1%	Quartz, Feldspar	1%
Silt	>30%	Clay minerals	86%
Clay	>60%	Opaques	2%
		Zeolites	2%
		Carbonate unspecified	5%
		Diatoms	1%
		Radiolarians	2%
		Sponge spicules	1%

GRAIN SIZE:
1-48 (0.1, 30.1, 69.7)

CARBON-CARBONATE:
1-70 (0.5, 0.1, 3)

SITE 443 HOLE CORE 27 CORED INTERVAL: 244.5-254.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Miocene		B	B		1	0.5, 1.0	O O — — O O O		•
					2		—		•
		B	B		3		— (VOID)		
					4		—		•
		B	B	CM	CC				



LITHOLOGIC DESCRIPTION

Mud (sometimes with radiolarians, nannofossils or vitric glass). Grayish brown (2.5Y 5/2), very firm, homogeneous mud to mudstone. Section 1-0-32 cm: hole fill contamination.

Clay Mineralogy (%)
2-36: chlorite 10, illite 35, mixed layers 15, vermiculite 5, smectite 30, kaolinite 5, quartz rare, feldspar very rare.

Smears:

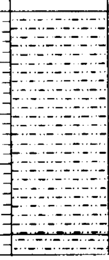
1-75			
Sand < 1%		Quartz, Feldspar	3%
Silt >30%		Mica	TR
Clay >65%		Clay minerals	84%
		Volcanic glass	2%
		Carbonate unspecified	3%
		Radiolarians	8%
		Sponge spicules	TR
2-75			
Sand < 1%		Quartz, Feldspar	1%
Silt >30%		Mica	TR
Clay >65%		Clay minerals	70%
		Volcanic glass	15%
		Carbonate unspecified	10%
		Radiolarains	8%
		Nannofossils	3%
4-75			
Sand < 1%		Quartz, Feldspar	1%
Silt >30%		Clay minerals	85%
Clay >65%		Volcanic glass	4%
		Carbonate unspecified	7%
		Radiolarians	2%
		Sponge spicules	1%

GRAIN SIZE:
2-90 (0.6, 31.7, 67.6)

CARBON-CARBONATE:
2-66 (0.3, 0.1, 1)
4-39 (0.2, 0.1, 1)

SITE 443 HOLE CORE 28 CORED INTERVAL: 254.0-263.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Miocene		B	RP		1	0.5, 1.0	O O — —		•
					2		—		
		B	B	FP	CC				



LITHOLOGIC DESCRIPTION

Mud
Grayish brown (1.5Y 5/2) very firm, homogeneous, slightly deformed mud. Dark powdery spots throughout (Mn). Section 1-0-40 cm: hole fill contamination.

Clay Mineralogy (%)
2-38: chlorite 5, illite 30, mixed layers 10, vermiculite 5, smectite 40, kaolinite 10, very rare quartz and feldspar.

Smears:

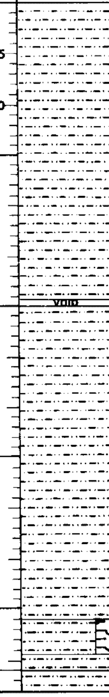
1-75			
Sand < 1%		Quartz, Feldspar	4%
Silt >30%		Mica	TR
Clay >65%		Clay minerals	80%
		Volcanic glass	5%
		Carbonates unspecified, Nannofossils	<10%
		Radiolarians	1%
		Sponge spicules	TR

GRAIN SIZE:
1-120 (0.2, 33.1, 66.7)

CARBON-CARBONATE:
1-124 (0.1, 0.1, 0)

SITE 443 HOLE CORE 29 CORED INTERVAL: 263.5-273.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Miocene		B	B		1	0.5, 1.0	O O —		•
					2		— (VOID)		
		B	B		3		—		
					4		—		
		B	B		5		—		•
		B	B	FP	CC				



LITHOLOGIC DESCRIPTION

Mudstone
Olive gray (5Y 5/2) hard, slightly deformed, homogeneous, slightly burrowed mudstone, finely scattered throughout by blackish Mn patches. Section 1-1-30 cm: hole fill contamination. Locally – siliceous fossils bearing mudstone.

Clay Mineralogy (%)
2-112: chlorite 10, illite 30, mixed layers 25, smectite 30, kaolinite 5, very rare quartz.

Smears:

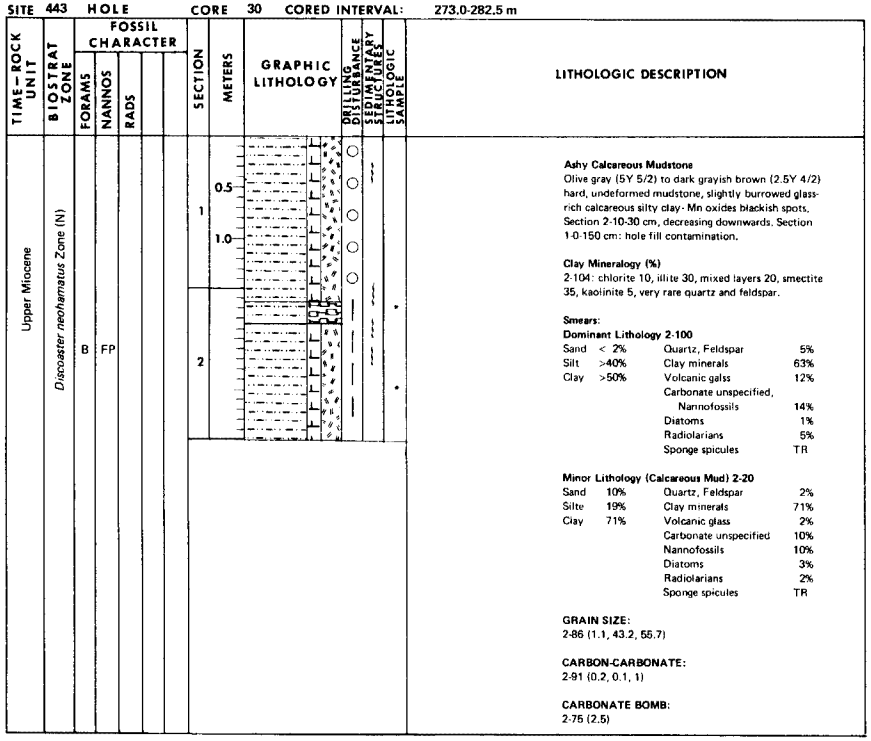
1-75 (Mudstone)			
Sand < 1%		Quartz, Feldspar	2%
Silt >35%		Heavy minerals	TR
Clay >60%		Clay minerals	79%
		Volcanic glass	1%
		Opaques	1%
		Zeolites	2%
		Carbonate unspecified, Nannofossils	9%
		Diatoms	1%
		Radiolarians	3%
		Sponge spicules	2%
Minor Lithology (Siliceous Mudstone) 5-20			
Sand TR		Quartz, Feldspar	3%
Silt 23%		Clay minerals	77%
Clay 77%		Carbonate unspecified	7%
		Diatoms, Radiolarians	13%

GRAIN SIZE:
2-94 (1.2, 34.8, 64.1)
4-94 (0.3, 35.5, 64.2)

CARBON-CARBONATE:
2-99 (0.4, 0.1, 2)
4-99 (0.2, 0.1, 1)

CARBONATE BOMB:
2-85 (2.5)

SITE 443 HOLE CORE 30 CORED INTERVAL: 273.0-282.5 m



LITHOLOGIC DESCRIPTION

Ashy Calcareous Mudstone
Olive gray (5Y 5/2) to dark grayish brown (2.5Y 4/2) hard, undeformed mudstone, slightly burrowed glass-rich calcareous silty clay- Mn oxides blackish spots. Section 2-10-30 cm, decreasing downwards. Section 1-0-150 cm: hole fill contamination.

Clay Mineralogy (%)
2-104: chlorite 10, illite 30, mixed layers 20, smectite 35, kaolinite 5, very rare quartz and feldspar.

Smears:
Dominant Lithology 2-100

Sand	< 2%	Quartz, Feldspar	5%
Silt	>40%	Clay minerals	63%
Clay	>50%	Volcanic glass	12%
		Carbonate unspecified, Nannofossils	14%
		Diatoms	1%
		Radiolarians	5%
		Sponge spicules	TR

Minor Lithology (Calcareous Mud) 2-20

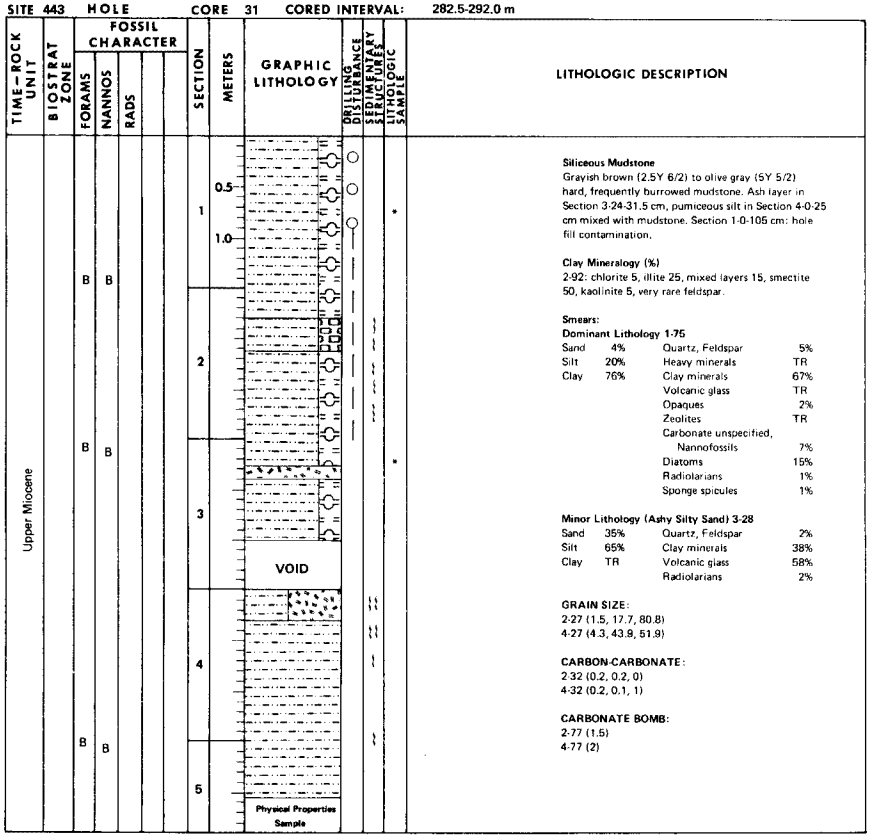
Sand	10%	Quartz, Feldspar	2%
Silte	19%	Clay minerals	71%
Clay	71%	Volcanic glass	2%
		Carbonate unspecified	10%
		Nannofossils	10%
		Diatoms	3%
		Radiolarians	2%
		Sponge spicules	TR

GRAIN SIZE:
2-86 (1.1, 43.2, 55.7)

CARBON-CARBONATE:
2-91 (0.2, 0.1, 1)

CARBONATE BOMB:
2-75 (2.5)

SITE 443 HOLE CORE 31 CORED INTERVAL: 282.5-292.0 m



LITHOLOGIC DESCRIPTION

Siliceous Mudstone
Grayish brown (2.5Y 6/2) to olive gray (5Y 5/2) hard, frequently burrowed mudstone. Ash layer in Section 3-24-31.5 cm, pumiceous silt in Section 4-0-25 cm mixed with mudstone. Section 1-0-105 cm: hole fill contamination.

Clay Mineralogy (%)
2-92: chlorite 5, illite 25, mixed layers 15, smectite 50, kaolinite 5, very rare feldspar.

Smears:
Dominant Lithology 1-75

Sand	4%	Quartz, Feldspar	5%
Silt	20%	Heavy minerals	TR
Clay	76%	Clay minerals	67%
		Volcanic glass	TR
		Opaques	2%
		Zeolites	TR
		Carbonate unspecified, Nannofossils	7%
		Diatoms	15%
		Radiolarians	1%
		Sponge spicules	1%

Minor Lithology (Ashy Silty Sand) 3-28

Sand	35%	Quartz, Feldspar	2%
Silt	65%	Clay minerals	38%
Clay	TR	Volcanic glass	58%
		Radiolarians	2%

GRAIN SIZE:
2-27 (1.5, 17.7, 80.8)
4-27 (4.3, 43.9, 51.9)

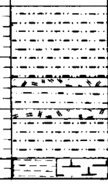
CARBON-CARBONATE:
2-32 (0.2, 0.2, 0)
4-32 (0.2, 0.1, 1)

CARBONATE BOMB:
2-77 (1.5)
4-77 (2)

SITE 443 **HOLE** **CORE** 32 **CORED INTERVAL:** 292.0-301.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS
Upper Miocene	*Discoaster neohamatus* Zone (N)	RP	AP	RP	1, CC	0.5, 1.0

GRAPHIC LITHOLOGY



LITHOLOGIC DESCRIPTION

Mudstone with Nannofossils
Olive gray (5Y 4/2) hard moderately burrowed silty claystone or mudstone. Presence of black (5Y 2/1) volcanic pumiceous silt in Section 1-70-73 cm and Section 1-101-108 cm, the latter showing a graded bedding. Clayey nannofossil ooze in the Core Catcher. Section 1-0-24 cm: hole fill contamination.

Clay Mineralogy (%)
1-90: chlorite 5, illite 20, mixed layers 20, smectite 50, kaolinite 5.

Smears:
Dominant Lithology 1-140

Sand	< 1%	Quartz, Feldspar	2%
Silt	>35%	Clay minerals	82%
Clay	>65%	Volcanic glass	5%
		Nannofossils	10%
		Radiolarians	1%
		Sponge spicules	TR

Minor Lithology (Ashy Silt) 1-105

Sand	5%	Quartz, Feldspar	15%
Silt	95%	Mica	4%
Clay	—	Heavy minerals	1%
		Volcanic glass	74%
		Nannofossils	6%
		Diatoms	1%
		Radiolarians	TR

Minor Lithology (Clayey Nannofossil Ooze) CC

Sand	3%	Quartz, Feldspar	2%
Silt	7%	Clay minerals	47%
Clay	90%	Opaques	TR
		Nannofossils	40%
		Radiolarians	2%
		Heavy minerals	1%
		Voclanic glass	2%
		Carbonate unspecified	5%
		Diatoms	TR
		Sponge spicules	1%

GRAIN SIZE:
1-51 (2.3, 48.6, 49.1)

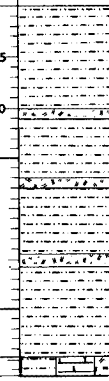
CARBON-CARBONATE:
1-56 (0.3, 0.1, 2)

CARBONATE BOMB:
1-95 (2)

SITE 443 **HOLE** **CORE** 33 **CORED INTERVAL:** 301.5-311.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS
Upper Miocene	*Discoaster neohamatus* Zone (N)	B	CP, CP	RP	1, 2, 3, CC	0.5, 1.0

GRAPHIC LITHOLOGY



LITHOLOGIC DESCRIPTION

Mudstone
Olive gray (5Y 5/2) hard, undisturbed, slightly to strongly burrowed, throughout. Scattered with blackish powdery silt. Volcanic layers, mainly in Section 1-102-112 cm, Section 2-24-28 cm and Section 2-95-104 cm. Section 1-0-15 cm: hole fill contamination.

Clay Mineralogy (%)
2-86: chlorite TR, illite 15, mixed layers 25, smectite 55, kaolinite 5.

Smears:
2-75

Sand	< 4%	Quartz, Feldspar	3%
Silt	>45%	Clay minerals	83%
Clay	>45%	Volcanic glass	TR
		Nannofossils	10%
		Diatoms	1%
		Radiolarians	3%

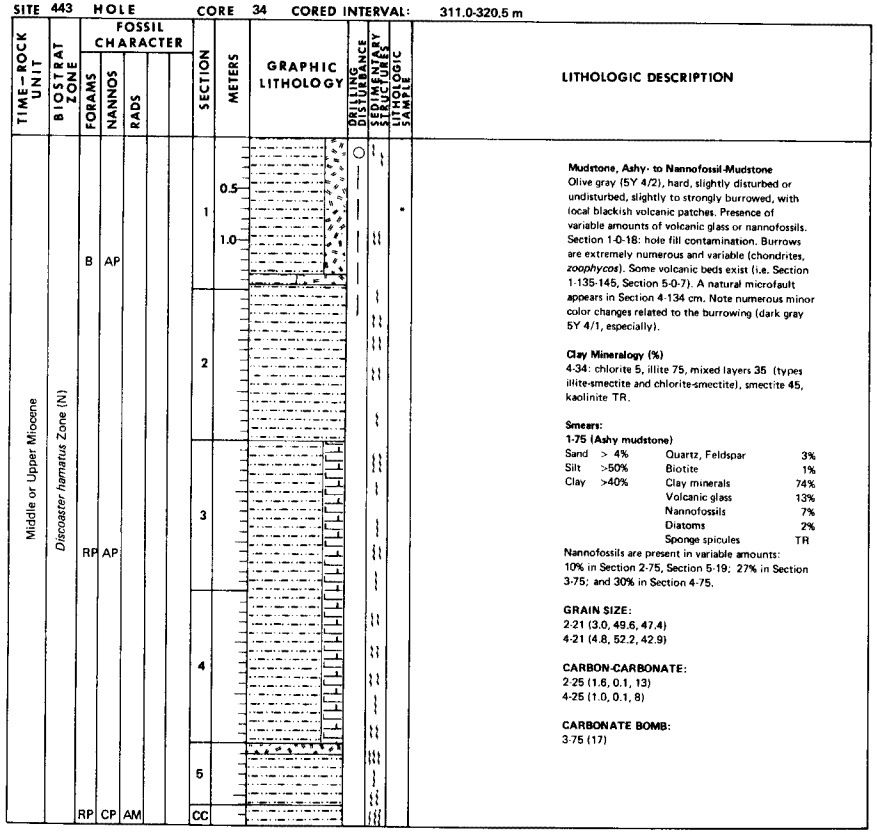
Minor Lithology (Ashy Silt) 2-105

Sand	15%	Quartz, Feldspar	20%
Silt	85%	Mica, Chlorite	TR
Clay	TR	Altered Volcanic Glass	TR
		Opaques	TR
		Calcareous nannofossils	8%

GRAIN SIZE:
2-64 (3.6, 49.9, 46.5)

CARBON-CARBONATE:
2-69 (0.6, 0.1, 4)

SITE 443 HOLE CORE 34 CORED INTERVAL: 311.0-320.5 m



Mudstone, Ashy- to Nannofossil-Mudstone
Olive gray (5Y 4/2), hard, slightly disturbed or undisturbed, slightly to strongly burrowed, with local blackish volcanic patches. Presence of variable amounts of volcanic glass or nannofossils. Section 1-0-18: hole fill contamination. Burrows are extremely numerous and variable (chondrites, *zoophycos*). Some volcanic beds exist (i.e. Section 1-135-145, Section 5-0-7). A natural microfault appears in Section 4-134 cm. Note numerous minor color changes related to the burrowing (dark gray 5Y 4/1, especially).

Clay Mineralogy (%)
4-34: chlorite 5, illite 75, mixed layers 35 (types illite-smectite and chlorite-smectite), smectite 45, kaolinite TR.

Smears:
1-75 (Ashy mudstone)

Sand	> 4%	Quartz, Feldspar	3%
Silt	>50%	Biotite	1%
Clay	>40%	Clay minerals	74%
		Volcanic glass	13%
		Nannofossils	7%
		Diatoms	2%
		Sponge spicules	TR

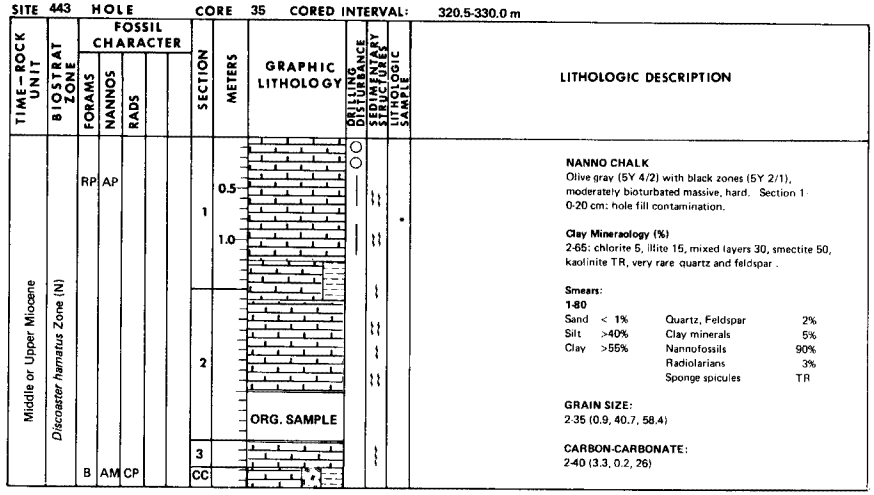
Nannofossils are present in variable amounts: 10% in Section 2-75, Section 5-19; 27% in Section 3-75; and 30% in Section 4-75.

GRAIN SIZE:
2-21 (3.0, 49.6, 47.4)
4-21 (4.8, 52.2, 42.9)

CARBON-CARBONATE:
2-25 (1.6, 0.1, 13)
4-25 (1.0, 0.1, 8)

CARBONATE BOMB:
3-75 (17)

SITE 443 HOLE CORE 35 CORED INTERVAL: 320.5-330.0 m



NANNO CHALK
Olive gray (5Y 4/2) with black zones (5Y 2/1), moderately bioturbated massive, hard. Section 1: 0-20 cm: hole fill contamination.

Clay Mineralogy (%)
2-65: chlorite 5, illite 15, mixed layers 30, smectite 50, kaolinite TR, very rare quartz and feldspar .

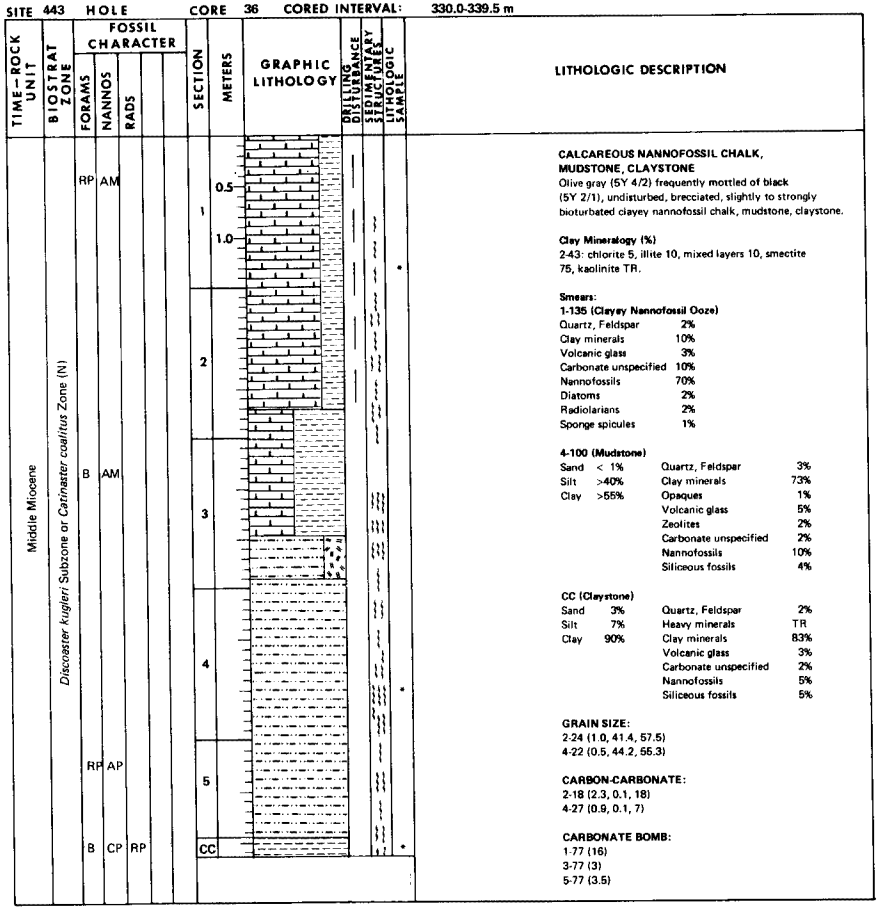
Smears:
1-80

Sand	< 1%	Quartz, Feldspar	2%
Silt	>40%	Clay minerals	5%
Clay	>55%	Nannofossils	90%
		Radiolarians	3%
		Sponge spicules	TR

GRAIN SIZE:
2-35 (0.9, 40.7, 58.4)

CARBON-CARBONATE:
2-40 (3.3, 0.2, 26)

SITE 443 HOLE CORE 36 CORED INTERVAL: 330.0-339.5 m



CALCAREOUS NANNOFOSSIL CHALK, MUDSTONE, CLAYSTONE
Olive gray (5Y 4/2) frequently mottled of black (5Y 2/1), undisturbed, brecciated, slightly to strongly bioturbated clayey nannofossil chalk, mudstone, claystone.

Clay Mineralogy (%)
2-43: chlorite 5, illite 10, mixed layers 10, smectite 75, kaolinite TR.

Smears:

1-135 (Clayey Nannofossil Ooze)

Quartz, Feldspar	2%		
Clay minerals	10%		
Volcanic glass	3%		
Carbonate unspecified	10%		
Nannofossils	70%		
Diatoms	2%		
Radiolarians	2%		
Sponge spicules	1%		

4-100 (Mudstone)

Sand	< 1%	Quartz, Feldspar	3%
Silt	>40%	Clay minerals	73%
Clay	>55%	Opaques	1%
		Volcanic glass	5%
		Zeolites	2%
		Carbonate unspecified	2%
		Nannofossils	10%
		Siliceous fossils	4%

CC (Claystone)

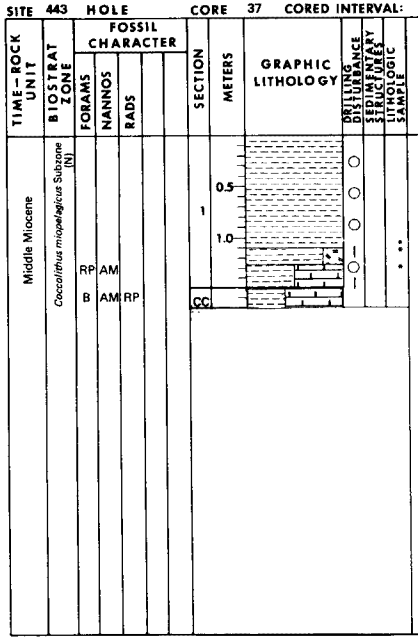
Sand	3%	Quartz, Feldspar	2%
Silt	7%	Heavy minerals	TR
Clay	90%	Clay minerals	83%
		Volcanic glass	3%
		Carbonate unspecified	2%
		Nannofossils	5%
		Siliceous fossils	5%

GRAIN SIZE:
2-24 (1.0, 41.4, 57.5)
4-22 (0.5, 44.2, 56.3)

CARBON-CARBONATE:
2-18 (2.3, 0.1, 18)
4-27 (0.9, 0.1, 7)

CARBONATE BOMB:
1-77 (16)
3-77 (3)
5-77 (3.5)

SITE 443 HOLE CORE 37 CORED INTERVAL: 339.5-349.0 m



CLAYSTONE, NANNOFOSSIL-CLAYSTONE
Olive gray (5Y 4/2) hard, massive, bioturbated claystone, nannofossil-claystone, locally ashy claystone.

Smears:

1-110 (Claystone)

Sand	1%	Quartz, Feldspar	2%
Silt	9%	Clay minerals	81%
Clay	90%	Opaques	TR
		Volcanic glass	8%
		Zeolites	TR
		Carbonate unspecified	5%
		Diatoms	1%
		Radiolarians	2%
		Sponge spicules	1%

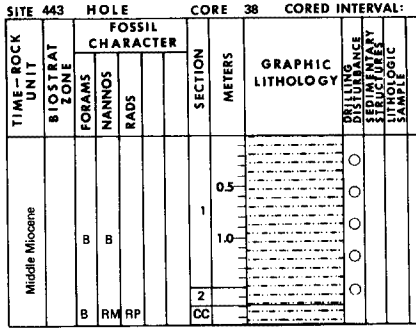
1-115 (Ashy Claystone)

Sand	1%	Quartz, Feldspar	1%
Silt	10%	Clay minerals	81%
Clay	89%	Volcanic glass	11%
		Zeolites	2%
		Diatoms	1%
		Radiolarians	3%
		Sponge spicules	2%

1-135 (Nannofossil Claystone)

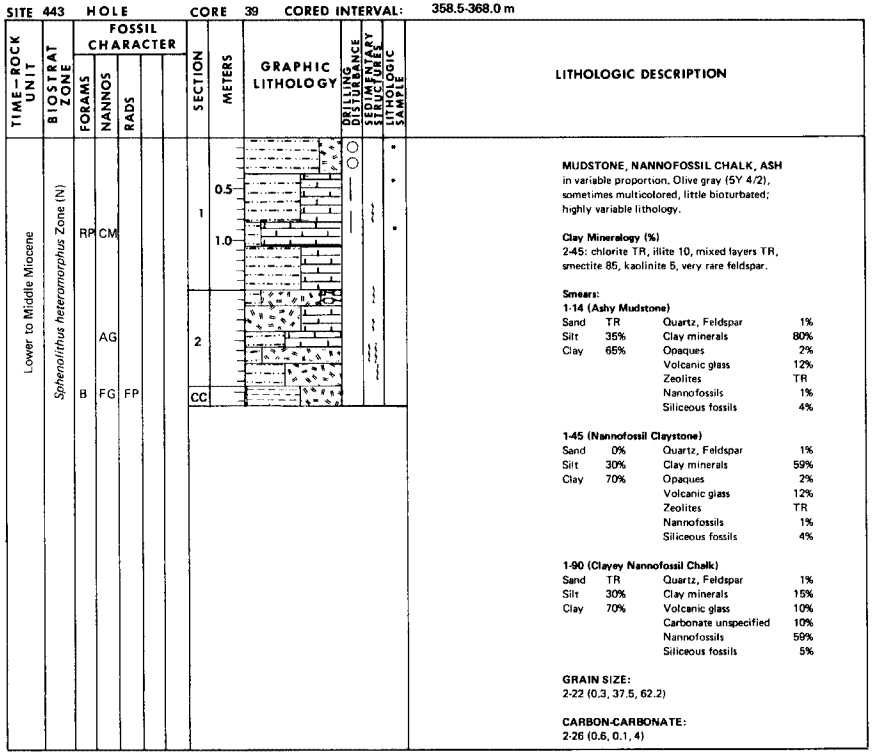
Sand	0%	Quartz, Feldspar	2%
Silt	10%	Clay minerals	50%
Clay	90%	Opaques	2%
		Volcanic glass	5%
		Zeolites	2%
		Nannofossils	38%
		Sponge spicules	1%

SITE 443 HOLE CORE 38 CORED INTERVAL: 349.0-358.5 m



Mudstone
Complete drilling breccia with hole contamination. Mainly olive gray (5Y 4/2) as in Core 37.

SITE 443 HOLE CORE 39 CORED INTERVAL: 358.5-368.0 m



MUDSTONE, NANNOFOSSIL CHALK, ASH
in variable proportion. Olive gray (5Y 4/2), sometimes multicolored, little bioturbated; highly variable lithology.

Clay Mineralogy (%)
2-45: chlorite TR, illite 10, mixed layers TR, smectite 85, kaolinite 5, very rare feldspar.

Smears:

1-14 (Ashy Mudstone)

Sand	TR	Quartz, Feldspar	1%
Silt	35%	Clay minerals	80%
Clay	65%	Opaques	2%
		Volcanic glass	12%
		Zeolites	TR
		Nannofossils	1%
		Siliceous fossils	4%

1-45 (Nannofossil Claystone)

Sand	0%	Quartz, Feldspar	1%
Silt	30%	Clay minerals	59%
Clay	70%	Opaques	2%
		Volcanic glass	12%
		Zeolites	TR
		Nannofossils	1%
		Siliceous fossils	4%

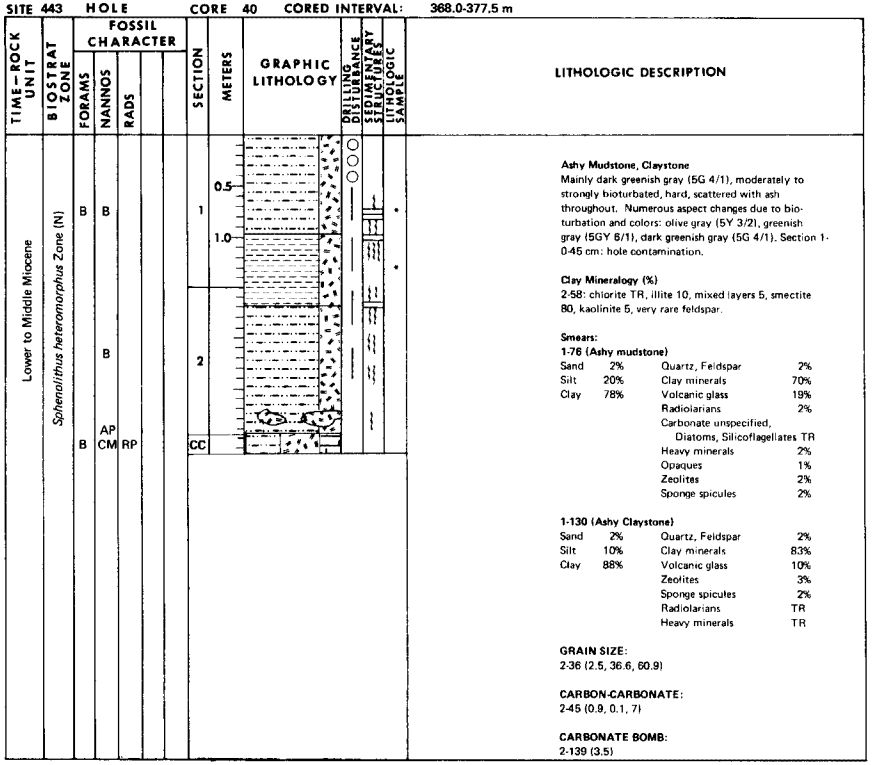
1-90 (Clayey Nannofossil Chalk)

Sand	TR	Quartz, Feldspar	1%
Silt	30%	Clay minerals	15%
Clay	70%	Volcanic glass	10%
		Carbonate unspecified	10%
		Nannofossils	59%
		Siliceous fossils	5%

GRAIN SIZE:
2-22 (0.3, 37.5, 62.2)

CARBON-CARBONATE:
2-26 (0.6, 0.1, 4)

SITE 443 HOLE CORE 40 CORED INTERVAL: 368.0-377.5 m



Ashy Mudstone, Claystone
Mainly dark greenish gray (5G 4/1), moderately to strongly bioturbated, hard, scattered with ash throughout. Numerous aspect changes due to bioturbation and colors: olive gray (5Y 3/2), greenish gray (5GY 6/1), dark greenish gray (5G 4/1). Section 1-0-45 cm: hole contamination.

Clay Mineralogy (%)
2-58: chlorite TR, illite 10, mixed layers 5, smectite 80, kaolinite 5, very rare feldspar.

Smears:

1-76 (Ashy mudstone)

Sand	2%	Quartz, Feldspar	2%
Silt	20%	Clay minerals	70%
Clay	78%	Volcanic glass	19%
		Radiolarians	2%
		Carbonate unspecified, Diatoms, Silicoflagellates	TR
		Heavy minerals	2%
		Opaques	1%
		Zeolites	2%
		Sponge spicules	2%

1-130 (Ashy Claystone)

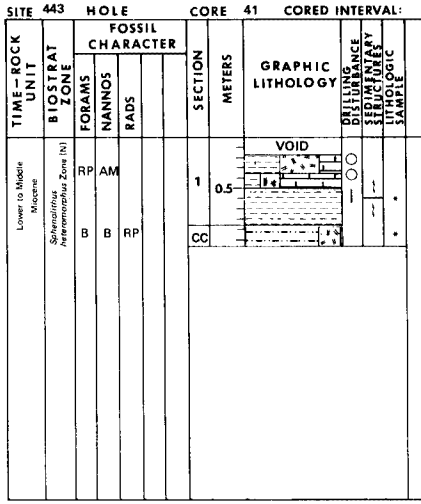
Sand	2%	Quartz, Feldspar	2%
Silt	10%	Clay minerals	83%
Clay	88%	Volcanic glass	10%
		Zeolites	3%
		Sponge spicules	2%
		Radiolarians	TR
		Heavy minerals	TR

GRAIN SIZE:
2-36 (2.5, 36.6, 60.9)

CARBON-CARBONATE:
2-45 (0.9, 0.1, 7)

CARBONATE BOMB:
2-139 (3.5)

SITE 443 HOLE CORE 41 CORED INTERVAL: 377.5-387.0 m



LITHOLOGIC DESCRIPTION

Mudstone or Claystone, Ashy or Ashy-Nannofossil Claystone/Mudstone. Clayey nannofossil chalk.
Mainly dark greenish gray (5GY 5/1) with numerous color variations (5Y 5/1, 5Y 5/4, N5, 5G 5/1). Variable lithology, slight bioturbation. Thin ash layers in the lower part of the section.

Smears:

1-42 (Clayey Nannofossil Chalk)

Sand	1%	Clay minerals	14%
Silt	5%	Volcanic glass	5%
Clay	94%	Carbonate unspecified	20%
		Nannofossils	60%

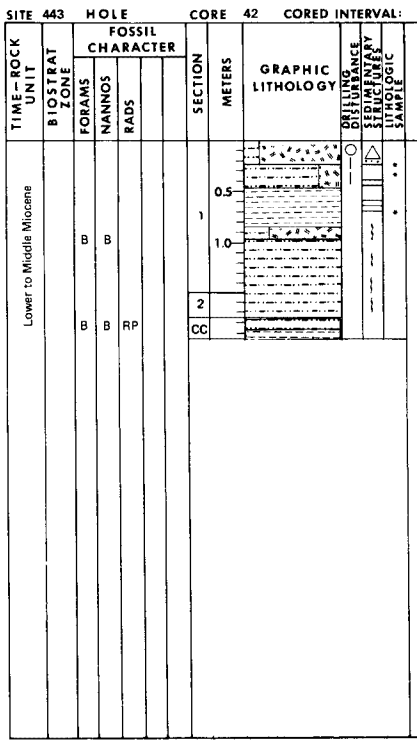
1-62 (Claystone)

Clay minerals	78%
Volcanic glass	5%
Nannofossils	9%
Miscellaneous	8%

CC (Ashy Mudstone)

Sand	3%	Clay minerals	78%
Silt	15%	Volcanic glass	15%
Clay	82%	Miscellaneous	8%

SITE 443 HOLE CORE 42 CORED INTERVAL: 387.0-396.5 m



LITHOLOGIC DESCRIPTION

Mudstone, Claystone, Muddy Ash
Mainly dark greenish gray (5BG 4/1) undisturbed, hard, slightly bioturbated heterogeneous sediment. Presence of several sedimentary structures: laminae, sharp contacts, graded-bedding. Numerous color changes occur such as black (Section 1-22-25 cm: ash and opaques) dark bluish gray (Section 1-66-70 cm: laminae) dark gray (Section 1-72-74 cm: ash streaks). Section 1-0-15 cm: hole drilling contamination.

Clay Mineralogy (%)
1-115: chlorite TR, illite 15, mixed layers 15, smectite 65, kaolinite 5, very rare feldspar.

Smears:

1-24 (Muddy Ash)

Sand	20%	Quartz, Feldspar	5%
Silt	50%	Heavy minerals	2%
Clay	30%	Clay minerals	28%
		Opaques	8%
		Volcanic glass	55%
		Zeolites	TR
		Carbonate unspecified	TR
		Siliceous fossils	2%

1-37 (Mudstone)

Sand	< 1%	Clay minerals	87%
Silt	>40%	Volcanic glass	9%
Clay	>55%	Miscellaneous	4%

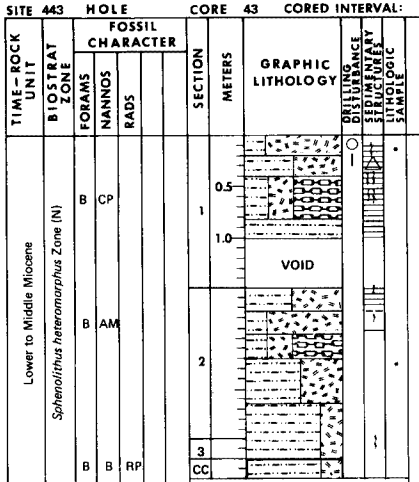
1-72 (Claystone)

Sand	5%	Clay minerals	95%
Silt	9%	Voclanic glass	3%
Clay	86%	Miscellaneous	2%

GRAIN SIZE:
1-107 (0.3, 42.8, 56.9)

CARBON-CARBONATE:
2-27 (0.5, 0.1, 3)

SITE 443 HOLE CORE 43 CORED INTERVAL: 396.5-406.0 m



LITHOLOGIC DESCRIPTION

Ashy Mudstone, Muddy Ash
Often dark greenish gray (5GY 4/1), with numerous color changes: gray (N5), greenish gray (5G 5/1), dark bluish gray (5B 4/1), gray (N6), dark bluish gray (5BG 4/1), black (YN2), gray (5Y 5/1), black (5Y 2/1). Hard, not deformed, with numerous sedimentary structures such as sharp and transitional contacts, laminae, graded-beddings, burrows filled with common sediment or with ash, ash layers or streaks.

Clay Mineralogy (%)
2-133: chlorite TR, illite 15, mixed layers 25, smectite 55, kaolinite 5, very rare feldspar.

Smears:

1-13 (Muddy Ash)

Sand	50%	Quartz, Feldspar	3%
Silt	20%	Clay minerals	25%
Clay	30%	Opaques	1%
		Volcanic glass	70%
		Zeolites	1%
		Radiolarians, Sponge spicules	TR

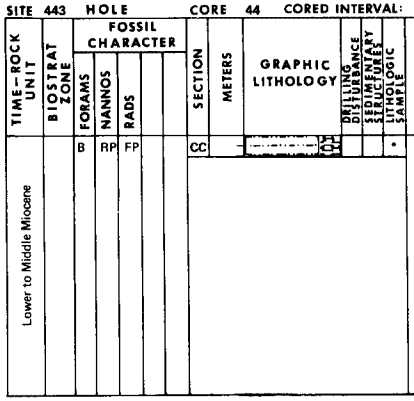
2-80 (Ashy Mudstone)

Sand	< 5%	Quartz, Feldspar	3%
Silt	>50%	Mica, Heavy minerals	TR
Clay	>40%	Clay minerals	60%
		Volcanic glass	32%
		Carbonate unspecified	3%
		Siliceous fossils	2%

GRAIN SIZE:
2-65 (4.6, 51.2, 44.2)

CARBON-CARBONATE:
2-46 (1.1, 0.1, 9)

SITE 443 HOLE CORE 44 CORED INTERVAL: 406.0-415.5 m



LITHOLOGIC DESCRIPTION

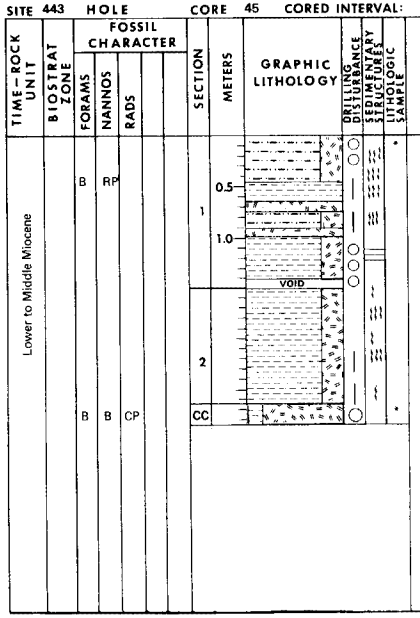
Calcareous Mudstone
The Core Catcher contains a dark greenish gray (5GY 4/1) to dark gray (N4), hard calcareous mudstone.

Smears:

CC

Sand	20%	Quartz, Feldspar	1%
Silt	30%	Clay minerals	65%
Clay	50%	Opaques	1%
		Volcanic glass	5%
		Carbonate unspecified	20%
		Calcareous nannofossils	5%
		Diatoms	TR
		Radiolarians	2%
		Sponge spicules	1%

SITE 443 HOLE CORE 45 CORED INTERVAL: 415.5-425.0 m



Ashy Mudstone/Claystone with Ash Layers
Basically olive gray (5Y 4/2) to greenish gray (5GY 5/1), hard, slightly to intensely bioturbated and laminated ashy mudstone or claystone with local thin clayey ash layers. Section 1-0-25: hole fill contamination.

Clay Mineralogy (%)
2-78: chlorite TR, illite 10, mixed layers 15, smectite 70, kaolinite 5.

Smears:
1-10 (Ashy Mudstone)

Sand	2%	Quartz, Feldspar	1%
Silt	>45%	Heavy minerals	TR
Clay	>45%	Clay minerals	86%
		Volcanic glass	10%
		Zeolites	1%
		Nannofossils	TR
		Siliceous fossils	2%

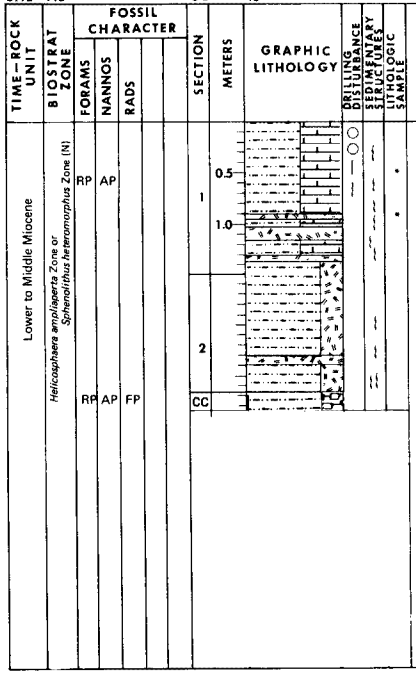
CC (Clayey Ash) Minor Lithology

Sand	20%	Quartz, Feldspar	1%
Silt	10%	Heavy minerals	1%
Clay	20%	Clay minerals	18%
		Volcanic glass	80%

GRAIN SIZE:
2-20 (2.0, 49.5, 48.5)

CARBON-CARBONATE:
2-34 (0.1, 0.1, 0)

SITE 443 HOLE CORE 46 CORED INTERVAL: 425.0-434.5 m



Nannofossil Mudstone, Ashy Mudstone, Ash
Basically greenish gray (5GY 5/1) but variable, hard, undeformed slightly to moderately burrowed nannofossil to ashy mudstone with interbeds of silty (black 5Y 2/1) or sandy (gray/light gray 5Y 6/1) ash. Section 1-0-20 cm: hole fill contamination.

Clay Mineralogy (%)
2-16: chlorite 5, illite 10, mixed layers 10, smectite 70, kaolinite 5, very rare feldspar.

Smears:
1-50 (Nannofossil Mudstone)

Sand	< 2%	Quartz, Feldspar	1%
Silt	>45%	Biotite	TR
Clay	>50%	Hornblende	TR
		Clay minerals	66%
		Volcanic glass	1%
		Nannofossils	30%
		Radiolarians	2%
		Sponge spicules	TR

1-96 (Clayey Ash) Minor Lithology

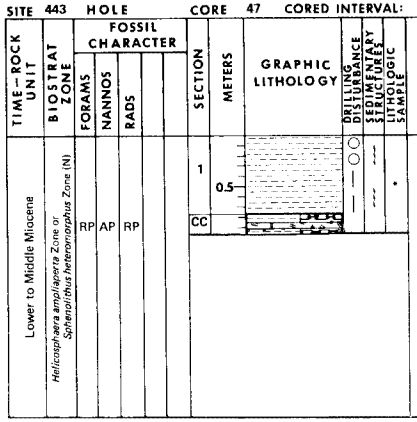
Sand	2%	Altered ash and	
Silt	93%	Clay minerals	83%
Clay	5%	Nannofossils	9%
		Miscellaneous	8%

GRAIN SIZE:
2-19 (1.8, 45.2, 53.0)

CARBON-CARBONATE:
2-21 (0.1, 0.1, 0)

CARBONATE BOMB:
2-29 (2.5)

SITE 443 HOLE CORE 47 CORED INTERVAL: 434.5-444.0 m



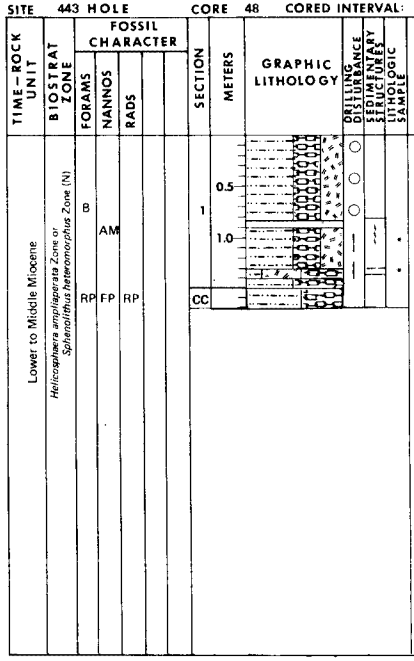
Claystone
Greenish gray (5GY 5/1), hard, undeformed (except in 16 upper cm: hole contamination), slightly burrowed, powered by ash spots, claystone.

Clay Mineralogy (%)
1-50: chlorite TR, illite 10, mixed layers 15, smectite 70, kaolinite 5.

Smears:
1-50

Quartz, Feldspar	4%
Clay minerals	91%
Volcanic glass	TR
Micronodules	1%
Carbonate unspecified	2%
Nannofossils	2%
Siliceous fossils	TR

SITE 443 HOLE CORE 48 CORED INTERVAL: 444.0-453.5 m



Ashy Muddy Chalk
Greenish gray (5GY 5/1), hard, clayey and calcareous sediment, highly deformed with drilling contamination between 1 and 83 cm in Section 1. Slightly deformed with minor bioturbation between 82 and 150 cm in Section 1. Presence of thin ash layers, generally light gray (5Y 6/1, i.e. 1-86-89). Pumiceous lapilli at Section 1-112 cm.

Clay Mineralogy (%)
1-119: illite 5, mixed layers 5, smectite 90, kaolinite TR, very rare feldspar.

Smears:
1-106 Dominant Lithology

Sand	4%	Clay minerals	40%
Silt	55%	Volcanic glass	10%
Clay	41%	Carbonate unspecified and Nannofossils	50%

1-138 Minor Lithology (Clayey Ashy Chalk)

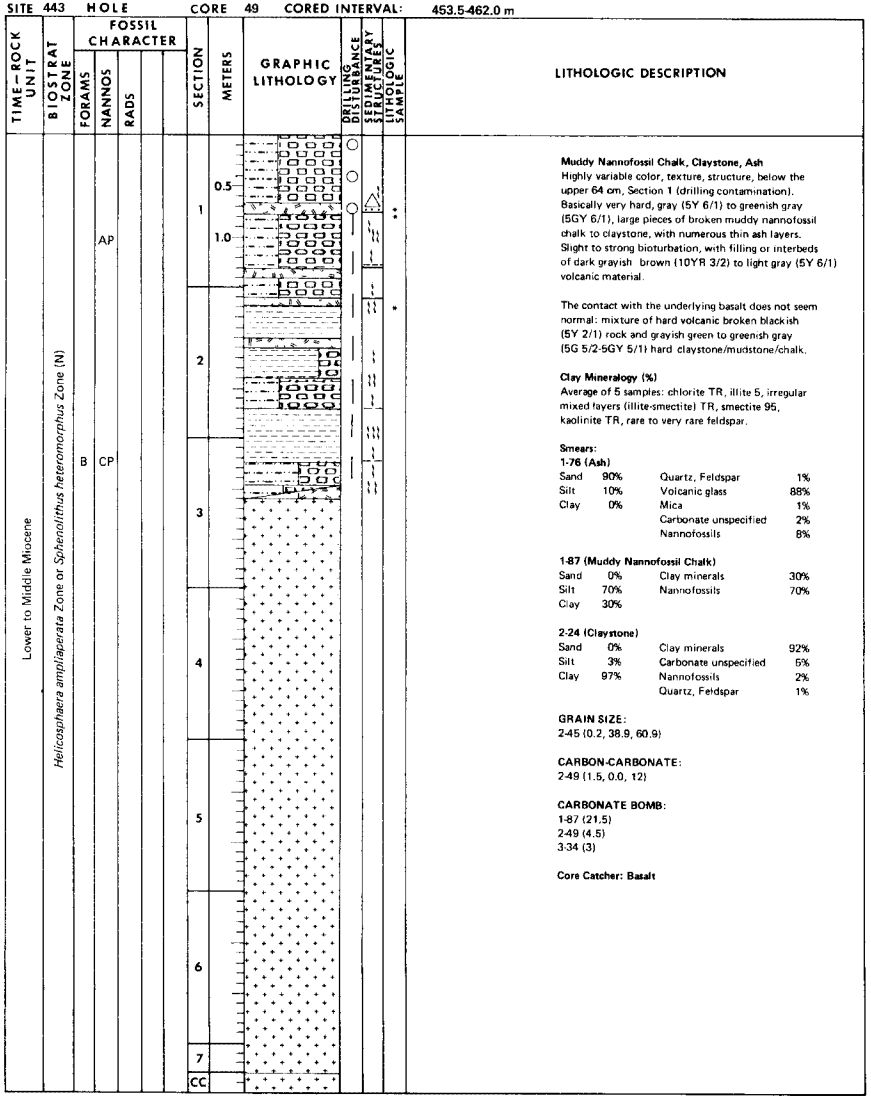
Sand	30%	Quartz, Feldspar	TR
Silt	55%	Clay minerals	15%
Clay	15%	Volcanic glass	40%
		Carbonate unspecified	15%
		Nannofossils	30%

GRAIN SIZE:
1-105 (4.3, 54.5, 41.2)

CARBON-CARBONATE:
1-109 (0.8, 0.4, 3)

CARBONATE BOMB:
1-125 (27)

SITE 443 HOLE CORE 49 CORED INTERVAL: 453.5-462.0 m



Muddy Nannofossil Chalk, Claystone, Ash
Highly variable color, texture, structure, below the upper 64 cm, Section 1 (drilling contamination). Basically very hard, gray (5Y 6/1) to greenish gray (5GY 6/1), large pieces of broken muddy nannofossil chalk to claystone, with numerous thin ash layers. Slight to strong bioturbation, with filling or interbeds of dark grayish brown (10YR 3/2) to light gray (5Y 6/1) volcanic material.

The contact with the underlying basalt does not seem normal: mixture of hard volcanic broken blackish (5Y 2/1) rock and grayish green to greenish gray (5G 5/2-5GY 5/1) hard claystone/mudstone/chalk.

Clay Mineralogy (%)
Average of 5 samples: chlorite TR, illite 5, irregular mixed layers (illite-smectite) TR, smectite 95, kaolinite TR, rare to very rare feldspar.

Smears:

1-76 (Ash)

Sand	90%	Quartz, Feldspar	1%
Silt	10%	Volcanic glass	88%
Clay	0%	Mica	1%
		Carbonate unspecified	2%
		Nannofossils	8%

1-87 (Muddy Nannofossil Chalk)

Sand	0%	Clay minerals	30%
Silt	70%	Nannofossils	70%
Clay	30%		

2-24 (Claystone)

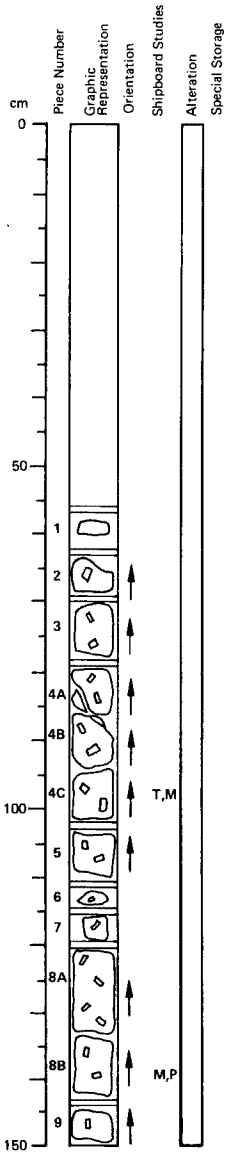
Sand	0%	Clay minerals	92%
Silt	3%	Carbonate unspecified	5%
Clay	97%	Nannofossils	2%
		Quartz, Feldspar	1%

GRAIN SIZE:
2-45 (0.2, 38.9, 60.9)

CARBON-CARBONATE:
2-49 (1.5, 0.0, 12)

CARBONATE BOMB:
1-87 (21.5)
2-49 (4.5)
3-34 (3)

Core Catcher: Basalt



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		4 9	3

Depth: 456.5 to 458.0 m

Visual Description

0-57 cm: sediment.

57-62 cm: small piece with glassy margin and chill zone with 3% vesicles (generally < 1 mm).

62-70 cm: fine-grained, gray, sparsely plagioclase phyric, vesicular basalt; 7.5% plagioclase phenocrysts and 7.5% vesicles (generally < 1 mm).

70-150 cm: gray, sparsely plagioclase phyric basalt (coarse, micro-diabasic texture); 7.5% plagioclase phenocrysts, occasional clay-lined vesicles.

On external drill cut faces some larger vesicles (up to 5 mm across) are infilled by white or clear crystalline zeolites(?).

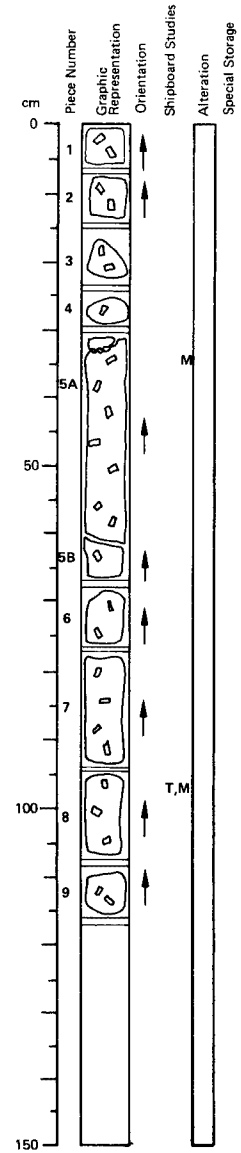
81-88 cm (4A and 4B): vein of calcite and brown material. No alteration visible in bordering basalt.

Shipboard Data

Magnetic Data:	**101 cm**	**137 cm**
Intensity (emu/cc)	674.7	1034.6
Inclination before demag.	–29.1	–29.6
Stable Inclination	–28.2	–32.5

Physical Properties:	**137 cm**
$\bar{V}p$ (km/s)	5.80
Porosity (%)	0.31
Wet Bulk Density	3.10
Grain Density	3.11

Other Data:	**121 cm**
Thermal cond. (mcal/cm-s-°C)	4.18



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		4 9	4

Depth 458.0 to 459.2 m

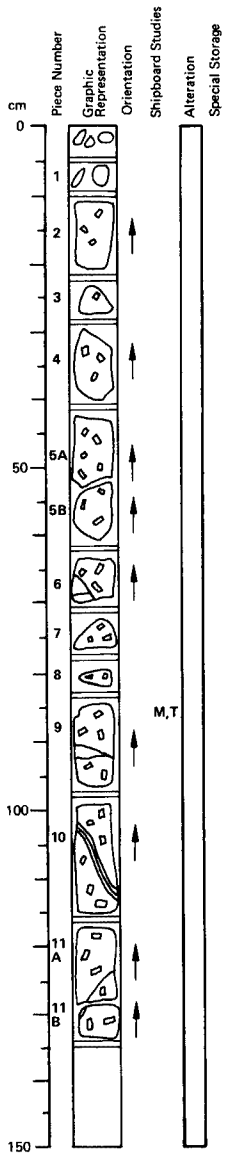
Visual Description

Gray, plagioclase phyric basalt (coarse-grained almost microdiabasic texture), odd – pyroxene phenocryst, odd – clay infilled vesicles, and 15-20% plagioclase phenocrysts.

Shipboard Data

Magnetic Data:	**40 cm**	**102 cm**
Intensity (emu/cc)	704.2	476.7
Inclination before demag.	–31.8	–25.8
Stable Inclination	–31.7	–29.6

Other Data:	**79 cm**
Therm. cond. (mcal/cm-s-°C)	4.46



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 0	1

Depth: 463.0 to 464.3 m

Visual Description

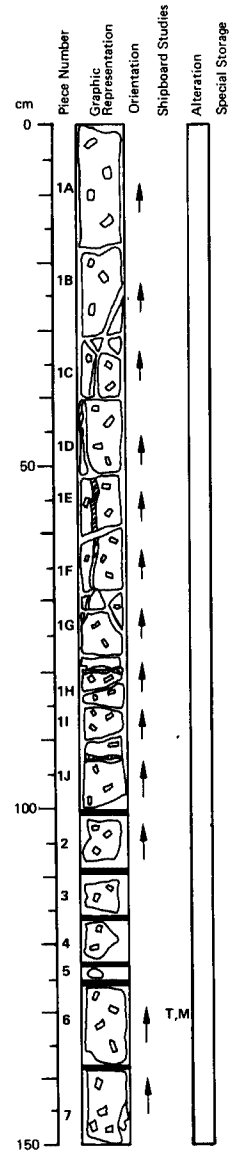
0-5 cm: sediment, uphole contamination.

5-134 cm: medium gray basalt. Fine-grained with 10 to 20% euhedral plagioclase from 2 to 7 mm. Pyroxene phenocrysts 2 to 4 mm (<1%). Amygdules filled with white zeolites(?) and calcite <1%. Veins filled with calcite (100-115 cm, 2 mm thick) and pyrites and possibly pyrhatite or chalcopyrite on joint surfaces. Fresh, little evidence of weathering. May be chlorite on vein surfaces. Plagioclase-pyroxene phyric basalt. No visible vesicles.

Shipboard Data

Magnetic Data:	**85 cm**
Intensity (emu/cc)	528.5
Inclination before demag.	–28.7

Physical Properties:	**117 cm**
$\overline{V}p$ (km/s)	5.10
Porosity (%)	0.74
Wet Bulk Density	2.95
Grain Density	2.97



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 0	2

Depth: 464.3 to 465.8 m

Visual Description

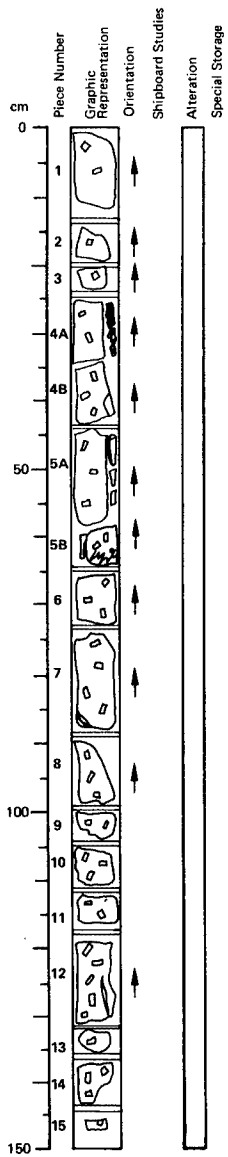
0-150 cm: medium gray plagioclase-pyroxene phyric basalt, plagioclase phenocrysts 10-20%, 20-70 mm, euhedral pyroxene phenocrysts < 1%, 2-4 mm. Fine-grained, fresh, no visible vesicles. Carbonate vein fillings abundant, free growing aragonite and pyrite (marcasite?) and green clayey mineral (glauconite?).

Shipboard Data

Bulk Analysis:	**14 cm**
SiO_2	49.71
Al_2O_3	16.33
Fe_2O_3	1.29
FeO	8.50
MgO	7.38
CaO	11.63
Na_2O	3.09
K_2O	0.21
TiO_2	1.51
P_2O_5	0.17
MnO	0.18
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	198.00
Ni	50.00
Sr	151.00
Zr	121.00

Magnetic Data:	**30 cm**
Intensity (emu/cc)	585.8
Inclination before demag.	–31.3
Stable Inclination	–29.9

Other Data:	**0 cm**	**127 cm**
Therm. cond. (mcal/cm-s-°C)	4.35	4.35



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE		CORE		SECT.	
5	8	4	4	3		5	0		3

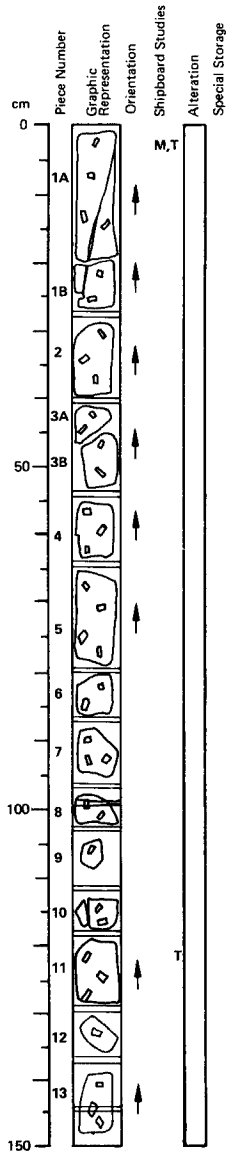
Depth: 465.8 to 467.3 m

Visual Description

Plagioclase basalt. Fine-grained, no vesicles, fresh, medium gray colored. Plagioclase phenocrysts 10-20%, 2-7 mm, euhedral. Pyroxene phenocrysts < 1%, 2-3 mm. Vein fillings – carbonate, some sulphide (pyrite?) and green clay minerals.

Shipboard Data

Bulk Analysis:	**80 cm**
SiO_2	50.35
Al_2O_3	15.84
Fe_2O_3	1.22
FeO	8.08
MgO	6.21
CaO	12.84
Na_2O	3.19
K_2O	0.19
TiO_2	1.55
P_2O_5	0.17
MnO	0.25
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	224.00
Ni	54.00
Sr	161.00
Zr	120.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE		CORE		SECT.	
5	8	4	4	3		5	0		4

Depth: 467.3 to 468.8 m

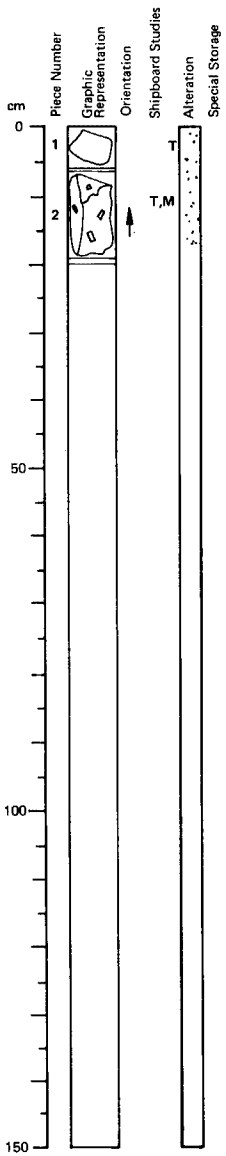
Visual Description

Plagioclase-pyroxene phyric basalt. Fine-grained, medium gray color, fresh. Plagioclase phenocrysts 10-20%, 2-7 mm; pyroxene phenocrysts < 1% ~2 mm.
Vein fillings – carbonate (0-25 cm) with clay minerals.
102-137 cm: plagioclase phenocrysts, sausseritized.

Shipboard Data

Bulk Analysis:	**74 cm**
SiO_2	50.18
Al_2O_3	15.80
Fe_2O_3	1.32
FeO	8.73
MgO	7.01
CaO	11.65
Na_2O	3.21
K_2O	0.24
TiO_2	1.51
P_2O_5	0.16
MnO	0.17
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	231.00
Ni	56.00
Sr	152.00
Zr	115.00

Magnetic Data:	**2 cm**
Intensity (emu/cc)	55.8
Inclination before demag.	–32.7
Stable Inclination	–33.6
Other Data:	**66 cm**
Therm. cond. (mcal/cm-s-°C)	4.42



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 1	1

Depth: 472.5 m

Visual Description

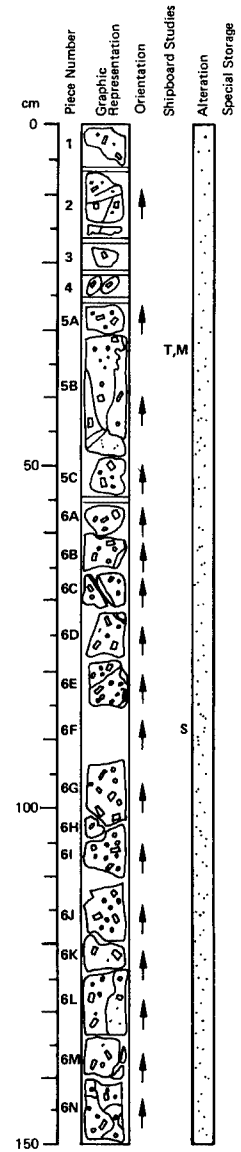
0-5 cm: fine-grained to aphanitic. Brown basalt — possibly slump from above with the approximate 1 meter of talus and slurry that came down the hole with this recovery. Basalt may be olivine bearing ~4%, ~1 mm, plagioclase phenocrysts in 2 bands 1 cm wide across rock ~1 mm, ~8%.

17-20 cm: plagioclase phyric basalt — similar to that in Core 50. Plagioclase phenocrysts 2-5 mm, euhedral, fine- to medium-grained. Carbonate vein, and amygdule fillings. Stained amygdules look like olivine.

Shipboard Data

Bulk Analysis:	0 cm
SiO_2	49.87
Al_2O_3	13.01
Fe_2O_3	1.27
FeO	8.36
MgO	9.21
CaO	11.49
Na_2O	3.04
K_2O	0.51
TiO_2	1.53
P_2O_5	0.16
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—

Magnetic Data:	9 cm
Intensity (emu/cc)	256.3
Inclination before demag.	42.2



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 2	1

Depth: 477.5 to 479.0 m

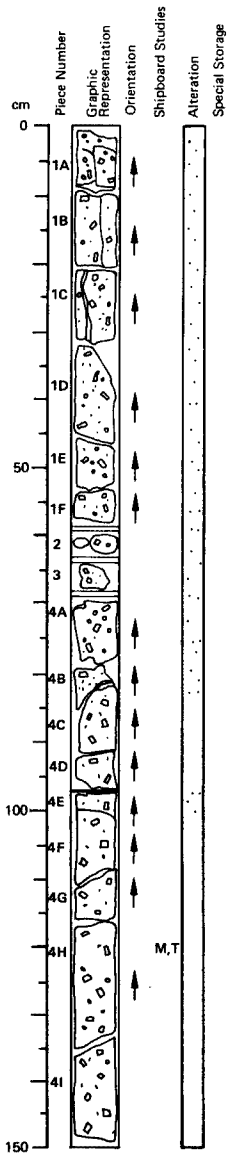
Visual Description

Plagioclase phyric basalt. Medium- to fine-grained basalt similar to that in Cores 49-51, except for the presence of ubiquitous carbonate-filled amygdules ~3% and vesicles ~3-5%. Carbonate vein fillings abundant. Lightly weathered. Many amygdules filled with clay. No chill zones. Plagioclase phenocrysts ~10%, 2-4 mm.

Shipboard Data

Bulk Analysis:	2 cm	90 cm
SiO_2	50.44	49.52
Al_2O_3	15.99	15.00
Fe_2O_3	1.18	1.22
FeO	7.80	8.03
MgO	6.23	8.19
CaO	12.89	12.52
Na_2O	3.30	3.17
K_2O	0.20	0.32
TiO_2	1.53	1.35
P_2O_5	0.16	0.12
MnO	0.35	0.14
LOI	—	—
H_2O^+	—	—
H_2O^-	—	—
CO_2	—	—
Cr	244.00	249.00
Ni	60.00	99.00
Sr	165.00	168.00
Zr	114.00	92.00

Magnetic Data:	33 cm
Intensity (emu/cc)	182.3
Inclination before demag.	40.5
Stable Inclination	41.2
Physical Properties:	**85 cm**
$\bar{V}p$ (km/s)	5.07
Porosity (%)	3.72
Wet Bulk Density	2.95
Grain Density	3.02



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 2	2

Depth: 479.0 to 480.5 m

Visual Description

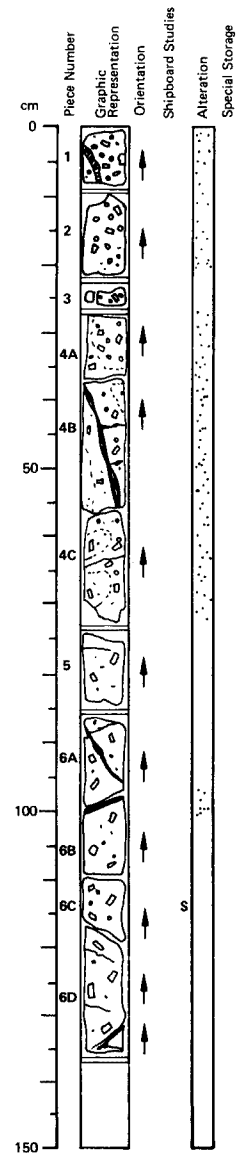
Plagioclase phyric basalt. Amygdaloidal 3-5%, 0.5-2.0 mm, smectite or calcite filled vesicles, often composite. Vesicular 0-2%, many half-filled with alteration products. Plagioclase phenocrysts 10%, 2-80 mm. Carbonate veins abundant. Similar to basalt in Cores 49, 50, 51 and Section 1 of Core 52. No chill zones.

Shipboard Data

Bulk Analysis:	**120 cm**
SiO_2	50.09
Al_2O_3	15.72
Fe_2O_3	1.27
FeO	8.36
MgO	8.23
CaO	12.20
Na_2O	3.04
K_2O	0.10
TiO_2	1.38
P_2O_5	0.12
MnO	0.16
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	263.00
Ni	94.00
Sr	164.00
Zr	98.00

Magnetic Data:	**120 cm**
Intensity (emu/cc)	449.2
Inclination before demag.	31.6
Stable Inclination	46.6

Other Data:	**119 cm**
Therm. cond. (mcal/cm-s-°C)	4.42



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 2	3

Depth: 480.5 to 481.8 m

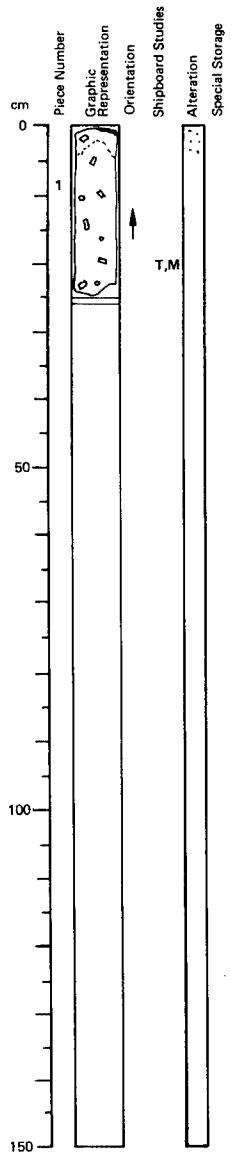
Visual Description

Plagioclase phyric basalt. Amygdaloidal, 2-4% amygdules with calcite and smectite fillings. Vesicular 0-5%: where core is weathered, many of the vesicules lack fillings or are partially filled with calcite. Carbonate veins up to 3 mm similar to veins filled with blaxial carbonate in Core 50. Plagioclase phenocrysts 5-10%, ~2-3 mm. Medium-grained diabase.

Note: 85-135 cm is 1/2 of a single continuous piece too large for the end of the core section; remainder in Section 4.

Shipboard Data

Magnetic Data:	**85 cm**	**107 cm**
$\bar{V}p$ (km/s)	--	5.36
Porosity (%)	5.81	
Wet Bulk Density	2.84	
Grain Density	2.96	



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			5	2		4

Depth: 481.8 to 482.1 m

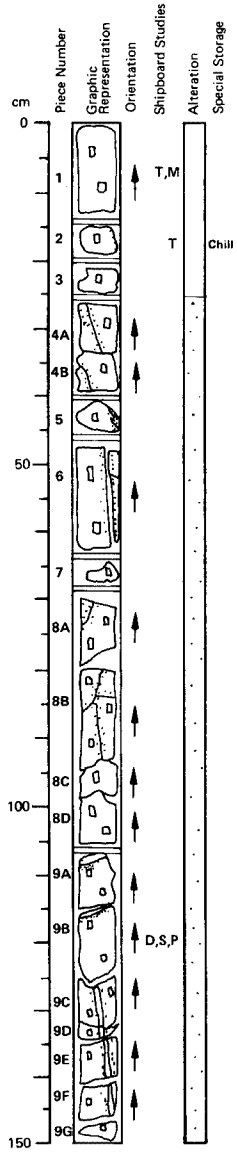
Visual Description

Plagioclase phyric diabase. Medium gray basalt, medium-grained. Calcite vein at 0 cm. Plagioclase phenocrysts ~5%, ~2 mm. 1-2% amygdules filled with smectite and carbonate.

Shipboard Data

Bulk Analysis:	**16 cm**
SiO_2	50.07
Al_2O_3	15.86
Fe_2O_3	1.25
FeO	8.27
MgO	8.12
CaO	12.13
Na_2O	3.10
K_2O	0.11
TiO_2	1.37
P_2O_5	0.12
MnO	0.16
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	256.00
Ni	86.00
Sr	163.00
Zr	101.00

Magnetic Data:	**21 cm**
Intensity (emu/cc)	557.7
Inclination before demag.	32.8
Stable Inclination	39.5



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			5	3		1

Depth: 482.0 to 483.5 m

Visual Description

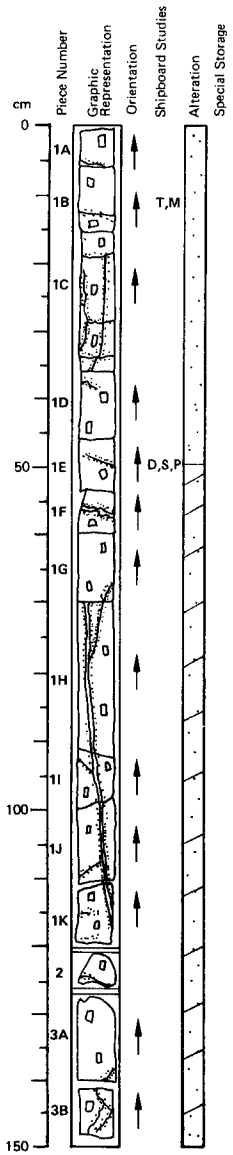
0-150 cm: phyric, medium-grained basalt, dark gray. Plagioclase phenocrysts up to 10-15%, up to 4 mm.
0-25 cm: fresh basalt.
25-150 cm: lightly altered, with alteration close to calcite vein. Oxidation to iron-oxides.
0-14 cm: basalt identical to that described for Core 52, Sections 3 and 4.
15-19 cm: chill zone, of next lava flow (number 2).

Shipboard Data

Magnetic Data:	**7 cm**
Intensity (emu/cc)	603.7
Inclination before demag.	31.6
Stable Inclination	39.6

Physical Properties:	**115 cm**
$\bar{V}p$ (km/s)	5.30
Porosity (%)	3.07
Wet Bulk Density	2.95
Grain Density	3.01

Other Data:	**115 cm**
Therm. cond. (mcal/cm-s-°C)	4.10



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			5	3		2

Depth: 483.5 to 485.0 m

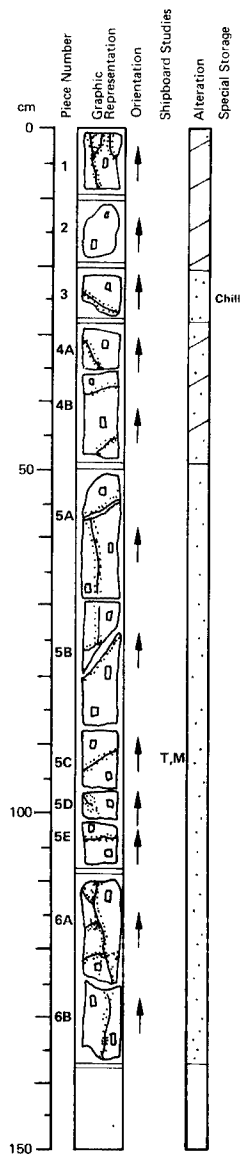
Visual Description

0-150 cm: basalt, phyric, medium-grained, dark gray (brownish). All intervals (show) light alteration. A calcite vein, which has thickness 3-5 mm occurs in Pieces 1F and 1H. Alteration consists of an oxidation of zone close calcite veins. 50-150 cm: oxidation is moderate. Plagioclase phenocrysts up to 10%. Basalt identical to that described for Core 53 Section 1, 14-150 cm.

Shipboard Data

Bulk Analysis:	**117 cm**
SiO_2	50.82
Al_2O_3	15.96
Fe_2O_3	1.21
FeO	7.96
MgO	7.02
CaO	12.32
Na_2O	3.34
K_2O	0.25
TiO_2	1.42
P_2O_5	0.13
MnO	0.14
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	263.00
Ni	107.00
Sr	171.00
Zr	107.00

Magnetic Data:	**12 cm**
Intensity (emu/cc)	342.4
Inclination before demag.	42.8
Stable Inclination	42.5
Other Data:	**48 cm**
Therm. cond. (mcal/cm-s-°C)	4.66



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			5	3		3

Depth: 485.0 to 486.4 m

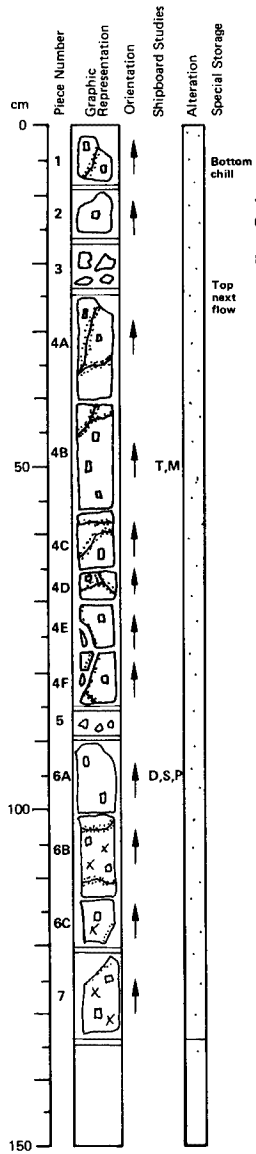
Visual Description

0-20 cm: basalt, phyric, medium-grained, dark brownish-gray, identical to that described for Core 53 Section 2, but with more oxides. Represents base of lava flow.
20-27 cm: chilled zone of next lava flow.
27-147 cm: basalt, phyric, medium-grained, identical to basalt described for Core 53 Section 2.
28-47 cm: light to moderate oxides (dark brownish-gray).
47-147 cm: lightly altered (dark gray), plagioclase phenocrysts about 10%.

Shipboard Data

Bulk Analysis:	**64 cm**
SiO_2	50.09
Al_2O_3	15.47
Fe_2O_3	1.25
FeO	8.24
MgO	7.97
CaO	12.09
Na_2O	3.22
K_2O	0.17
TiO_2	1.43
P_2O_5	0.12
MnO	0.14
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	263.00
Ni	102.00
Sr	165.00
Zr	101.00

Magnetic Data:	**86 cm**
Intensity (emu/cc)	584.1
Inclination before demag.	39.0
Stable Inclination	40.5
Other Data:	**83 cm**
Therm. cond. (mcal/cm-s-°C)	4.10



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 4	1

Depth: 491.5 to 492.8 m

Visual Description

0-8 cm: basalt, phyric, fine-grained, dark gray, bottom chilled zone of base of Core 53 Section 3.

8-16 cm: basalt, glomerophyric, medium-grained, dark gray (fresh), glomerophenocrysts ~10%, 2-4 mm.

16-133 cm: basalt, glomerophyric fine-grained, dark gray, slightly altered (oxidized) close to calcite vein (1-2 cm).

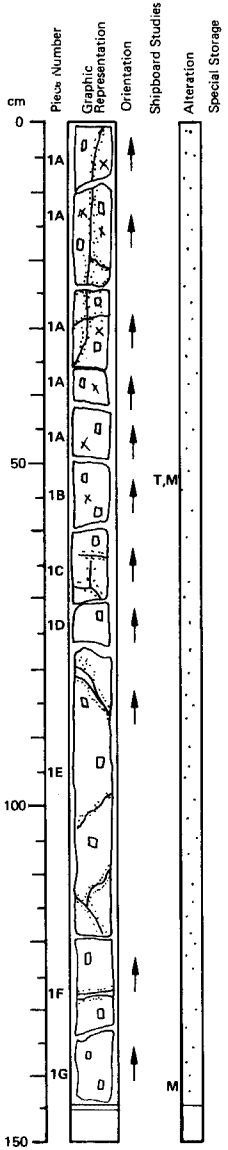
100-133 cm: more coarse-grained, phenocrysts and glomerophenocrysts of plagioclase 10-15% up to 5 mm. Phenocrysts of pyroxene 30%, 0.5 mm.

Shipboard Data

Magnetic Data:	**54 cm**
Intensity (emu/cc)	411.9
Inclination before demag.	41.8
Stable Inclination	39.3

Physical Properties:	**90 cm**
$\overline{V}p$ (km/s)	5.87
Porosity (%)	6.05
Wet Bulk Density	2.88
Grain Density	3.00

Other Data:	**120 cm**
Therm. cond. (mcal/cm-s-°C)	4.14



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 4	2

Depth: 492.8 to 494.3 m

Visual Description

0-60 cm: upper 60 cm appears identical to that described at the base of Section 1.

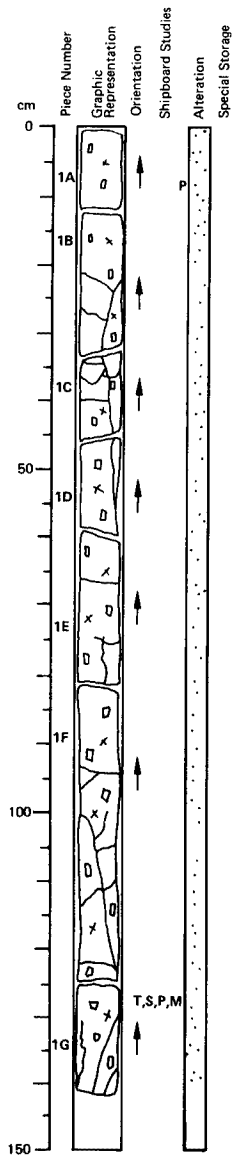
60-143 cm: basalt, same as before, but medium-grained. Basalt phyric (glomerophyric), dark gray, slightly altered (oxidized) close to calcite veins (1-2 cm). Phenocrysts and glomerophenocrysts of plagioclase (20%, 3 mm).

Shipboard Data

Bulk Analaysis:	**44 cm**
SiO_2	49.61
Al_2O_3	15.72
Fe_2O_3	1.26
FeO	8.32
MgO	8.80
CaO	11.94
Na_2O	3.02
K_2O	0.11
TiO_2	1.54
P_2O_5	0.12
MnO	0.16
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	254.00
Ni	112.00
Sr	161.00
Zr	95.00

Magnetic Data:	**54 cm**	**138 cm**
Intensity (emu/cc)	733.4	398.1
Inclination before demag.	38.9	26.2
Stable Inclination	41.8	42.3

Other Data:	**132 cm**
Therm. cond. (mcal/cm-s-°C)	4.52



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 3	3

Depth: 494.3 to 495.7 m

Visual Description

Dark gray plagioclase-pyroxene phyric basalt (medium grained). Plagioclase phenocrysts 2 to 5 mm across, approximately 10%; pyroxene phenocrysts 1 to 2 mm across, 5-10%.
Thin white carbonate filled veins are common (0.5 mm across) with brown zone of alteration (greenish tinge) 1.0 to 1.5 cm across.
Odd amygdule filled by light olive green clays.
25-56 cm: veins infilled by brown iron-oxides and some carbonate. Some sausseritized(?) plagioclase phenocrysts similar to previous section.
109 cm: small piece of native copper in carbonate vein (1 mm across).

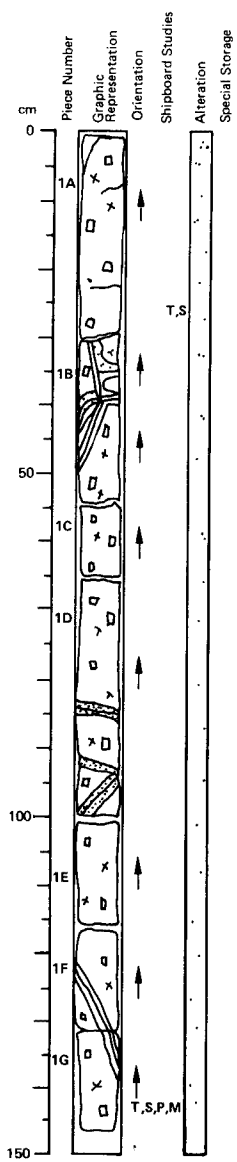
Shipboard Data

Bulk Analysis:	**4 cm**
SiO_2	49.77
Al_2O_3	15.74
Fe_2O_3	1.26
FeO	8.30
MgO	9.03
CaO	11.82
Na_2O	3.16
K_2O	0.11
TiO_2	1.32
P_2O_5	0.12
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	253.00
Ni	117.00
Sr	160.00
Zr	94.00

Magnetic Data:	**125 cm**
Intensity (emu/cc)	179.7
Inclination before demag.	38.5

Physical Properties:	**0 cm**
$\bar{V}p$ (km/s)	5.83
Porosity (%)	5.72
Wet Bulk Density	2.93
Grain Density	3.05

Other Data:	**0 cm**	**124 cm**
Therm. cond. (mcal/cm-s-°C)	4.27	4.19



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 4	4

Depth: 495.7 to 497.1 m

Visual Description

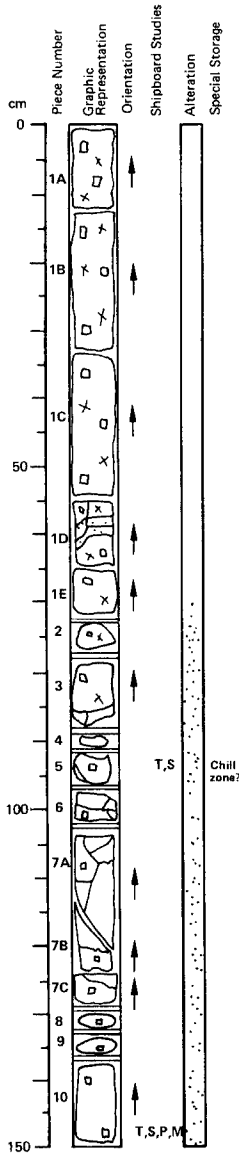
Dark gray plagioclase-pyroxene phyric basalt (medium grained). Plagioclase phenocrysts (10%) 2-5 mm across, pyroxene phenocrysts (10%) 1-2 mm across.
Carbonate veins 0.5-1 mm wide with alteration cones (brown coloration) 1-2 cm wide.
Odd amygdule filled by light olive green clays.
Similar to previous section.

Shipboard Data

Bulk Analysis:	**106 cm**
SiO_2	49.70
Al_2O_3	15.64
Fe_2O_3	1.27
FeO	8.36
MgO	8.98
CaO	11.84
Na_2O	3.10
K_2O	0.14
TiO_2	1.33
P_2O_5	0.11
MnO	0.16
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	275.00
Ni	110.00
Sr	158.00
Zr	95.00

Magnetic Data:	**146 cm**
Intensity (emu/cc)	316.6
Inclination before demag.	45.7
Stable Inclination	43.5

Other Data:	**15 cm**	**70 cm**	**140 cm**
Therm. cond. (mcal/cm-s-°C)	4.18	3.56	4.56



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 4	5

Depth: 497.1 to 498.6 m

Visual Description

0-90 cm: dark gray plagioclase-pyroxene phyric, medium-grained basalt similar to previous section. Approximately 10% plagioclase phenocrysts (2-5 mm across) and 5-10% pyroxene phenocrysts (1-2 mm across).

Carbonate vein with alteration zone (vein 2 mm wide, alteration zone 2 cm wide) similar to previous core.

From 70 to 90 cm weathering increases.

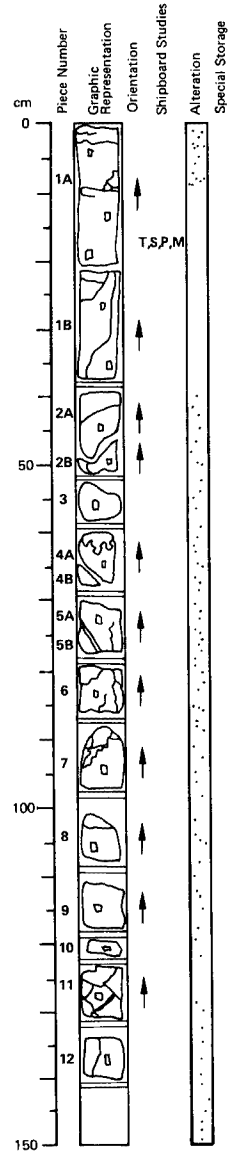
92-150 cm: dark gray sparsely plagioclase phyric basalt (between 93 and 96 cm, Piece 5, a few vesicles and fine grain groundmass with few phenocrysts – possibly chilled margin). Approximately 5-10% plagioclase phenocrysts (some as glomerocrysts) 2-5 mm across. Grains of brown alteration material (iron-oxides?) (0.5 to 1 mm across) particularly near carbonate veins and fractures (constitute approximately 5%).

Shipboard Data

Bulk Analysis:	**31 cm**
SiO_2	49.77
Al_2O_3	15.97
Fe_2O_3	1.26
FeO	8.32
MgO	0.70
CaO	11.86
Na_2O	3.22
K_2O	0.13
TiO_2	1.36
P_2O_5	0.12
MnO	0.15
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	262.00
Ni	101.00
Sr	161.00
Zr	98.00

Magnetic Data:	**146 cm**
Intensity (emu/cc)	273.8
Inclination before demag.	43.5
Stable Inclination	40.3

Other Data:	**2 cm**	**45 cm**	**145 cm**
Therm. cond. (mcal/cm-s-°C)	4.61	4.54	4.09



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 4	6

Depth: 498.6 to 500.0 m

Visual Description

Dark gray, sparsely plagioclase phyric basalt. Approximately 5-10% phenocrysts (some as glomerocrysts) 2-5 mm across.

Odd grains of brown alteration material (iron-oxides?) <1 mm across and odd vesicle lined with similar material. Also occasional round vesicle infilled by a dark gray material (clay?).

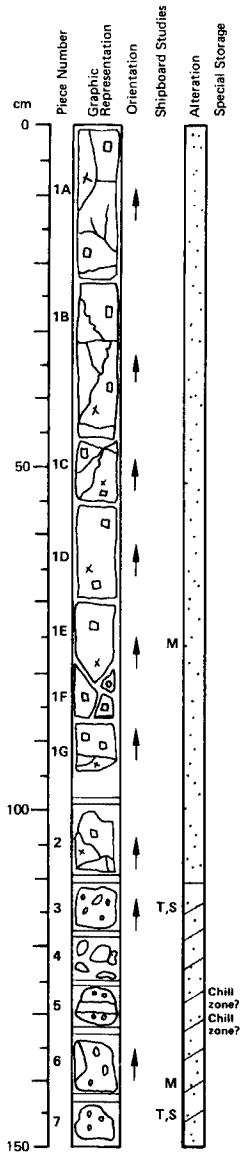
White carbonate lined veins and fractures with weathered surfaces common.

Shipboard Data

Bulk Analysis	**36 cm**
SiO_2	49.84
Al_2O_3	15.73
Fe_2O_3	1.24
FeO	8.21
MgO	8.26
CaO	12.16
Na_2O	3.06
K_2O	0.12
TiO_2	1.34
P_2O_5	0.11
MnO	0.16
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	267.00
Ni	103.00
Sr	165.00
Zr	95.00

Magnetic Data:	**14 cm**
Intensity (emu/cc)	1328.3
Inclination before demag.	41.9
Stable Inclination	46.1

Other Data:	**28 cm**
Therm. cond. (mcal/cm-s-°C)	4.14



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 4	7

Depth: 500.0 to 501.5 m

Visual Description

0-110 cm: dark gray sparsely plagioclase phyric basalt. Approximately 5-10% phenocrysts (2-5 mm across). Fresh except for light to moderately weatehred zones surrounding veins and fractures. Odd pyroxene phenocrysts, similar to previous section.

110-150 cm: vesicular, gray basalt, aphyric 5-20% vesicles, many from 0.5-2 mm across and some large composite ones. Weathering in zones around vesicles particularly in Piece 6 (133-141 cm) with a pipe zone of vesicles.

Piece 5 (125-131 cm): includes weathered contact zones (chill margins?) above and below carbonate band (lithified sediment?). Lithified carbonate material also on Piece 7 (143-150 cm).

Above Piece 5 (125 cm): vesicles lined by dark material and clear well formed crystals (zeolite?).

Below Piece 5 (131 cm): vesicles filled or lined by light brownish gray clay(?).

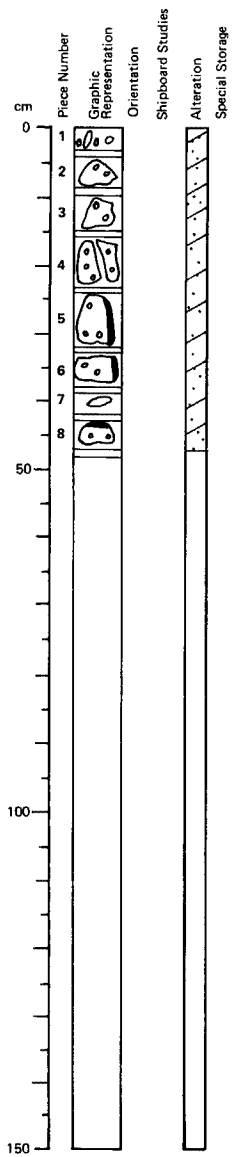
Shipboard Data

Bulk Analysis:	**71 cm**
SiO_2	49.90
Al_2O_3	15.73
Fe_2O_3	1.26
FeO	8.28
MgO	8.42
CaO	12.25
Na_2O	3.10
K_2O	0.09
TiO_2	1.35
P_2O_5	0.11
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	273.00
Ni	99.00
Sr	161.00
Zr	97.00

Magnetic Data:	**76 cm**	**138 cm**
Intensity (emu/cc)	611.7	731.7
Inclination before demag.	37.4	63.5
Stable Inclination	41.5	62.8

Physical Properties:	**60 cm**	**67 cm**
$\bar{V}p$ (km/s)	5.91	—
Porosity (%)	7.98	3.53
Wet Bulk Density	2.97	2.93
Grain Density	3.14	3.00

Other Data:	**60 cm**
Therm. cond. (mcal/cm-s-°C)	4.53



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 4	8

Depth: 501.5 to 502.0 m

Visual Description

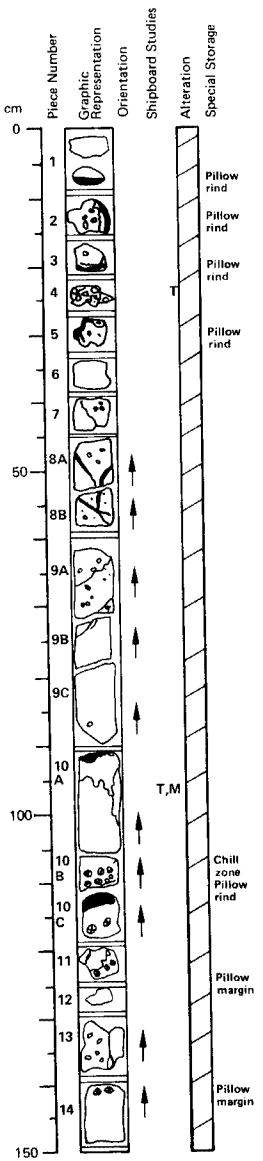
Slightly vesicular, gray, aphyric fine-grained basalts. Glassy rinds (and chill margins) on Pieces: 5, 25-31 cm; 6, 32-36 cm; and 8, 43-46 cm.

Besicles approximately 10%, 4-8% < 1 mm.

Carbonate lined and weathered fracture surfaces on Pieces 4 (18-24 cm) and 5 (25-31 cm).

Weathering gives greenish tinge to clay and carbonate lining and infilling of some vesicles.

Some alteration of glassy rinds to palagonite.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5	1

Depth: 501.0 to 502.5 m

Visual Description

Aphyric pillow basalt. Microphenocrysts (incipient groundmass crystallization of feldspar in aphanitic groundmass near pillow rinds. Fine-grained microphyric basalt in pillow interiors 25% plagioclase microphenocrysts. Vesicular 1-5% , calcite veins common, carbonate infillings of vesicles ~1%.

Piece 4 carbonate cemented intraformational limestone, palagonite fragments and chert?

Thin Section Description — 99 cm

Phenocrysts: olivine 1%, ~.5 mm, idioblastic, replaced 100% by calcite.

Groundmass: plagioclase 40%, .5-1.0 mm, $>An_{65}$*, lathes, *albitetroin; clinopyroxene 25%, 0.1-1.0 mm, quench feathers and granules; magnetite 3%, .01-.1 mm euhedra and anhedra.

Vesicles: 10%, .1-1.0, 20% calcite filling.

Texture: intersertal.

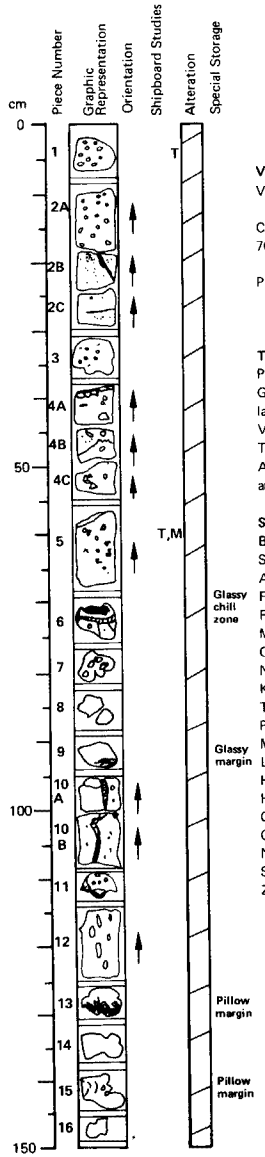
Alteration: 5% carbonate in groundmass, replacing groundmass and olivine microphenocrysts; 20% clays intergranular , replacing groundmass.

Shipboard Data

Bulk Analysis:	81 cm	104 cm	145 cm
SiO_2	49.95	49.26	49.51
Al_2O_3	13.19	13.15	13.20
Fe_2O_3	1.35	1.31	1.33
FeO	8.97	8.66	8.80
MgO	8.28	8.83	2.61
CaO	11.44	11.95	11.56
Na_2O	3.02	2.84	2.95
K_2O	0.45	0.42	0.40
TiO_2	1.57	1.51	1.60
P_2O_5	0.16	0.16	0.15
MnO	0.13	0.14	0.14
LOI	—	—	—
H_2O^+	—	—	—
H_2O^-	—	—	—
CO_2	—	—	—
Cr	244.00	252.00	241.00
Ni	80.00	111.00	98.00
Sr	178.00	170.00	168.00
Zr	118.00	117.00	120.00

Magnetic Data:	99 cm
Intensity (emu/cc)	208.2
Inclination before demag.	71.5
Stable Inclination	72.4

Physical Properties:	77 cm
$\bar{V}p$ (km/s)	4.00
Porosity (%)	22.63
Wet Bulk Density	2.51
Grain Density	2.95



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5	2

Depth: 502.5 to 504.0 m

Visual Description

Vesicular aphyric pillow basalt. Vesicles 3-15%, mostly fine, some coarse vugs up to 7 mm. Pipe vesicles at 115-124 cm. Fragment No. 1 most vesicular piece.

Carbonate veins up to 3 mm thick and quite common.

76-82 cm: carbonate cemented intraformational breccia with bits of palagonite and possibly chert? and pieces of limestone.

Pillow rinds common. Basalt generally aphyric but some is glomeroporphyritic with small (2 mm - 1 mm) glomerocrysts of plagioclase lathes in an aphanitic groundmass (Pieces 4, 6, 7, and 12). 28 cm piece has strings of feldspar laths.

Thin Section Description — 0 cm

Phenocrysts: olivine 3%, 0.2-1.0 mm, Fo_{87-85}, euhedral, microphenocrysts.

Groundmass: olivine 3%, partially replaced by iddingsite; plagioclase 25%, .1-.7 mm, $>An_{65}$*, laths, *albite; clinopyroxene 25%; magnetite 2%, .01-.1 mm, euhedra and anhedra.

Vesicles: 20%, .1-.5 mm, clays and calcite filling.

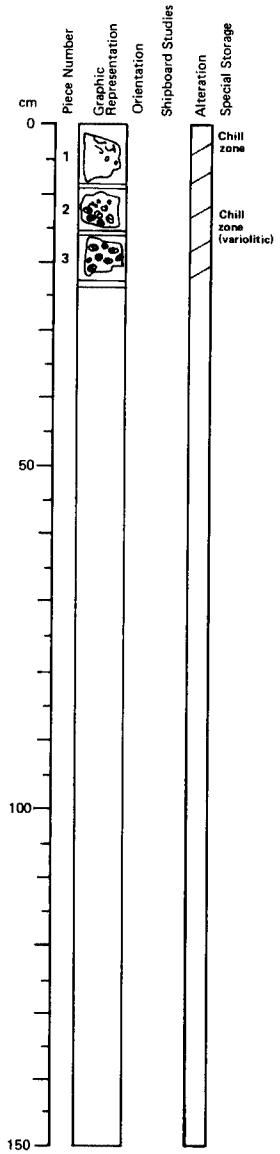
Texture: intersertal.

Alteration: 15% clays in groundmass and vesicles replacing groundmass; carbonate in vesicles and olivine.

Shipboard Data

Bulk Analysis:	115 cm
SiO_2	49.47
Al_2O_3	12.93
Fe_2O_3	1.31
FeO	8.62
MgO	9.24
CaO	11.67
Na_2O	2.91
K_2O	0.37
TiO_2	1.55
P_2O_5	0.15
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	234.00
Ni	124.00
Sr	167.00
Zr	116.00

Magnetic Data:	60 cm
Intensity (emu/cc)	174.9
Inclination before demag.	72.7
Stable Inclination	74.5



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

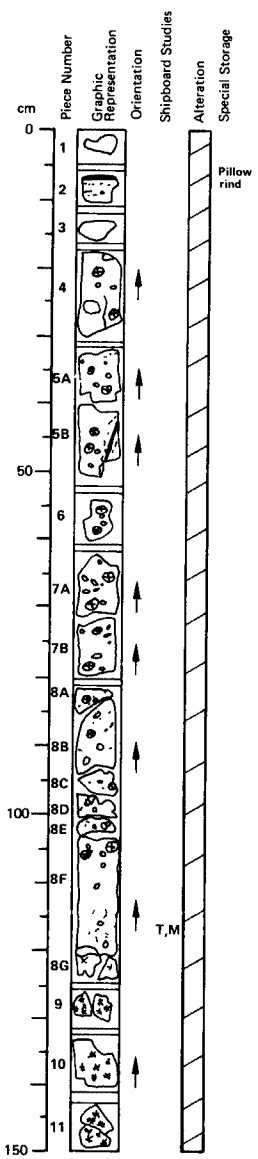
LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 5	3

Depth: 504.0 to 504.2 m

Visual Description

Variolitic aphyric basalt. Calcite filled amygdules 3% measuring up to 6 mm. Vesicles fine to medium 3-5%, fine-grained to aphanitic.

Part of pillow sequence. Fragment 2 - plagioclase microglomerocrysts make rock microglomerophyric.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 6	1

Depth: 504.5 to 506.0 m

Visual Description

0-126 cm: spherulitic basalt, variolitic, 3-5% vesicular and vugs, partially filled by calcite. Brown stained zones for 1 cm around calcite veins (Piece 5B and 8B).

Piece 8 grades from variolitic basalt into aphanitic basalt filled with acicular needles of plagioclase up to 2 mm long in an aphanitic groundmass .

* = glomerocryst made up of fine plagioclase needles (spherulites).

126-150 cm: glomerophenocrystal basalt. Glomerocrysts of acicular plagioclase needles ~2 mm across, 5% vesicular.

Thin Section Description – 117 cm

Groundmass: plagioclase 30%, .01-1.0 mm; clinopyroxene 25%, .01-1.5 mm, granules and quench; magnetite 3%, .01-.1; other 30% grundge.

Vesicles: 7%, .1-1.5 mm, calcite or larger.

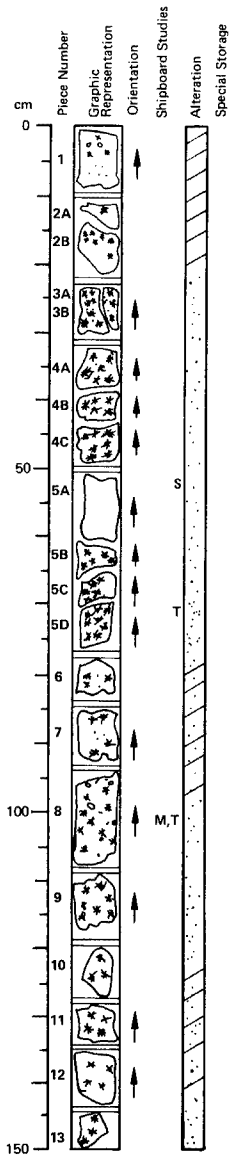
Texture: intersertal.

Alteration: 4% carbonate mostly vesicles, some groundmass.

Shipboard Data

Bulk Analysis:	**112 cm**
SiO_2	49.79
Al_2O_3	12.10
Fe_2O_3	1.29
FeO	8.55
MgO	10.21
CaO	11.28
Na_2O	2.90
K_2O	0.46
TiO_2	1.43
P_2O_5	0.15
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	278.00
Ni	156.00
Sr	162.00
Zr	109.00

Magnetic Data:	**117 cm**	
Intensity (emu/cc)	709.6	
Inclination before demag.	60.0	
Stable Inclination	59.9	
Other Data:	**61 cm**	**105 cm**
Therm. cond. (mcal/cm-s-°C)	3.26	3.33



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			5	6		2

Depth: 506.0 to 507.5 m

Visual Description

Breaks in section (not chill zones) at 23 and 77 cm.

Fine-grained sphenultitic basalt; radiating acicular plagioclase needles in 2 mm clusters give rock a spotted appearance, groundmass aphanitic 2-10% vesicules, a few vugs.

Calcite present only in small amounts as vesicle filling in top 1/3 of core.

77-150 cm: rock grades from a few spherulites ~5% to ~30% spherulites at base.

Thin Section Description – 60 cm

Phenocrysts: olivine 4%, 0.1-0.5 mm, euhedral, replaced 100% by calcite.

Groundmass: plagioclase 55%, groundmass microlites; other grundge remainder.

Vesicles: 25%, .05-1.0 mm.

Texture: intersertal.

Alteration: 4% carbonate replacing olivine microphenos.

Thin Section Description – 68 cm

Groundmass: plagioclase 40%, .1-5.0 mm, $>An_{73}$*, acicular needles and laths, *albite hour glass zoning; clinopyroxene 30%, .01-.5 mm, granules and microlites; magnetite 2-3%.

Vesicles: 25%, .2-2.0 mm, irregular to round.

Texture: intersertal.

Alteration: 3% carbonate, some vugs and some groundmass.

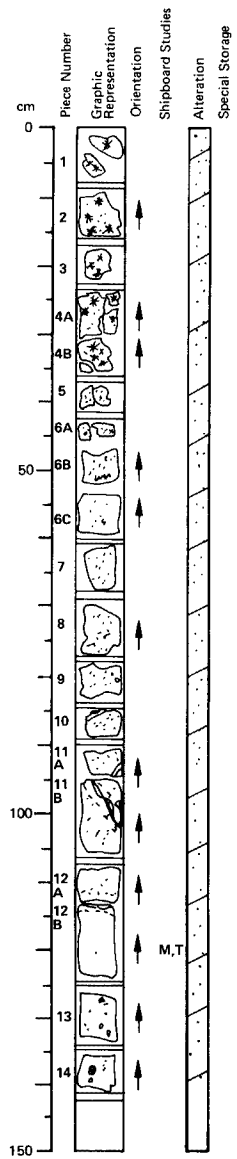
Shipboard Data

Bulk Analysis:	**103 cm**
SiO_2	48.89
Al_2O_3	13.75
Fe_2O_3	1.21
FeO	7.98
MgO	7.54
CaO	14.02
Na_2O	2.92
K_2O	0.28
TiO_2	1.56
P_2O_5	0.16
MnO	0.13
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	219.00
Ni	86.00
Sr	176.00
Zr	122.00

Magnetic Data:	**100 cm**
Intensity (emu/cc)	110.1
Inclination before demag.	60.2
Stable Inclination	58.2

Physical Properties:	**49 cm**
$\bar{V}p$ (km/s)	3.94
Porosity (%)	27.07
Wet Bulk Density	2.46
Grain Density	3.00

Other Data:	**49 cm**	**94 cm**
Therm. cond. (mcal/cm-s-°C)	3.35	3.27



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			5	6		3

Depth: 507.5 to 508.9 m

Visual Description

Plagioclase spherulitic basalt grading into plagioclase microphyric basalt in a single unit which started in the preceding section (Section 2, 77 cm). Acicular plagioclase spherulites at top grading downward into randomly oriented acicular plagioclase lathes in an aphanitic groundmass.

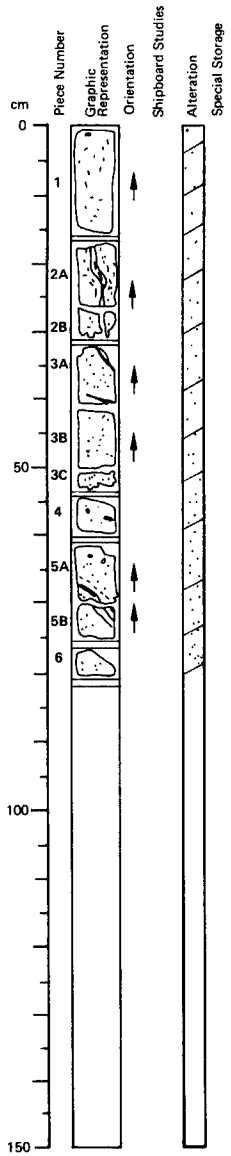
Calcite veins have iron-oxide stain for a 1 to 1 1/2 cm zone around them. Calcite amygdules common from 125-142 cm.

Shipboard Data

Bulk Analysis:	**113 cm**
SiO_2	50.18
Al_2O_3	13.89
Fe_2O_3	1.29
FeO	8.52
MgO	7.47
CaO	11.48
Na_2O	3.29
K_2O	0.54
TiO_2	1.97
P_2O_5	0.18
MnO	0.14
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	213.00
Ni	54.00
Sr	167.00
Zr	131.00

Magnetic Data:	**120 cm**
Intensity (emu/cc)	53.3
Inclination before demag.	58.1
Stable Inclination	63.9

Other Data:	**97 cm**	**115 cm**
Therm. cond. (mcal/cm-s-°C)	3.51	3.64



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 6	4

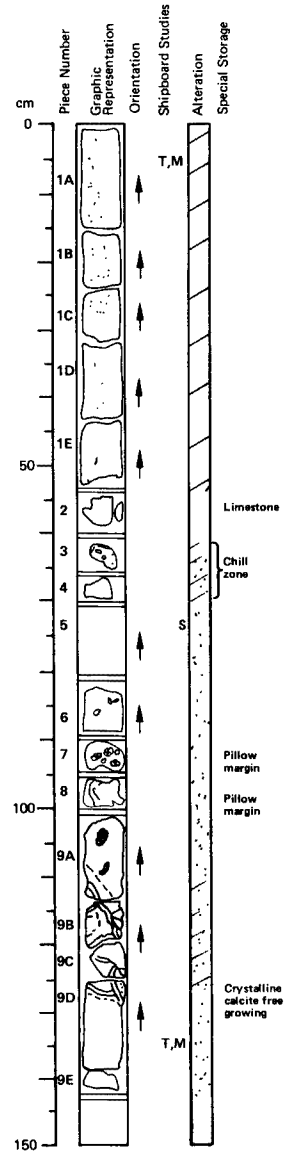
Depth: 508.9 to 509.7 m

Visual Description

Aphyric vesicular basalt – contamination of unit in previous section. Vesicules range from 2-7% depending on degree of weathering and extent of infilling to form amygdules. Piece 2 contains a 3-4 mm wide calcite vein with open space at its center with free growing crystalline calcite. Both veins in Pieces 2 and 5 have 1 cm oxidized zone at peripherying of calcite in the basalt.

Shipboard Data

Other Data:	**0 cm**
Therm. cond. (mcal/cm-s-°C)	3.48



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 7	1

Depth: 510.5 to 511.9 m

Visual Description

0-52 cm: aphyric massive basalt – end of massive basalt unit found in Core 56. 0-10% vesicles depending on amount.

54-60 cm: limestone and chalk (lithified nannofossil ooze), 1 fragment chalk, 1 fragment of lithographic limestone. Mn dendrites in largest chunk.

61-142 cm: aphyric pillow basalt, grades from massive glass zones up to 4 cm thick into variolitic basalt and then into aphyric pillow basalts filled with plagioclase spherulites and random microphenocrysts. Similar (except for massive glass zones to basalt in Cores 55 and 56. Vesicularity ~1-2%.

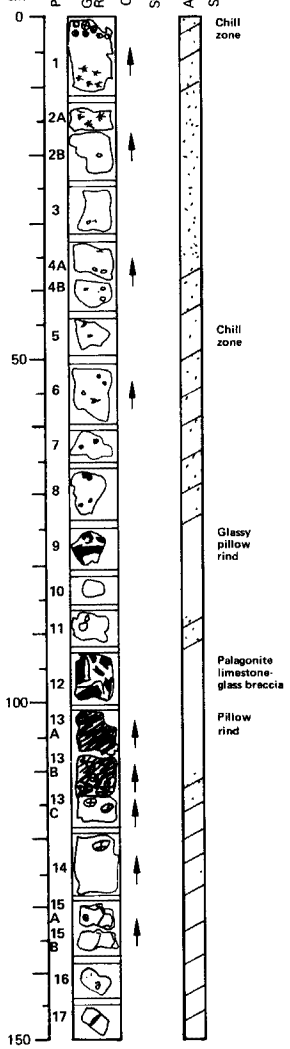
0-52 cm: moderate weathering.

61-142 cm: light to moderate weathering and alteration (two are hard to separate). Oxidized zones around veins.

Shipboard Data

Bulk Analysis:	**129 cm**
SiO_2	49.61
Al_2O_3	13.21
Fe_2O_3	1.30
FeO	8.60
MgO	8.48
CaO	11.75
Na_2O	3.12
K_2O	0.39
TiO_2	1.64
P_2O_5	0.17
MnO	0.14
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	228.00
Ni	103.00
Sr	171.00
Zr	122.00

Magnetic Data:	**6 cm**	**134 cm**
Intensity (emu/cc)	16.5	65.8
Inclination before demag.	51.8	65.9
Stable Inclination	53.2	—
Physical Properties:	**70 cm**	
Vp (km/s)	4.45	
Porosity (%)	20.61	
Wet Bulk Density	2.59	
Grain Density	3.01	
Other Data:	**0 cm**	**125 cm**
Therm. cond. (mcal/cm-s-°C)	3.63	3.58



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 7	2

Depth: 511.9 to 513.4 m

Visual Description

Aphyric pillow basalts. Massive glass chill zones up to 7 cm thick -- aphyric -- grading into variolitic glass into variolitic basalt into variolitic glass into variolitic basalt into spherulitic (plagioclase) basalt (10-42 cm).

78 cm and 95-100 cm: limestone cemented pillow rind breccia -- palagonitized margins on glass.

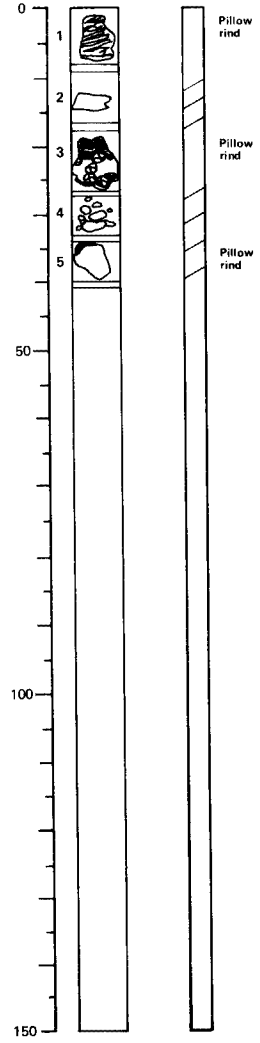
Carbonate-filled amygdules common.

Lightly weathered near glass (which is fresh) to moderately weathered (altered) elsewheres -- particularly near carbonate veins.

Shipboard Data

Bulk Analysis:	8 cm	109 cm
SiO_2	50.12	49.59
Al_2O_3	13.75	13.11
Fe_2O_3	1.28	1.36
FeO	8.47	9.00
MgO	7.66	7.26
CaO	12.29	12.37
Na_2O	3.08	2.87
K_2O	0.45	0.55
TiO_2	1.64	1.65
P_2O_5	0.15	0.15
MnO	0.14	0.18
LOI	---	---
H_2O^+	---	---
H_2O^-	---	---
CO_2	---	---
Cr	237.00	222.00
Ni	92.00	90.00
Sr	166.00	159.00
Zr	124.00	123.00

Magnetic Data:	125 cm
Intensity (emu/cc)	209.2
Inclination before demag.	53.1
Stable Inclination	54.0



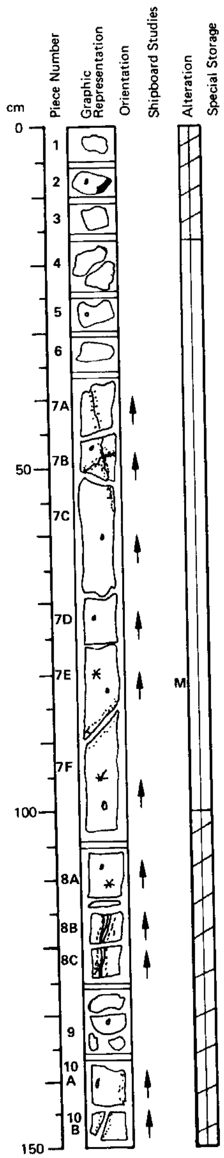
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 7	3

Depth: 513.4 to 513.8 m

Visual Description

Aphyric pillow basalt with thick glass rinds 0-7% vesicles. Some palagonitization of glass.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE				HOLE	CORE		SECT.
5	8	4	4	3			5	8	1

Depth: 520.0 to 521.5 m

Visual Description

0-24 cm: pillow lava, aphyric, yellow gray, altered. Vesicles 1-2%, <1 mm, but some up to 3 mm.

24-150 cm: interior part the same flow.

24-80 cm: basalt aphyric, dense, yellow gray, vesicles <5 mm, 1-2%.

80-150 cm: basalt, aphyric, fine-grained dark gray. Vesicles <1%, but 3 mm and less. Entire section has calcite veins with hydrooxide of iron.

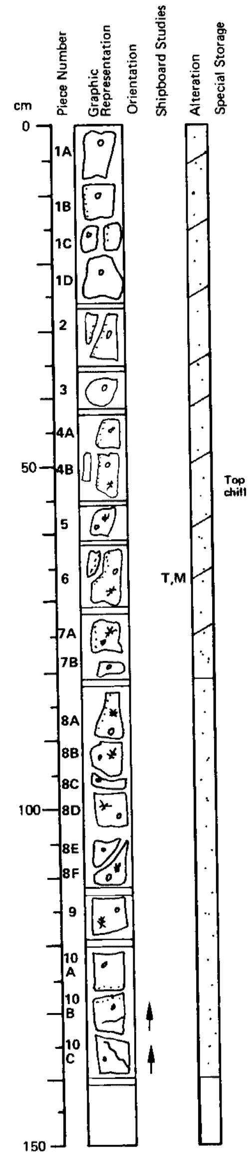
70-120 cm: rare spherulites of plagioclase, 1-2%, up to 5-7 mm.

Shipboard Data

Bulk Analysis:	**58 cm**	**94 cm**
SiO_2	49.95	50.31
Al_2O_3	13.96	14.26
Fe_2O_3	1.28	1.24
FeO	8.43	8.18
MgO	7.93	7.91
CaO	11.13	11.09
Na_2O	3.29	3.42
K_2O	0.48	0.56
TiO_2	1.82	1.84
P_2O_5	0.16	0.18
MnO	0.14	0.14
LOI	--	--
H_2O^+	--	--
H_2O^-	--	--
CO_2	--	--
Cr	233.00	227.00
Ni	79.00	62.00
Sr	168.00	175.00
Zr	124.00	138.00

Magnetic Data:	**61 cm**
Intensity (emu/cc)	306.2
Inclination before demag.	65.5
Stable Inclination	64.6

Other Data:	**82 cm**
Therm. cond. (mcal/cm-s-°C)	3.57



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE				HOLE	CORE		SECT.
5	8	4	4	3			5	8	2

Depth: 521.5 to 522.9 m

Visual Description

0-55 cm: basalt identical to that described at the base of Core 58, Section 1. Vesicles 10-15%, <1 mm.

55-70 cm: chill zone of next lava flow (rim glass is absent). Basalt aphyric, dense, yellow gray. Vesicles 2-3%, 1-2 mm.

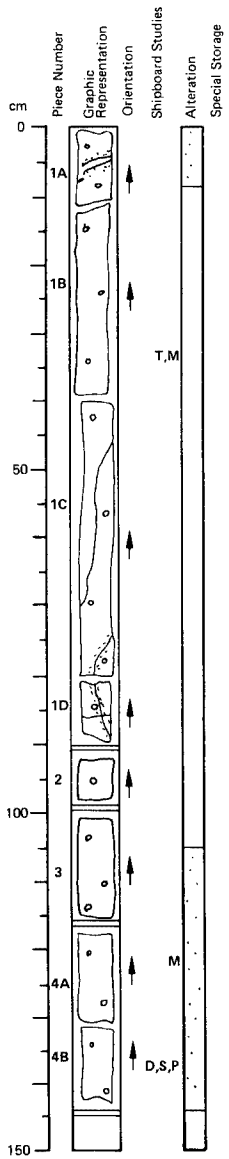
70-140 cm: basalt aphyric fine-grained dark gray, slightly altered. Vesicles 10-15%, <1 mm partly filled with calcite and clay.

50-120 cm: spherulites of plagioclase 1-2%, up to 5 mm. Vein with calcite and chlorite(?).

Shipboard Data

Bulk Analysis:	**99 cm**
SiO_2	50.69
Al_2O_3	14.38
Fe_2O_3	1.20
FeO	7.95
MgO	8.84
CaO	10.74
Na_2O	3.57
K_2O	0.26
TiO_2	1.76
P_2O_5	0.17
MnO	0.10
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	225.00
Ni	73.00
Sr	178.00
Zr	126.00

Magnetic Data:	**67 cm**
Intensity (emu/cc)	254.4
Inclination before demag.	72.2
Stable Inclination	72.8



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	3		5	8		3

Depth: 522.9 to 524.3 m

Visual Description

0-143 cm: basalt identical to that at the base of Section 2 (Core 58).
0-12 cm and 105-143 cm: basalt aphyric fine-grained, dark gray. Vesicles about 10%, < 1 mm, filled with calcite and clay.
12-105 cm: basalt, aphyric, medium- to coarse-grained (plagioclase up to 4 mm), dark gray, dense. Alteration occurs close to calcite vein (70-90 cm).

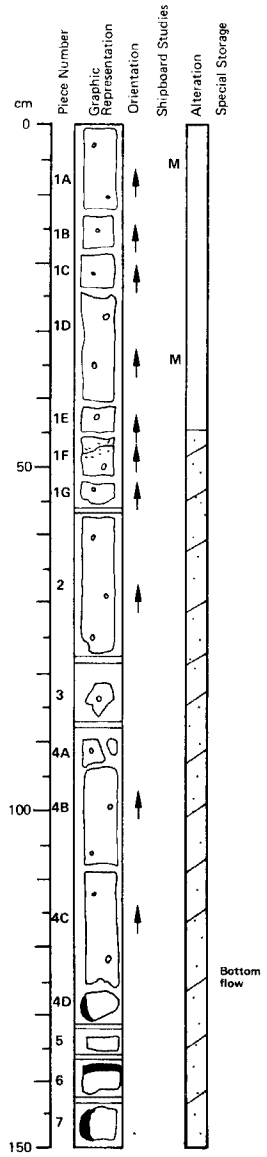
Shipboard Data

Bulk Analysis:	**29 cm**
SiO_2	47.07
Al_2O_3	9.64
Fe_2O_3	1.57
FeO	10.36
MgO	18.53
CaO	7.44
Na_2O	1.94
K_2O	0.23
TiO_2	1.39
P_2O_5	0.13
MnO	0.17
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	428.00
Ni	405.00
Sr	97.00
Zr	96.00

Magnetic Data:	**34 cm**	**121 cm**
Intensity (emu/cc)	232.7	440.4
Inclination before demag.	77.2	69.6
Stable Inclination	76.1	73.6

Physical Properties:	**137 cm**
$\overline{V}p$ (km/s)	3.82
Porosity (%)	19.59
Wet Bulk Density	2.60
Grain Density	2.99

Other Data:	**120 cm**	**114 cm**
Therm. cond. (mcal/cm-s-°C)	3.63	3.77



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	3		5	8		4

Depth: 524.3 to 525.9 m

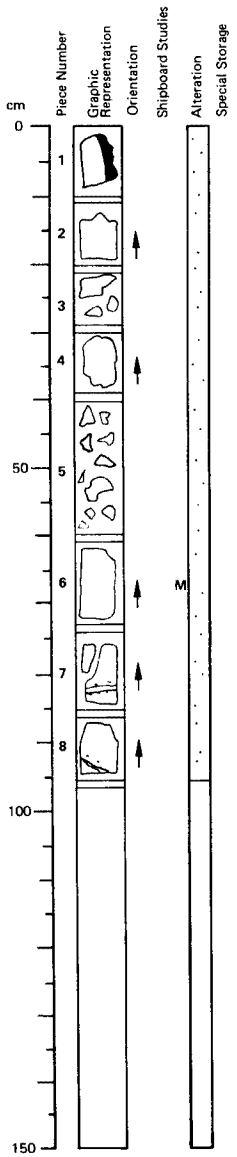
Visual Description

0-125 cm: basalt identical to that at the base of Section 3 (Core 58). Basalt aphyric, fine-grained. Vesicles about 10%. Mn sample Piece 1C: a pipe vesicle occurs (only one) 2 x 20 mm.
0-45 cm: fresh basalt, dark gray.
45-125 cm: basalt is altered, greenish gray. Vesicles partly are filled with clay (25-125 cm).
125-150 cm: pillow lava with glass rim. Basalt dense. Close to rim color is greenish-gray, 3 cm in from rim color is gray. Very rare phenocryst of plagioclase (1 mm).

Shipboard Data

Bulk Analysis:	**30 cm**
SiO_2	51.03
Al_2O_3	13.33
Fe_2O_3	1.23
FeO	8.12
MgO	11.55
CaO	9.27
Na_2O	3.28
K_2O	0.30
TiO_2	1.86
P_2O_5	0.19
MnO	0.10
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	246.00
Ni	115.00
Sr	154.00
Zr	138.00

Magnetic Data:	**6 cm**	**34 cm**
Intensity (emu/cc)	282.6	273.0
Inclination before demag.	69.4	71.0
Stable Inclination	--	71.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 8	5

Depth: 525.8 to 526.8 m

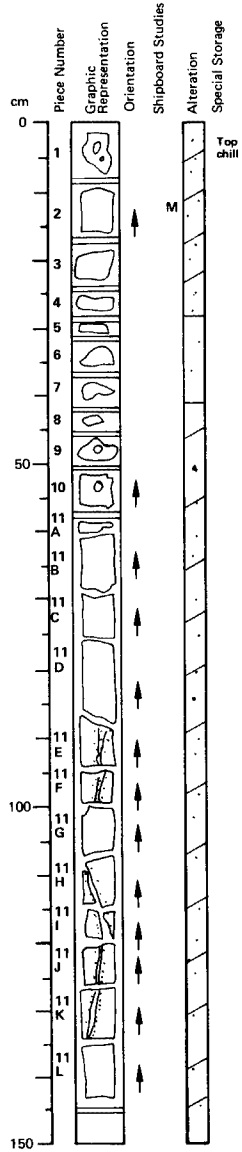
Visual Description

0-10 cm: the same pillow lava as at the base of Section 4 (Core 58) . It is the upper part of the flow.

10-95 cm: bottom part the same lava flow. Basalt, dense (10-45) and fine-grained (45-95 cm), dark gray, aphyric. Alteration close to calcite. Vein is very slight.

Shipboard Data

Magnetic Data:	**69 cm**
Intensity (emu/cc)	41.2
Inclination before demag.	–51.9
Stable Inclination	–50.2



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 9	1

Depth: 529.5 to 530.9 m

Visual Description

0-8 cm: basalt of top chill zone. Aphyric, dense, gray, with large open vesicles (1-3 cm).

8-144 cm: basalt, aphyric, dense, brown gray.

Calcite vein without alteration (with slight alteration).

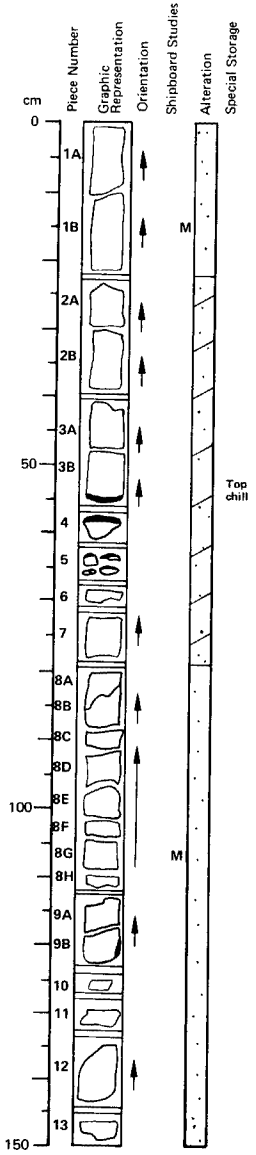
28-41 cm: sedimentary carbonate.

Alteration is weathering.

Shipboard Data

Bulk Analysis:	**71 cm**	**129 cm**
SiO_2	49.68	49.86
Al_2O_3	15.19	15.71
Fe_2O_3	1.25	1.22
FeO	8.24	8.03
MgO	6.69	7.82
CaO	13.05	12.18
Na_2O	3.11	3.17
K_2O	0.34	0.37
TiO_2	1.30	1.22
P_2O_5	0.11	0.11
MnO	0.18	0.17
LOI	--	--
H_2O^+	--	--
H_2O^-	--	--
CO_2	--	--
Cr	286.00	285.00
Ni	92.00	100.00
Sr	173.00	165.00
Zr	90.00	88.00

Magnetic Data:	**12 cm**
Intensity (emu/cc)	72.0
Inclination before demag.	53.8
Stable Inclination	46.1



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 9	2

Depth: 530.9 to 532.4 m

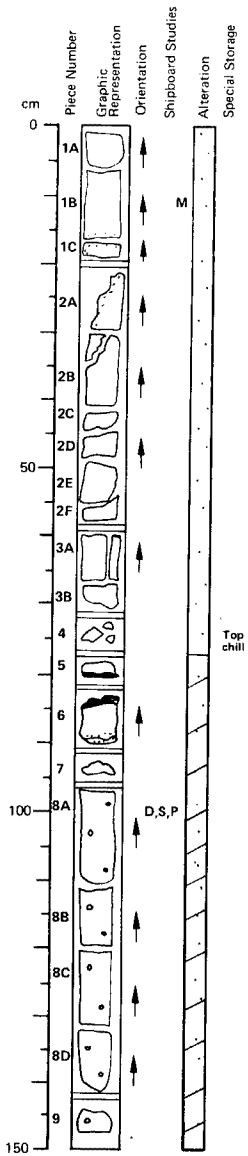
Visual Description

0-22 cm: basalt similar to that at the bottom of Section 1 (Core 59), but more fresh.
22-55 cm: chill zone of the same basalt flow. Basalt dense, aphyric, greenish-gray, vesicles 1-2%, <1 mm, filled with calcite. In the bottom of flow glass occurs (Piece 3B).
55-150 cm: next lava flow.
55-67 cm: pillow lava zone.
67-150 cm: basalt flow, dark gray, aphyric, very fine-grained.

Shipboard Data

Bulk Analysis:	15 cm	91 cm
SiO_2	49.68	49.86
Al_2O_3	15.19	15.71
Fe_2O_3	1.25	1.22
FeO	8.24	8.03
MgO	6.69	7.82
CaO	13.05	12.18
Na_2O	3.11	3.17
K_2O	0.34	0.37
TiO_2	1.30	1.22
P_2O_5	0.11	0.11
MnO	0.18	0.17
LOI	—	—
H_2O^+	—	—
H_2O^-	—	—
CO_2	—	—
Cr	291.00	294.00
Ni	104.00	108.00
Sr	149.00	156.00
Zr	91.00	84.00

Magnetic Data:	15 cm	106 cm
Intensity (emu/cc)	75.2	80.2
Inclination before demag.	35.4	−47.0
Stable Inclination	52.9	−51.1
Other Data:	**14 cm**	
Therm. cond. (mcal/cm-s-° C)	4.30	



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 9	3

Depth: 532.4 to 533.9 m

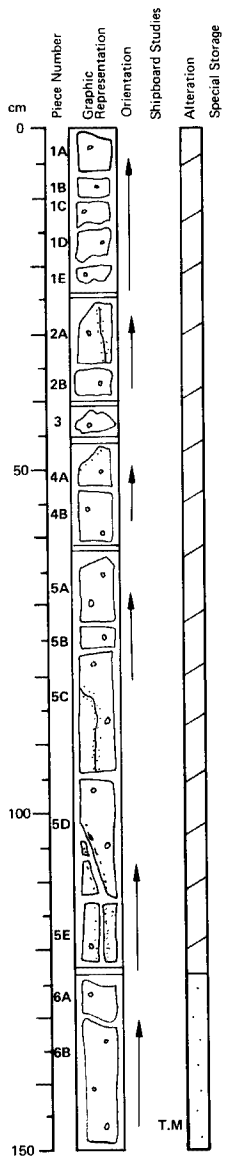
Visual Description

0-20 cm: basalt similar to that at the bottom (base) of Section 2 (Core 59).
20-76 cm: the same lava flow but basalt is dense, phyric, yellow gray, alteration close calcite vein is low.
76-150 cm: next lava flow.
76-90 cm: chill margin (top) of lava flow with rims of glass.
90-150 cm: basalt, fine-grained, aphyric, greenish-gray, vesicular. Vesicles 10-15%, <2 mm, filled with calcite. Alteration moderate.

Shipboard Data

Bulk Analysis:	4 cm	101 cm
SiO_2	49.90	49.85
Al_2O_3	15.71	15.18
Fe_2O_3	1.18	1.19
FeO	7.79	7.88
MgO	9.48	9.05
CaO	11.69	11.78
Na_2O	3.11	3.18
K_2O	0.13	0.27
TiO_2	1.25	1.29
P_2O_5	0.09	0.09
MnO	0.13	0.13
LOI	—	—
H_2O^+	—	—
H_2O^-	—	—
CO_2	—	—
Cr	297.00	301.00
Ni	113.00	145.00
Sr	154.00	150.00
Zr	87.00	91.00

Magnetic Data:	12 cm
Intensity (emu/cc)	44.2
Inclination before demag.	−6.5
Stable Inclination	−53.6
Physical Properties:	**98 cm**
$\bar{V}p$ (km/s)	5.22
Porosity (%)	8.24
Wet Bulk Density	2.84
Grain Density	3.00
Other Data:	**136 cm**
Therm. cond. (mcal/cm-s-° C)	4.08



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 9	4

Depth: 533.9 to 534.4 m

Visual Description

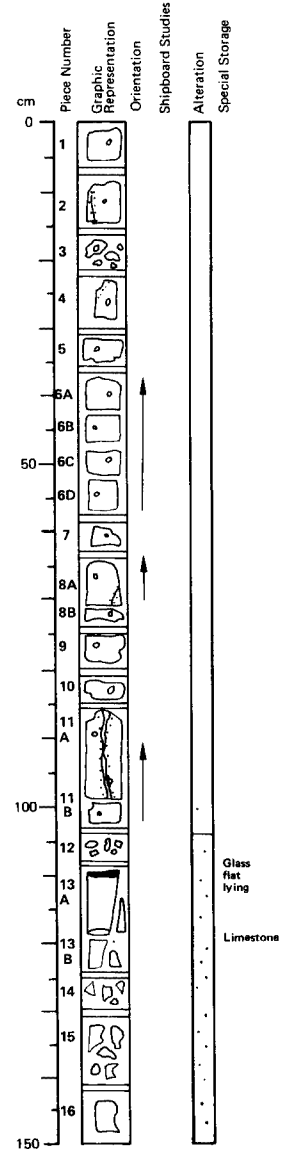
0-150 cm: basalt identical to that at the base of Section 3 (Core 59). Basalt, aphyric, fine-grained, vesicular. Vesicles 10-15%, <3 mm filled calcite and clay.

0-123 cm: basalt is weathered.

Shipboard Data

Bulk Analysis:	**138 cm**
SiO_2	49.22
Al_2O_3	14.96
Fe_2O_3	1.14
FeO	7.50
MgO	10.62
CaO	11.87
Na_2O	3.07
K_2O	0.10
TiO_2	1.28
P_2O_5	0.09
MnO	0.12
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	291.00
Ni	124.00
Sr	200.00
Zr	90.00

Magnetic Data:	**142 cm**
Intensity (emu/cc)	37.9
Inclination before demag.	38.7
Stable Inclination	52.5
Other Data:	**138 cm**
Therm. cond. (mcal/cm-s-°C)	4.13



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		5 9	5

Depth: 534.4 to 535.9 m

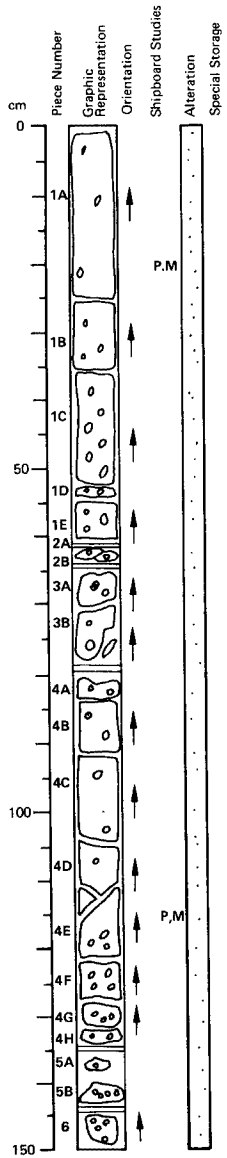
Visual Description

0-150 cm: basalt identical to that at the base of Section 4 (Core 59). Basalt, aphyric, fine-grained, vesicular. Vesicles 15%, <2 mm filled with clay minerals.

108-150 cm: chill zone of this flow. Basalt dense, vesicularity is less (about 2%). Basalt is weathered.

Shipboard Data

Bulk Analysis:	**65 cm**
SiO_2	49.79
Al_2O_3	15.72
Fe_2O_3	1.11
FeO	7.34
MgO	10.37
CaO	11.59
Na_2O	3.09
K_2O	0.33
TiO_2	1.27
P_2O_5	0.09
MnO	0.13
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	311.00
Ni	140.00
Sr	151.00
Zr	87.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 0	1

Depth: 539.0 to 540.5 m

Visual Description

Gray, aphyric, medium-grained (approximately 0.5 mm to 1 mm) basalt, containing pyroxene and plagioclase.

Amygdules filled by talc/chlorite/smectite type mineral and pyrite grains. Talc/smectite material and pyrite grains also line fractures at 26 cm (between Piece 1A and 1B) and at 110 cm (between Piece 1D and 1E).

Amygdules approximately 15-30% (1 mm - 10 mm across).

Very different from previous core.

Also white crystalline octahedral shaped mineral and white cylindrical (wire-like) mineral in some amygdules (zeolites?).

Thin Section Description – 112 cm

Phenocrysts: Spinel, 0.02 mm, light spinel square grain, 1 grain seen in olivine.

Groundmass: olivine 15%, 0.02-0.4 mm, anhedral; plagioclase 33%, 0.05-2.0 mm, laths, larger laths zoned; clinopyroxene: 20%, 0.02-0.8 mm, augite, anhedral; magnetite 5%, 0.01-0.2 mm, granular; other 25% cryptocrystalline matrix.

Vesicles: 2%, 0.02-0.1 and 0.7-2.0 mm

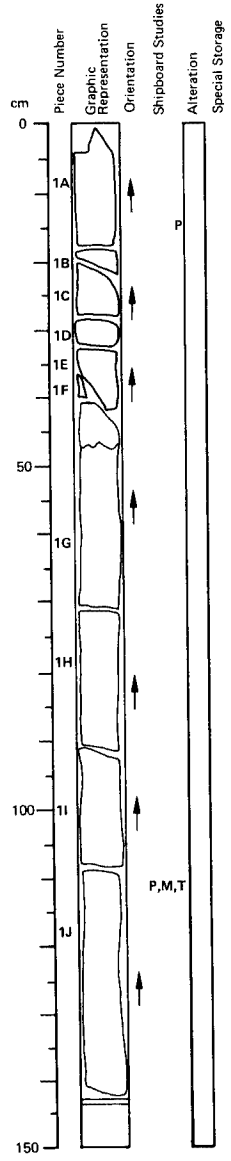
Texture: intersertal.

Shipboard Data

Bulk Analysis:	21 cm	80 cm
SiO_2	48.99	49.41
Al_2O_3	14.89	14.87
Fe_2O_3	1.18	1.20
FeO	7.79	7.94
MgO	11.29	11.21
CaO	10.96	10.72
Na_2O	3.00	3.10
K_2O	0.09	0.11
TiO_2	1.21	1.25
P_2O_5	0.09	0.09
MnO	0.16	0.16
LOI	—	—
H_2O^+	—	—
H_2O^-	—	—
CO_2	—	—
Cr	293.00	303.00
Ni	122.00	124.00
Sr	142.00	144.00
Zr	85.00	91.00

Magnetic Data:	15 cm	111 cm
Intensity (emu/cc)	75.1	95.6
Inclination before demag.	62.0	43.9
Stable Inclination	49.5	51.0

Other Data:	0 cm
Therm. cond. (mcal/cm-s-°C)	4.46



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 0	2

Depth: 540.5 to 541.9 m

Visual Description

Gray, aphyric, medium-grained (approximately 0.5 mm - 1 mm) basalt containing pyroxene and plagioclase.

0-42 cm: 25% amydules filled by green gray or white talc/chlorite/smectite material. Similar material lines vein between 33 and 53 cm. Plus some fine pyrite above section similar to previous core except no pyrite seen in amygdules.

42-150 cm: gray, aphyric, medium-grained basalt as above but virtually no amygdules except around vein at 46 cm.

Thin Section Description – 111 cm

Groundmass: olivine 20%, 0.2-0.6 mm, anhedral; plagioclase 45%, 0.1-2.0 mm, laths; magnetite 5%, 0.02-0.1 mm, granular; other 30% cryptocrystalline matrix including acicular pyroxene.

Texture: intersertal.

Alteration: other in groundmass replacing olivine?, talc, ?fibrous.

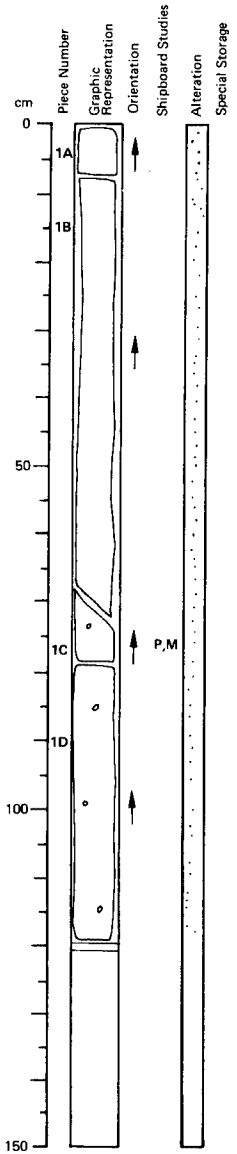
Shipboard Data

Bulk Analysis:	106 cm
SiO_2	49.28
Al_2O_3	14.94
Fe_2O_3	1.22
FeO	8.08
MgO	10.41
CaO	11.13
Na_2O	2.89
K_2O	0.11
TiO_2	1.26
P_2O_5	0.10
MnO	0.16
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	299.00
Ni	103.00
Sr	137.00
Zr	92.00

Magnetic Data:	110 cm
Intensity (emu/cc)	97.8
Inclination before demag.	36.7
Stable Inclination	47.3

Physical Properties:	8 cm
$\bar{V}p$ (km/s)	4.82
Porosity (%)	11.22
Wet Bulk Density	2.75
Grain Density	2.98

Other Data:	134 cm
Therm. cond. (mcal/cm-s-°C)	4.27



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 0	3

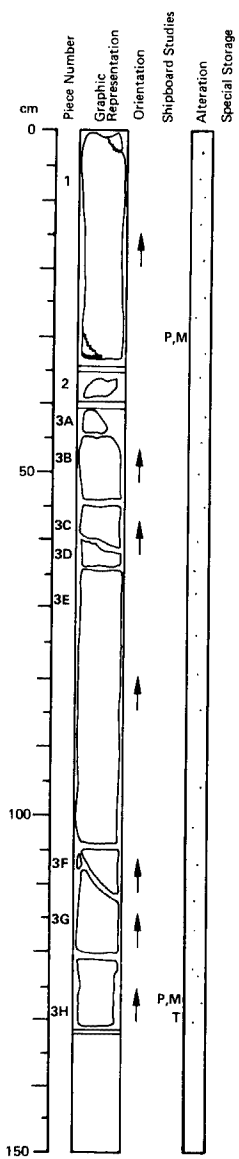
Depth: 541.9 to 543.1 m

Visual Description

Gray, medium-grained, aphyric basalt containing plagioclase and pyroxene vein between Piece 1B and 1C (66-70 cm), lined by smectite/talc/chlorite material. Below this line a small number of amygdules lined by white or greenish white material occur (approximately 1%, <2 mm across). Upper part (0-70 cm) similar to lower part of previous section. A few odd grains (very fine) of pyrite seen in some amygdules.

Shipboard Data

Magnetic Data:	**74 cm**
Intensity (emu/cc)	82.5
Inclination before demag.	50.7
Stable Inclination	51.5
Other Data:	**99 cm**
Therm. cond. (mcal/cm-s-°C)	4.39



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 0	4

Depth: 543.1 to 544.4 m

Visual Description

Gray, medium-grained (0.5 to 2 mm) aphyric basalt containing plagioclase and pyroxene (diabasic texture).

Odd amygdules filled by white or greenish white material (approximately 1%, 0.05 to 2 mm across).

Similar to previous core.

Fracture at 57-61 cm lined by greenish-white smectite/talc/chloritic material.

Fracture at 103-113 cm is lined by a similar material discolored by other alteration products

Thin Section Description – 126 cm

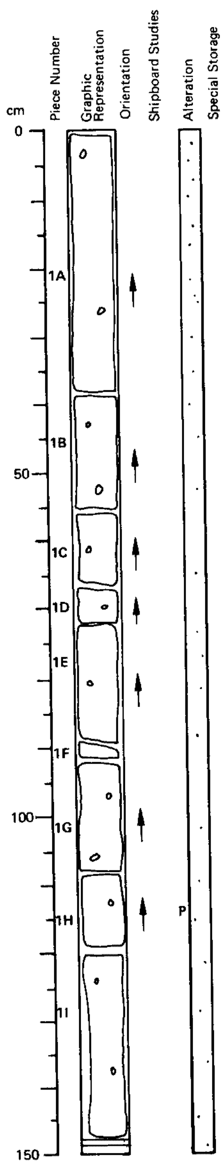
Groundmass: olivine 15%, 0.01-0.9 mm, anhedral, intergrown with plagioclase; plagioclase 35%, 0.1-2.0 mm, laths, some alignment; clinopyroxene 30%, 0.1-1.0 mm, augite, anhedral; magnetite 5%, 0.01-0.8 mm, granular; other 15%, cryptocrystalline matrix.

Texture: intersertal – intergranular.

Shipboard Data

Bulk Analysis:	**0 cm**
SiO_2	49.41
Al_2O_3	14.88
Fe_2O_3	1.21
FeO	8.01
MgO	10.39
CaO	11.41
Na_2O	2.94
K_2O	0.10
TiO_2	1.30
P_2O_5	0.04
MnO	0.17
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	305.00
Ni	96.00
Sr	147.00
Zr	90.00

Magnetic Data:	**4 cm**
Intensity (emu/cc)	72.2
Inclination before demag.	31.4
Stable Inclination	45.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE				HOLE	CORE		SECT.
5	8	4	4	3			6	0	5

Depth: 544.4 to 545.9 m

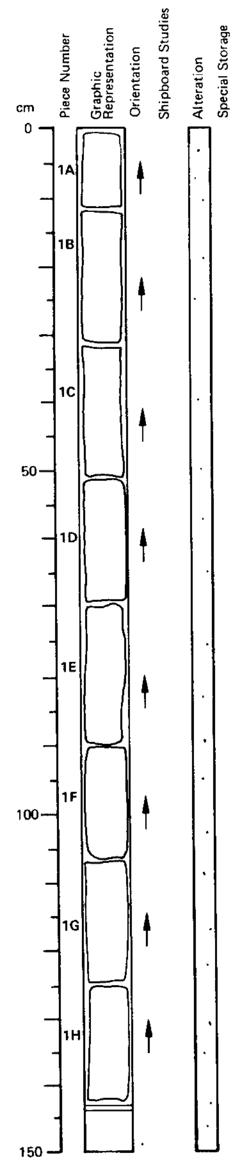
Visual Description

Gray, aphyric, medium-grained (0.5-2 mm) basalt (diabasic texture). Scattered amygdules filled by white material (generally <1 mm across, 1-3%), similar to previous section.

Vein along which rock fractured at 88 cm lined by white platey mineral and honey brown acicular crystals (rare).

Shipboard Data

Physical Properties:	**113 cm**
$\bar{V}p$ (km/s)	5.64
Porosity	2.37
Wet Bulk Density	2.89
Grain Density	2.94



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE				HOLE	CORE		SECT.
5	8	4	4	3			6	0	6

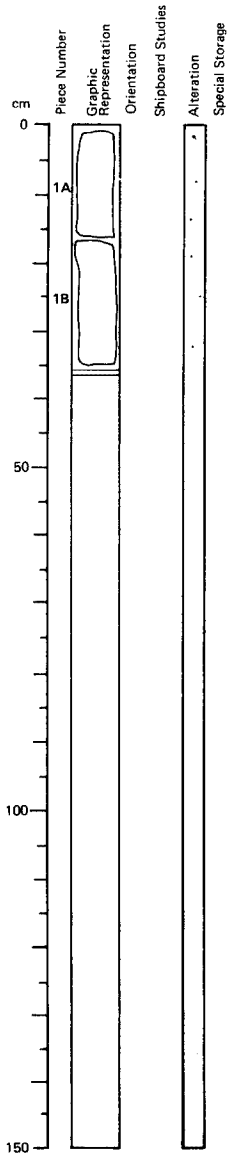
Depth: 545.9 to 547.4 m

Visual Description

Gray, aphyric, medium-grained basalt (0.5-2 mm) containing plagioclase and pyroxene. Only occasional small amygdules filled by white material (<1 mm across). Similar to previous section.

Shipboard Data

Bulk Analysis:	**104 cm**
SiO_2	48.77
Al_2O_3	15.08
Fe_2O_3	1.18
FeO	7.81
MgO	11.10
CaO	11.23
Na_2O	2.95
K_2O	0.21
TiO_2	1.16
P_2O_5	0.03
MnO	0.16
LOI	––
H_2O^+	––
H_2O^-	––
CO_2	––
Cr	299.00
Ni	147.00
Sr	172.00
Zr	82.00



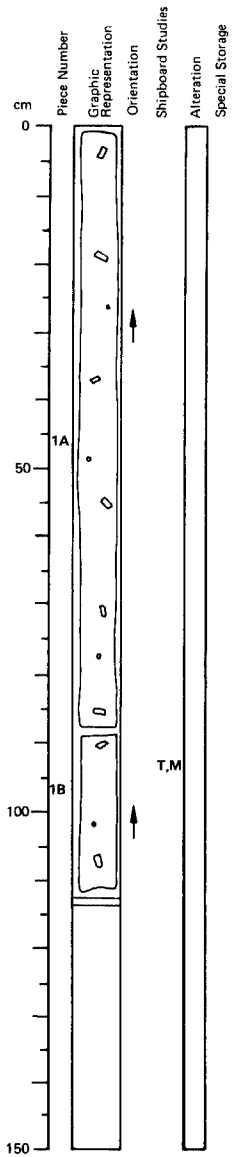
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			6	0		7

Depth: 547.4 to 547.7 m

Visual Description

Gray, aphyric, medium-grained (0.5-2 mm) containing plagioclase and pyroxene. No visible amygdules, otherwise similar to previous section.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			6	1		1

Depth: 548.5 to 549.6 m

Visual Description

Sparsely plagioclase phyric basalt -- fresh medium-gray, fine- to medium-gray basalt. Plagioclase phenocrysts are stubby lathes 1 x 2 to 2 x 5 mm, < 1% amygdules. No chill zones. Continuous with previous core.

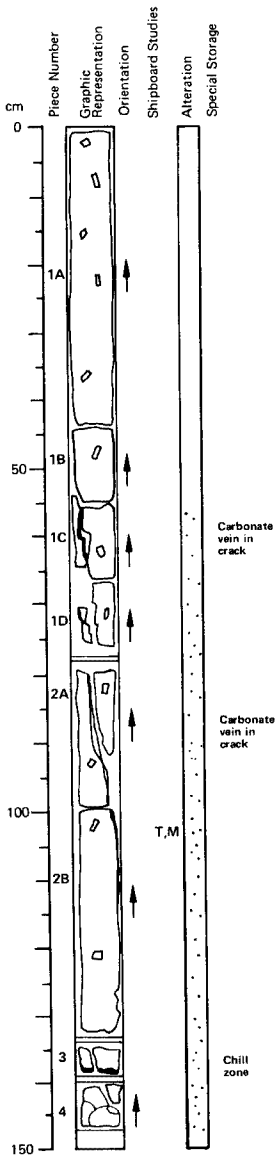
Thin Section Description -- 90 cm

Phenocrysts: spinel 0.02 to 0.03 mm, light spinel, square section, trace, few grains in olivine.
Groundmass: olivine 10%, 0.2-0.6 mm, anhedral; plagioclase 30%, 0.02-2.0 mm, laths; clinopyroxene 30%, 0.05-2.0 mm, augite, anhedral, some nucleated on acicular pyroxene; magnetite 5%, 0.02-0.3 mm, granular; other 25%, cryptocrystalline matrix, includes quenched acicular pyroxene.
Texture: intersertal -- intergranular.

Shipboard Data

Bulk Analysis:	**93 cm**
SiO_2	48.93
Al_2O_3	15.06
Fe_2O_3	1.20
FeO	7.94
MgO	11.89
CaO	11.13
Na_2O	2.83
K_2O	0.09
TiO_2	1.14
P_2O_5	0.09
MnO	0.15
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	324.00
Ni	183.00
Sr	1400.00
Zr	800.00

Magnetic Data:	**89 cm**
Intensity (emu/cc)	78.8
Inclination before demag.	49.5
Stable Inclination	54.2



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 1	2

Depth: 549.6 to 551.1 m

Visual Description

Fine-grained plagioclase phyric basalt continuous with last section to 140 cm.
Plagioclase phenocrysts 2 x 1 1/2 to 3 x 5 mm. Slight lateration of plagioclase.
Carbonate veins have some iron staining in the basalt near them.
Chill zone at 138 cm.
135-150 cm: aphanitic basalt very sparsely phyric to aphyric with a few scattered plagioclase phenocrysts.

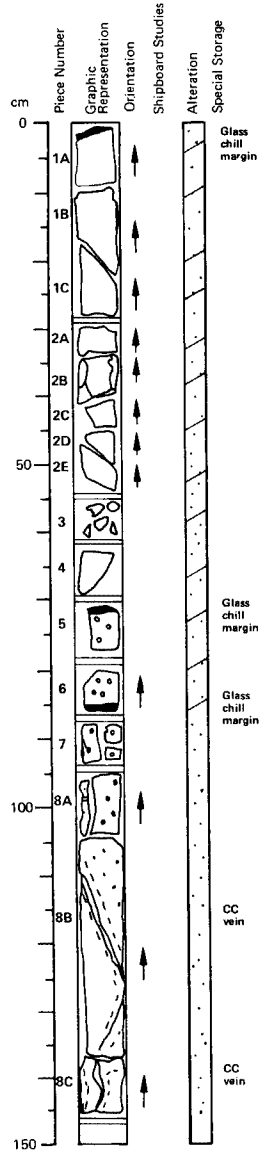
Thin Section Description – 104 cm

Groundmass: olivine 10%, 0.05-0.4 mm, anhedral; plagioclase 35%, 0.1-1.5 mm, laths, some laths fractured; clinopyroxene 30%, 0.02-0.8 mm, augite, anhedral; magnetite 5%, 0.02-0.2 mm, granular; other 20% groundmass.
Texture: intersertal.
Alteration: carbonate, vein filling, calcite; clays, vein filling, serpentine, chlorite; other, groundmass, replacing olivine, chlorite, iddingsite, serpentine.

Shipboard Data

Bulk Analysis:	107 cm
SiO_2	49.03
Al_2O_3	15.14
Fe_2O_3	1.21
FeO	8.00
MgO	9.92
CaO	11.95
Na_2O	2.90
K_2O	0.13
TiO_2	1.22
P_2O_5	0.09
MnO	0.15
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	299.00
Ni	127.00
Sr	199.00
Zr	83.00

Magnetic Data:	103 cm
Intensity (emu/cc)	113.9
Inclination before demag.	57.2
Stable Inclination	56.4
Other Data:	**0 cm**
Therm. cond. (mcal/cm-s-° C)	4.34



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 1	3

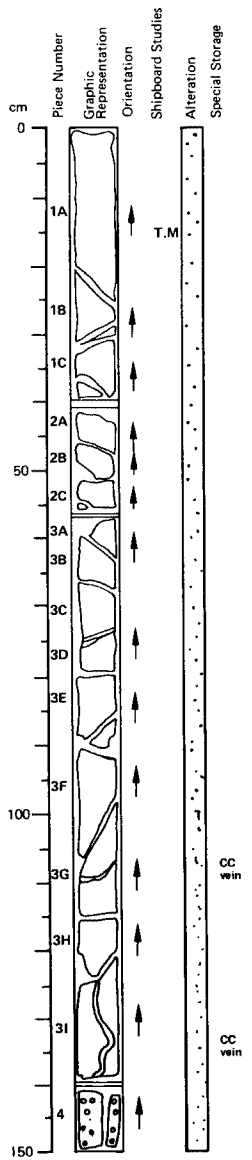
Depth: 551.1 to 552.6 m

Visual Description

Aphyric basalt. Fine-grained to aphanitic < 1% plagioclase phenocrysts, 1 x 3 to 2 x 4 mm, 0-2% vesicles. Amygdaloidal 80-120 cm with carbonate and smectite fillings moderate to light weathering. Carbonate veins have Fe-oxide staining in basalt at periphery.
It is not clear as to whether these are thin flows or pillows.

Shipboard Data

Bulk Analysis:	13 cm	29 cm	101 cm
SiO_2	49.54	49.92	49.56
Al_2O_3	15.35	15.39	15.27
Fe_2O_3	1.20	1.20	1.20
FeO	7.94	7.92	7.93
MgO	8.17	8.32	9.72
CaO	13.18	12.43	11.96
Na_2O	2.97	2.99	2.89
K_2O	0.25	0.25	0.08
TiO_2	1.24	1.26	1.25
P_2O_5	0.09	0.09	0.09
MnO	0.15	0.13	0.13
LOI	--	--	--
H_2O^+	--	--	--
H_2O^-	--	--	--
CO_2	--	--	--
Cr	302.00	304.00	308.00
Ni	108.00	117.00	105.00
Sr	167.00	167.00	151.00
Zr	89.00	88.00	86.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 1	4

Depth: 552.6 to 554.1 m

Visual Description

Plagioclase phyric basalt – continuation of unit from previous section ~1% plagioclase phenocrysts 1 x 2 to 2 x 4 mm. Fine-grained lightly weathered, ≪1% vesicles, <1% amygdules.

139-150 cm: amygdaloidal basalt ~5% amygdules lightly weathered, some Fe-oxidation in basalt near carbonate veins.

Thin Section Description – 107 cm

Phenocrysts: plagioclase 5%, 0.8-3 mm, lath-like or acicular.

Groundmass: plagioclase 45%, 0.25-0.6 mm, acicular; clinopyroxene 45%, augite, acicular, feathery quench growths common; magnetite 7.5%, <0.01 mm, granular.

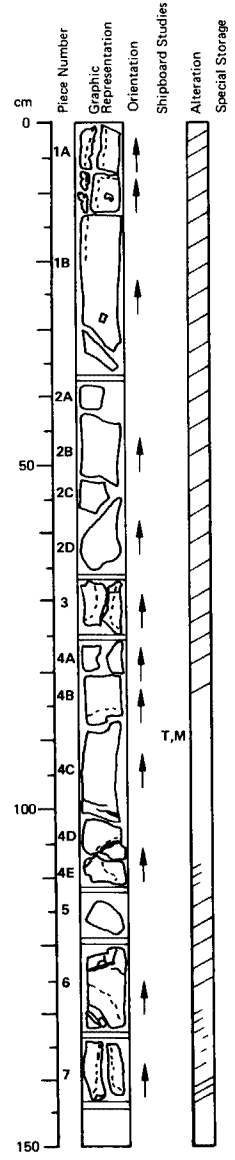
Vesicles: 2.5%, calcite filling, usually empty.

Texture: intersertal (quenched).

Shipboard Data

Bulk Analysis:	**69 cm**
SiO_2	49.86
Al_2O_3	15.60
Fe_2O_3	1.21
FeO	7.99
MgO	9.23
CaO	12.16
Na_2O	3.00
K_2O	0.07
TiO_2	1.25
P_2O_5	0.09
MnO	0.14
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	315.00
Ni	117.00
Sr	152.00
Zr	85.00

Magnetic Data	**106 cm**
Intensity (emu/cc)	136.3
Inclination before demag.	48.6
Stable Inclination	49.8
Physical Properties:	**77 cm**
$\bar{V}p$ (km/s)	5.75
Porosity (%)	3.78
Wet Bulk Density	2.90
Grain Density	2.97



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 2	1

Depth: 558.0 to 559.4 m

Visual Description

Aphyric basalt – ranges from brown where moderately weathered to medium gray where fresh. Fine- to medium-grained, there may be considerable chlorite in groundmass? Vesicularity ≪1%. Plagioclase phenocrysts scarce <1%, ~2-3 mm long, 1-2 mm wide. Oxidized zone around carbonate veins. Rare calcite amygdules present.

Thin Section Description – 91 cm

Phenocrysts: plagioclase 1%, 0.5-0.7 mm, laths, often clusters; clinopyroxene 0.1 x 0.4 mm, augite, 1 subophitic grain.

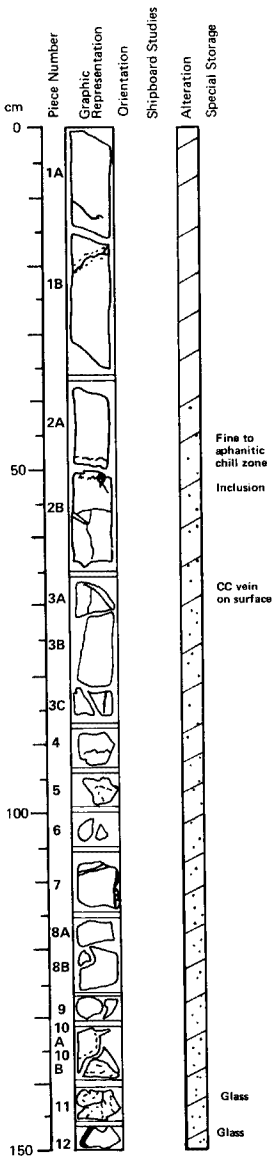
Groundmass: plagioclase 49%, 0.05-0.3 mm, laths; clinopyroxene 20%, 0.05-0.4 mm, augite, anhedral; magnetite 2.5%, 0.01-0.1 mm, granular, sometimes skeletal; other 27.5% cryptocrystalline matrix.

Texture: intergranular – intersertal.

Shipboard Data

Bulk Analysis:	**94 cm**
SiO_2	50.22
Al_2O_3	15.07
Fe_2O_3	1.14
FeO	7.55
MgO	9.59
CaO	12.03
Na_2O	2.93
K_2O	0.10
TiO_2	1.32
P_2O_5	0.10
MnO	0.12
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	290.00
Ni	94.00
Sr	158.00
Zr	91.00

Magnetic Data:	**90 cm**
Intensity (emu/cc)	82.8
Inclination before demag.	50.9
Stable Inclination	50.7
Other Data:	**15 cm**
Therm. cond. (mcal/cm-s-°C)	3.79



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 2	2

Depth: 559.4 to 560.9 m

V isual Description

Aphyric basalt – moderate to lightly to moderately weathered carbonate veins. Rare plagioclase phenocrysts ~2-3 mm long, 1-2 mm wide. Two narrow glass chill zones at end of section grading into aphanitic basalt into fine-grained basalt without a variolitic zone. One fine-grained chill zone with no glass at 51 cm.

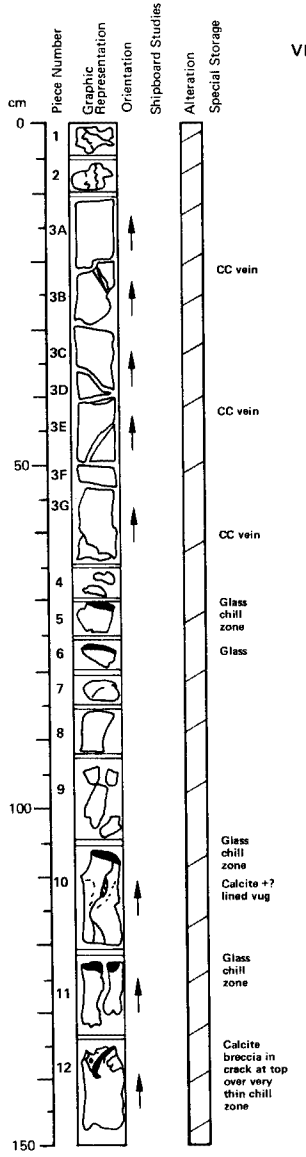
Thin Section Description – 30 cm

Phenocrysts: plagioclase 10%, 0.4-0.8 mm, broad laths.
Groundmass: plagioclase 20%, 0.05-0.7 mm, acicular; clinopyroxene 25%, 0.05-0.5 mm, augite, anhedral, some subophitic texture; magnetite 3%, 0.01-0.2 mm, granular; other 40% cryptocrystalline matrix.
Vesicles: 2%, finely crystalline clay, subrounded.
Texture: intersertal – intergranular.

Shipboard Data

Bulk Analysis:	**27 cm**
SiO_2	50.15
Al_2O_3	15.06
Fe_2O_3	1.14
FeO	7.52
MgO	8.92
CaO	11.77
Na_2O	3.26
K_2O	0.39
TiO_2	1.34
P_2O_5	0.11
MnO	0.12
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	293.00
Ni	97.00
Sr	161.00
Zr	98.00

Magnetic Data:	**29 cm**
Intensity (emu/cc)	35.6
Inclination before demag.	43.9
Stable Inclination	50.5
Physical Properties:	**43 cm**
$\bar{V}p$ (km/s)	4.87
Porosity (%)	13.19
Wet Bulk Density	2.69
Grain Density	2.95



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 2	3

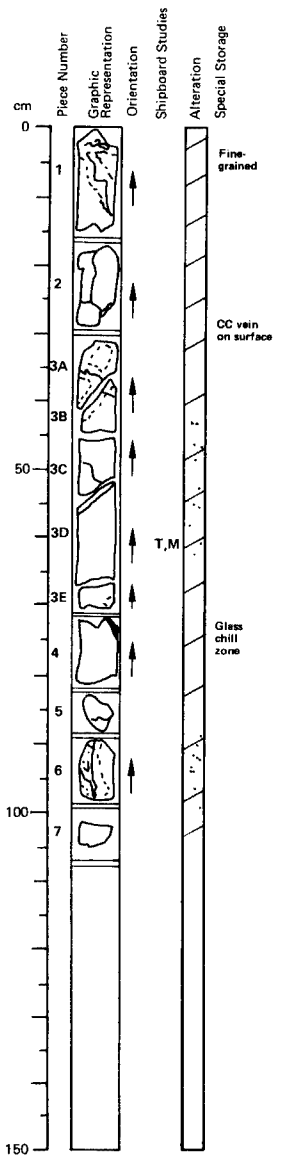
Depth: 560.9 to 562.4 m

Visual Description

Aphyric basalt – 5 glass chill zones up to 8.0 mm thick <1% plagioclase phenocrysts 1-3 mm, fine-grained. Palagonite and calcite breccia at top of chill margins on Pieces 11 and 12. Carbonate veins in most samples. Variolitic zone under chilled margins absent <1% carbonate filled amygdules.

Shipboard Data

Bulk Analysis:	**56 cm**
SiO_2	50.15
Al_2O_3	15.07
Fe_2O_3	1.13
FeO	7.48
MgO	9.05
CaO	12.42
Na_2O	2.94
K_2O	0.29
TiO_2	1.28
P_2O_5	0.09
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	321.00
Ni	127.00
Sr	163.00
Zr	90.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 2	4

Depth: 562.4 to 563.4 m

Visual Description

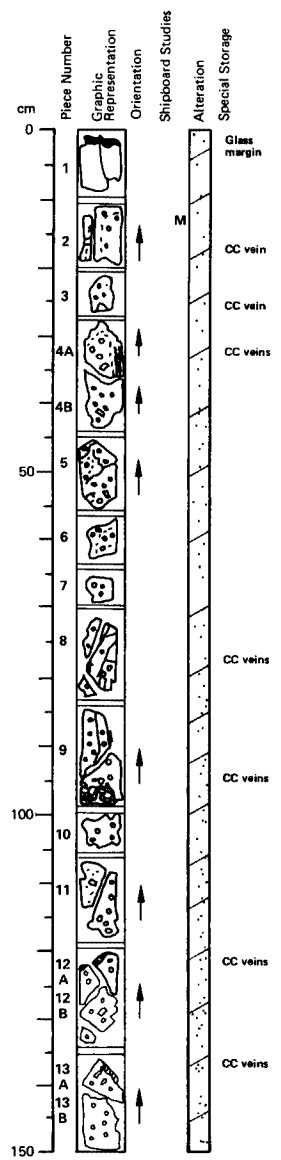
Aphyric basalt and plagioclase phyric basalt. Two chill zones, one with glass < 1-1% plagioclase phenocrysts 2-3 mm, moderate to light-moderate weathering.
Fine-grained to aphanitic and glassy texture.
Some carbonate veins have an oxidized zone.
Scattered calcite filled amygdules.
Spinel present as inclusions in plagioclase phenocrysts.

Thin Section Description — 63 cm

Phenocrysts: plagioclase 1%, 1 x 0.5 mm, An_{67}, laths.
Groundmass: plagioclase 30%, 0.01-0.4 mm, laths, microlites; magnetite 4$, <0.05 mm, granular; other 65% cryptocrystalline matrix and quenched, acicular pyroxene(?).
Texture: intersertal.
Alteration: other, iddingsite(?), chlorite.

Shipboard Data

Bulk Analysis:	18 cm	Magnetic Data:	62 cm
SiO_2	50.46	Intensity (emu/cc)	50.2
Al_2O_3	15.14	Inclination before demag.	46.2
Fe_2O_3	1.17	Stable Inclination	42.3
FeO	7.72		
MgO	7.79		
CaO	12.72		
Na_2O	3.00		
K_2O	0.29		
TiO_2	1.32		
P_2O_5	0.09		
MnO	0.13		
LOI	—		
H_2O^+	—		
H_2O^-	—		
CO_2	—		
Cr	310.00		
Ni	120.00		
Sr	165.00		
Zr	94.00		



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 3	1

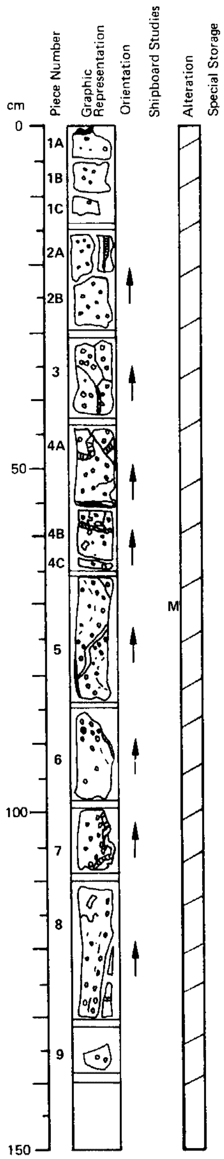
Depth: 567.5 to 569.0 m

Visual Description

Aphyric amygdaloidal basalt — massive, 3-5% amygdules filled with smectites and calcite and 0-5% vesicules in more weathered portions where vesicules are absent.
Occasional plagioclase phenocrysts <1%, 1-3 mm.
Numerous calcite veins with oxidation zones in basalt adjoining veins.
Moderate-light weathering.

Shipboard Data

Bulk Analysis:	140 cm	Magnetic Data:	10 cm
SiO_2	50.24	Intensity (emu/cc)	27.5
Al_2O_3	15.01	Inclination before demag.	43.5
Fe_2O_3	1.19	Stable Inclination	36.4
FeO	7.86		
MgO	8.21		
CaO	12.36		
Na_2O	3.14		
K_2O	0.30		
TiO_2	1.30		
P_2O_5	0.10		
MnO	0.13		
LOI	—		
H_2O^+	—		
H_2O^-	—		
CO_2	—		
Cr	306.00		
Ni	116.00		
Sr	165.00		
Zr	93.00		



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	3		6	3		2

Depth: 569.0 to 570.4 m

Visual Description

Aphyric amygdaloidal massive basalt. No chill zones. Rare plagioclase phenocrysts ≪1% ~2 x 1 to 3 x 2 mm fine-grained. 3-7% amygdules filled with calcite and smectites. Numerous calcite veins, oxidized zones in adjacent basalt. Moderately weathered.

In oxidized zones next to carbonate veins most vesicules are empty -- so vesicularity may be as much as 7% medium vesicles (1-3 mm).

Thin Section Description – 60 cm

Groundmass: plagioclase 45%, An_{62}, laths, often as microlites; clinopyroxene 25%, acicular, poorly crystallized; magnetite 5%, 0.01-0.1 mm, granular; other glassy, cryptocrystalline matrix.

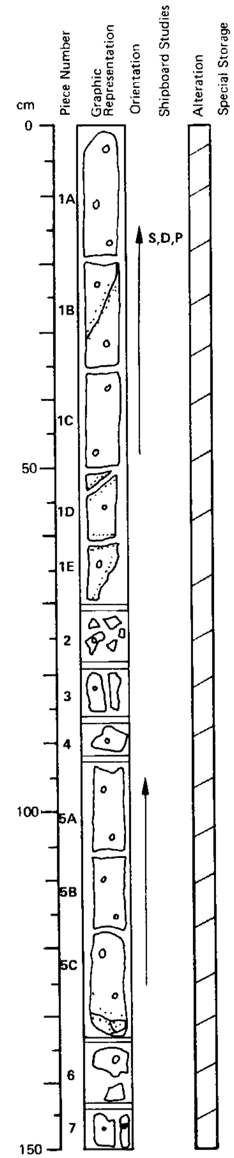
Vesicles: 5%, 0.1-0.8 mm calcite, subrounded.

Texture: intersertal.

Alteration: clays in groundmass replacing glassy material, yellow, palagonite(?).

Shipboard Data

Magnetic Data:	**71 cm**
Intensity (emu/cc)	50.8
Inclination before demag.	47.6
Stable Inclination	47.1



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	3		6	3		3

Depth: 570.4 to 571.9 m

Visual Description

Section is identical to that in Section 2 (Core 63).

0-150 cm: basalt, aphyric, fine-grained yellow gray, vesicular. Vesicles 5-10%, 0.5-2.0 mm, filled with calcite. Yellowish color associated with oxidation.

Thin Section Description – 59 cm

Groundmass: plagioclase 38%, laths; clinopyroxene 30%, 0.1-0.8 mm, anhedral; magnetite 2%; 0.01-0.2 mm, granular.

Vesicles: 5%, 0.1-1.5 mm, calcite, subrounded.

Texture: intersertal – intergranular.

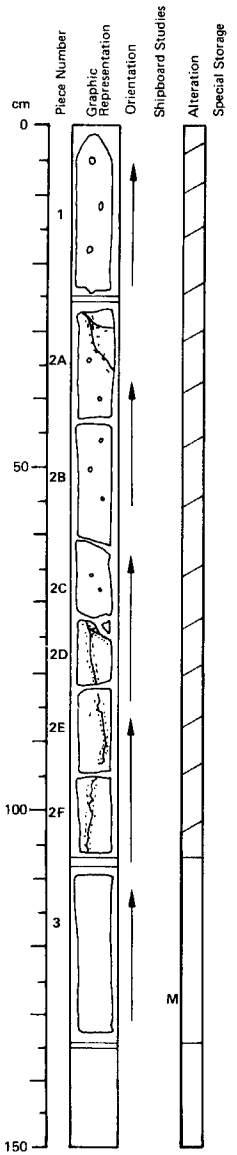
Alteration: clays in groundmass, yellow; other iddingsite(?).

Shipboard Data

Bulk Analysis:	**116 cm**
SiO_2	49.97
Al_2O_3	15.04
Fe_2O_3	1.14
FeO	7.52
MgO	8.74
CaO	12.70
Na_2O	3.08
K_2O	0.28
TiO_2	1.27
P_2O_5	0.10
MnO	0.12
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	307.00
Ni	180.00
Sr	166.00
Zr	91.00

Physical Properties:	**103 cm**
$\bar{V}p$ (km/s)	5.03

Other Data:	**105 cm**
Therm. cond. (mcal/cm-s-°C)	3.96



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 3	4

Depth: 571.9 to 573.2 m

Visual Description

Basalt identical to that of Section 3 (Core 63).

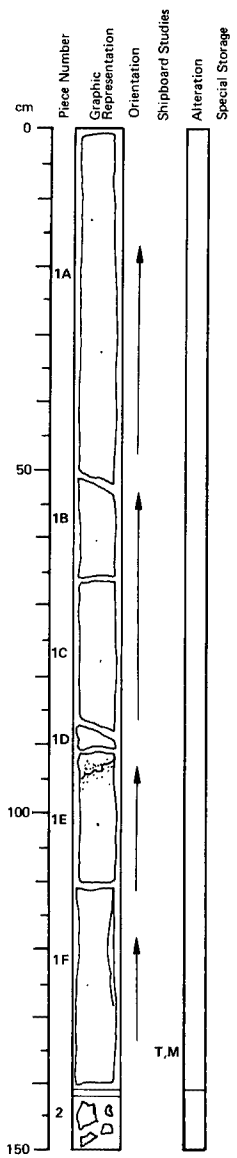
0-134 cm: basalt aphyric, fine-grained, vesicular in the upper part (7%, < 1 mm) and non-vesicular at the base of section.

0-108 cm: oxidation of basalt, yellowish-gray.

108-134 cm: fresh basalt, dark gray, no vesicles.

Shipboard Data

Magnetic Data:	**99 cm**
Intensity (emu/cc)	127.4
Inclination before demag.	68.2
Stable Inclination	54.7



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 3	5

Depth: 573.2 to 574.7 m

Visual Description

0-150 cm: basalt identical to that at the base of Section 4, Core 63.

Aphyric, fine-grained, dark gray.

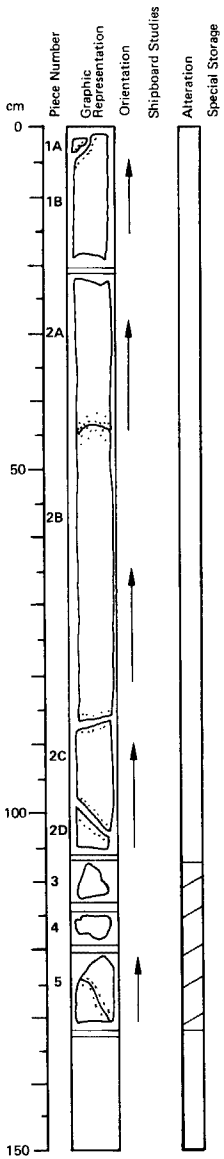
Alteration in one place, close to calcite vein (Piece 1E).

Few vesicles.

Shipboard Data

Bulk Analysis:	**8 cm**
SiO_2	49.89
Al_2O_3	15.03
Fe_2O_3	1.21
FeO	7.98
MgO	10.14
CaO	11.39
Na_2O	3.07
K_2O	0.13
TiO_2	1.30
P_2O_5	0.10
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	308.00
Ni	94.00
Sr	146.00
Zr	89.00

Magnetic Data:	**128 cm**	**137 cm**
Intensity (emu/cc)	27.6	78.5
Inclination before demag.	40.0	43.7
Stable Inclination	47.4	52.3



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			6	3		6

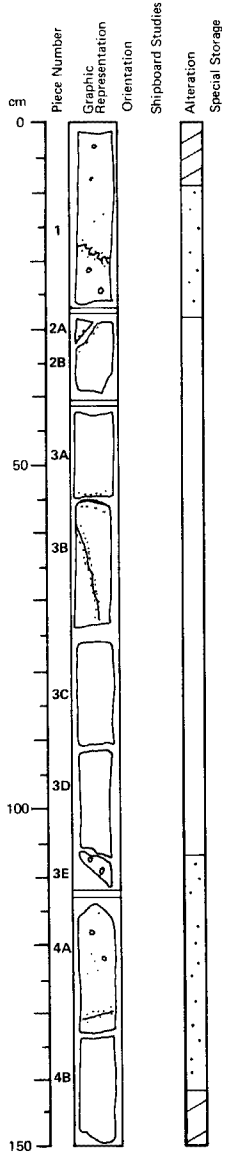
Depth: 574.7 to 576.0 m

Visual Description

0-107 cm: basalt identical to that at Section 5 (Core 63).
Basalt aphyric, fine-grained, gray dark, vesicularity low.
Alteration close to calcite plus chlorite and serpentine(?) (greenish alteration).
107-132 cm: the same type of basalt, but it becomes oxidized.

Shipboard Data

Bulk Analysis:	**12 cm**
SiO_2	49.69
Al_2O_3	14.92
Fe_2O_3	1.21
FeO	7.99
MgO	10.33
CaO	11.43
Na_2O	3.04
K_2O	0.12
TiO_2	1.32
P_2O_5	0.11
MnO	0.16
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	300.00
Ni	96.00
Sr	148.00
Zr	90.00



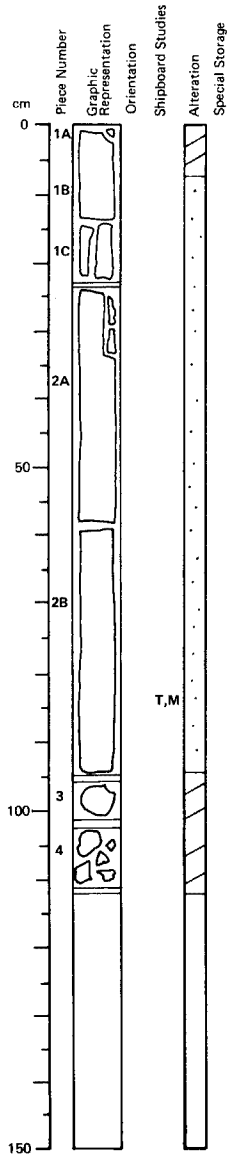
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			6	3		7

Depth: 576.0 to 577.5 m

Visual Description

0-75 cm: basalt identical to that of Section 6 (Core 63).
Basalt aphyric, fine-grained, dark gray, partly vesicular (0-25 cm, 3%, < 1 mm). Vesicles filled with calcite.
75-150 cm: similar basalt, but fresh medium-grained, aphyric, dark gray. Plagioclase lath, up to 2 mm.
Alteration close to calcite-zeolite veins. In the same parts oxidation (weathering) occurs.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			6	3		8

Depth: 577.5 to 578.7 m

Visual Description

0-94 cm: basalt is identical to that at the base of Section 7, Core 63.
Basalt medium-grained, aphyric, dark gray.
Vesicles about 1-2%, <1 mm.
Plagioclase lath 2 mm, pyroxene 0.5 mm.
94-111 cm: zone of alteration. Zone is fractured and substituted with calcite and green secondary minerals.

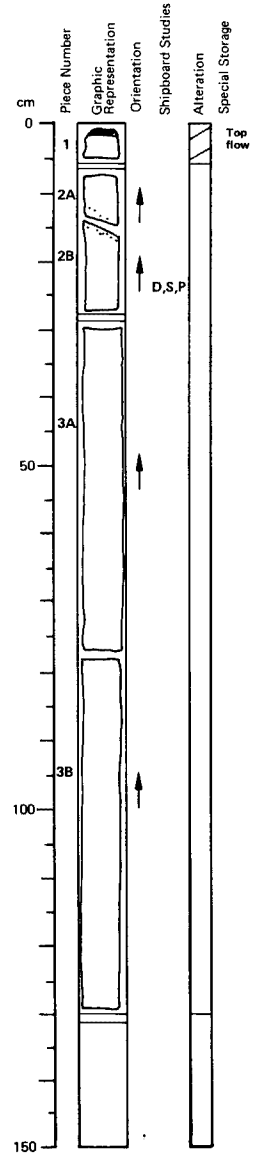
Thin Section Description — 85 cm

Groundmass: plagioclase 30%, 0.2-1.5 mm, laths, often zoned; clinopyroxene 30%, 0.2-1%, subhedral, subophitic; magnetite 5%, 0.02-0.7%, granular, large grains - skeletal interior; other 35%, cryptocrystalline matrix.
Texture: intergranular — intersertal.

Shipboard Data

Bulk Analysis:	**54 cm**
SiO_2	50.22
Al_2O_3	15.25
Fe_2O_3	1.21
FeO	7.99
MgO	9.72
CaO	11.60
Na_2O	3.23
K_2O	0.12
TiO_2	1.33
P_2O_5	0.11
MnO	0.15
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	300.00
Ni	96.00
Sr	148.00
Zr	90.00

Magnetic Data:	**84 cm**
Intensity (emu/cc)	79.1
Inclination before demag.	24.0
Stable Inclination	53.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			6	4		1

Depth: 577.0 to 578.3 m

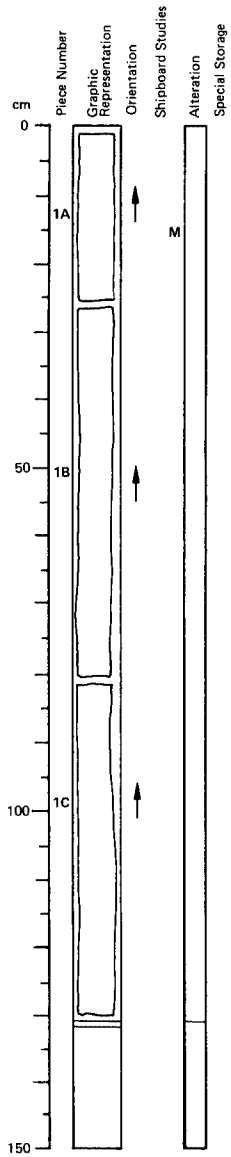
Visual Description

0-7 cm: top of flow chill margin zone with glass rim. Basalt fine-grained, dense, yellow gray.
7-130 cm: basalt, phyric, fine-grained, dark gray. Plagioclase up to 4-5 mm. Alteration close to calcite vein.

Shipboard Data

Bulk Analysis:	**78 cm**
SiO_2	48.92
Al_2O_3	14.83
Fe_2O_3	1.22
FeO	8.05
MgO	11.75
CaO	10.72
Na_2O	2.72
K_2O	0.14
TiO_2	1.18
P_2O_5	0.10
MnO	0.15
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	319.00
Ni	139.00
Sr	137.00
Zr	82.00

Physical Properties:	**24 cm**
$\bar{V}p$ (km/s)	5.19
Porosity (%)	9.82
Wet Bulk Density	2.83
Grain Density	3.03



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 4	2

Depth: 578.3 to 579.9 m

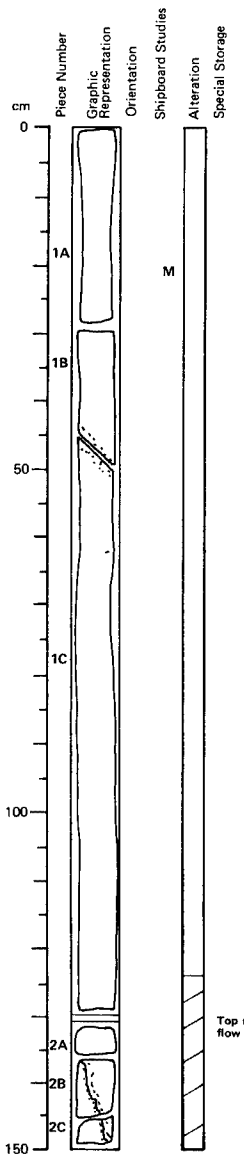
Visual Description
0-130 cm: basalt identical to that described for Section 1, Core 64.
Basalt very fresh, dense, fine-grained, phyric, dark gray. Plagioclase laths up to 5 mm.

Thin Section Description – 13 cm
Groundmass: olivine 3%, anhedral, relict grains in groundmass alteration; plagioclase 40%, laths; clinopyroxene 25%, anhedral, some subophitic; magnetite 2%, granular; other 25%, cryptocrystalline material.
Texture: intersertal – intergranular.
Alteration: clays in groundmass replacing olivine, chlorite; other in groundmass replacing olivine, serpentine.

Shipboard Data

Bulk Analysis:	97 cm
SiO_2	48.65
Al_2O_3	14.50
Fe_2O_3	1.21
FeO	7.98
MgO	12.68
CaO	10.70
Na_2O	2.54
K_2O	0.14
TiO_2	1.15
P_2O_5	0.10
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	323.00
Ni	170.00
Sr	137.00
Zr	78.00

Magnetic Data:	16 cm
Intensity (emu/cc)	74.0
Inclination before demag.	7.9
Stable Inclination	49.3
Other Data:	**130 cm**
Therm. cond. mcal/cm-s-°C)	4.08



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 3		6 4	3

Depth: 579.9 to 581.4 m

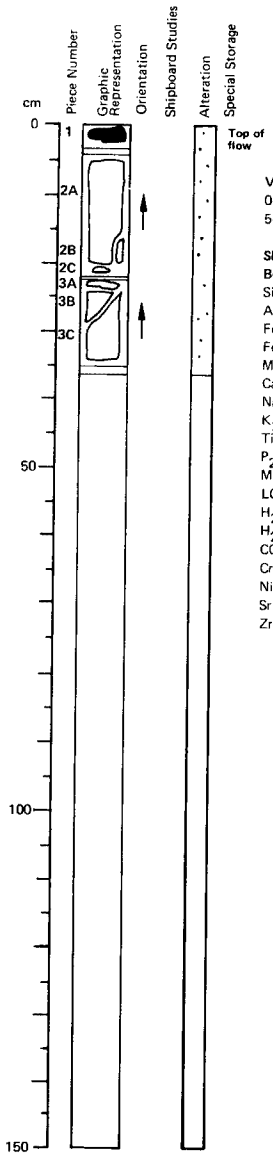
Visual Description
0-130 cm: basalt identical to that described for Section 2, Core 64. Basalt fresh, phyric, dense, fine-grained, dark gray. Plagioclase, up to 5 mm. Alteration in two places.
46-50 cm: close to calcite vein.
125-150 cm: weathering.
130-150 cm: top of next lava flow. Basalt aphyric, fine-grained (dense), yellow gray. Top is very close to the glassy margin (possible pillow lava).

Thin Section Description – 39 cm
Groundmass: olivine 10%, anhedral, relict grains, fibrous pseudomorphs; plagioclase 30%, 0.1-1 mm, laths; clinopyroxene 25%, 0.1-1 mm, augite, anhedral; magnetite 5%, 0.02-0.2, granular; other 30%, cryptocrystalline material.
Texture: intersertal – intergranular.
Alteration: other in groundmass replacing olivine, talc(?) iddingsite.

Shipboard Data

Bulk Analysis:	0 cm
SiO_2	48.90
Al_2O_3	14.61
Fe_2O_3	1.21
FeO	7.98
MgO	12.26
CaO	10.76
Na_2O	2.63
K_2O	0.16
TiO_2	1.16
P_2O_5	0.09
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	311.00
Ni	144.00
Sr	136.00
Zr	84.00

Magnetic Data:	20 cm
Intensity (emu/cc)	79.1
Inclination before demag.	27.2
Stable Inclination	50.8



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	3			6	4		4

Depth: 581.4 to 581.8 m

Visual Description

0-0.5 cm: glassy margin.

5-35 cm: basalt, aphyric, fine-grained, yellow gray.

Shipboard Data

Bulk Analysis:	**5 cm**	**32 cm**
SiO_2	49.97	50.03
Al_2O_3	15.01	15.10
Fe_2O_3	1.23	1.21
FeO	8.09	8.00
MgO	8.10	8.62
CaO	12.50	12.39
Na_2O	2.99	3.02
K_2O	0.31	0.29
TiO_2	1.29	1.26
P_2O_5	0.10	0.10
MnO	0.15	0.15
LOI	--	--
H_2O^+	--	--
H_2O^-	--	--
CO_2	--	--
Cr	310.00	304.00
Ni	96.00	119.00
Sr	173.00	93.00
Zr	91.00	89.00

SITE SUMMARY SHEET

SITE 444 HOLES 444 and 444A

Date occupied	January 4, 1978
Date departed	January 9, 1978
Time on hole	3 1/2 days
Position: latitude	28° 38.25'N
longitude	137° 41.03'E
Water depth (sea level)	4843.0 corrected meters, echo sounding
Water depth (rig floor)	4853.0 corrected meters, echo sounding
Bottom felt at	4852.0 meters, drill pipe
Penetration	444 = 91.5 444A = 310.6 meters
Number of holes	2
Number of cores	444 = 10 444A = 27
Total length of cored section	444 = 91.5 444A = 228.0 meters
Total core recovered	444 = 41.49 444A = 107.2 meters
Percentage core recovery	444 = 45 444A = 47%
Oldest Sediment Cored	
Depth sub-bottom	444 = 91.5 444A = 272.7 meters
Nature	444 = clay and pumice 444A = red clay
Age	444 = early Pliocene/late Miocene 444A = early middle Miocene
Measured velocity	444 = 1.53 444A = 1.72 km/s
Basement	
Depth sub-bottom	444 = not reached 444A = 310.0 meters
Nature	444A = basalt
Velocity range	444A = 4.25-5.46 km/s

Principal Results:

Site 444 is located in the east-central part of the Shikoku Basin, 45 nautical miles southeast of Site 443. The stratigraphic section consists of 52 meters of Pleistocene interbedded mud, vitric mud, ash, and clayey nanno ooze; 32 meters of Pliocene mud, ash, and vitric mud; 110 meters of late Miocene mud, ash, vitric mud, nanno ooze, radiolarian ooze, quartz sand, and siliceous mud; and 69 meters of middle Miocene mudstone, ash, nanno ooze, and radiolarian mudstone cut by a 10-meter basalt sill. Next below are 19 meters of amygdaloidal phyric basalt flows, and another 19-meter aphanitic, aphyric basalt flow. An early Pliocene/latest Miocene hiatus occurs in the section. The dominant sediment motif is one of mixed hemipelagic and ash deposition. Basement age is 15 m.y.B.P. which is at variance with the magnetic anomaly age for the site.

SITE 444 HOLE CORE 1 CORED INTERVAL: 0.0-6.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Pleistocene or Holocene	*Emiliania huxleyi* Zone N.23	FP	FM	CM	CC					**

Dominant Lithology: (A) Vitric Mud:
dark greenish gray, dark gray, gray (5GY 4/1 to 5Y 4/1 and N4).

Minor Lithology (B) Ash:
gray to light gray (N5 to N6)

Smears:

	A	B
Quartz, Feldspar	5%	2%
Clay minerals	60%	—
Opaques	1%	—
Volcanic glass	15%	97%
Calcareous fossils (nannofossils, foraminifers)	5%	—
Siliceous fossils	5%	—
Carbonate unspecified	10%	1%

SITE 444 HOLE CORE 2 CORED INTERVAL: 6.0-15.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Pleistocene	*Ceratolithus cristatus* Subzone (N) *Emiliania huxleyi* Zone (N)	FP	FP	CM	1	0.5	VOID			
						1.0				
					2					*
		B	B	FP						*
					3		VOID			
					4					**
							ORG. SAMPLE			
		B	RP	CM	5		VOID			
		RP	FP	AP	CC					

Dominant Lithology (A) Mud:
dark gray, dark greenish gray and gray (5Y 4/1, 5GY 4/1 and 5Y 5/1) with gray (N6 and N7) ash in distinct ash beds or as volcanic glass content in vitric mud.

Minor Lithologies:
(B) Ash
(C) Mud, lighter colored, finer texture, less ashy, more calcareous.
(D) Clayey ash

Smears:

	A	B	C	D
Quartz, Feldspar	TR- 7%	2%	3%	TR
Clay minerals	62-84%	—	85%	40%
Volcanic glass	TR-15%	97%	1%	50%
Opaques	TR	—	+	—
Calcareous fossils	0-10%	—	—	—
Carbonate unspecified	5-10%	1%	9%	6%
Siliceous fossils	0-10%	—	1%	3%

GRAIN SIZE:
2-55 (0.7, 37.6, 61.8)
4-43 (0.8, 35.2, 64.0)

CARBON-CARBONATE:
2-58 (0.1, 0.1, 0)
4-53 (0.7, 0.4, 3)

SITE 444 HOLE CORE 3 CORED INTERVAL: 15.5-25.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Pleistocene	*Ceratolithus cristatus* Subzone (N)	RP	RP	CP	1	0.5				
						1.0				
					2					*
		RP	B	CP						
					3					*
		RP	AP	CM	CC					

Mud (A)
Dark greenish gray and gray (5GY 4/1 and N5) with scattered zones of dark gray (5Y 4/1) harder and firmer. Some calcareous mud and minor ash. Highly disturbed, soft to firm.

Minor Lithology:
Calcareous Mud (B)
It is very similar in texture and composition to the dominant lithology, except for its calcareous content and a slightly lower ash content. The calcareous muds that are included in the minor lithology are generally gray (N5) whereas those in the dominant lithology are dark greenish gray (5GY 4/1).

Smears:

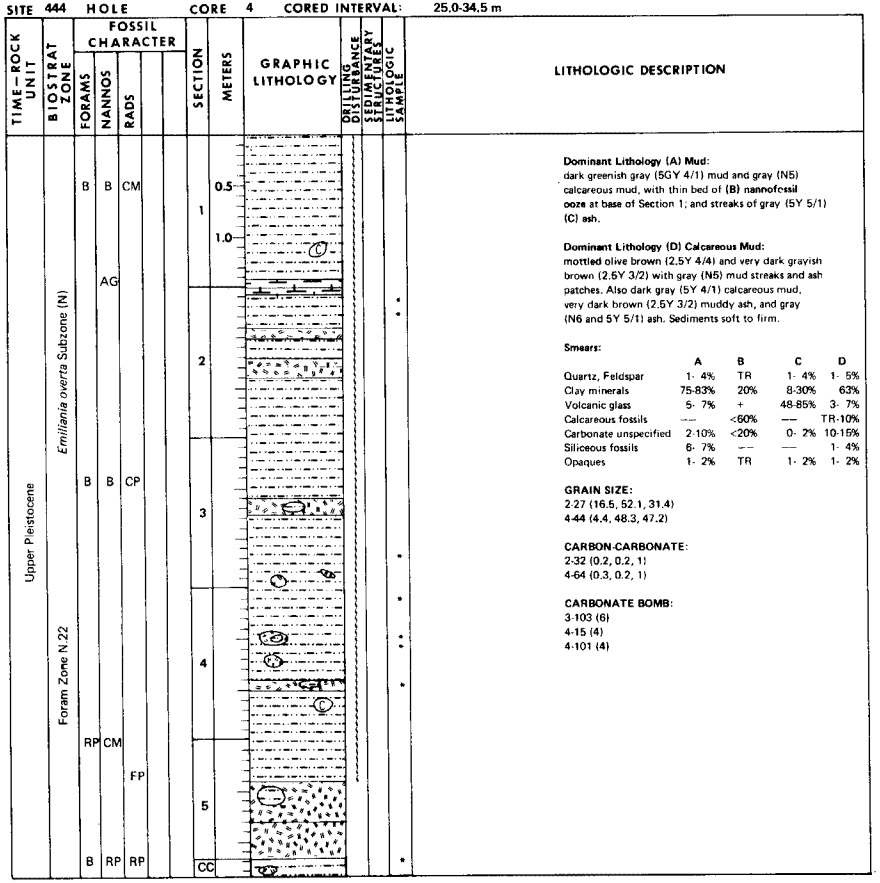
	A	B
Quartz, Feldspar	TR- 3%	TR- 2%
Clay minerals	75-87%	70-85%
Volcanic glass	2- 3%	0- 2%
Opaques	TR- 2%	TR
Calcareous fossils	1- 5%	4-15%
Carbonate unspecified	0- 7%	8-20%
Siliceous fossils	2- 6%	2-14%

GRAIN SIZE:
2-64 (0.1, 35.3, 64.6)

CARBON-CARBONATE:
2-68 (0.8, 0.5, 3)

CARBONATE BOMB:
3-59 (2.2)

SITE 444 HOLE CORE 4 CORED INTERVAL: 25.0-34.5 m



Dominant Lithology (A) Mud:
dark greenish gray (5GY 4/1) mud and gray (N5) calcareous mud, with thin bed of **(B) nannofossil ooze** at base of Section 1; and streaks of gray (5Y 5/1) **(C) ash.**

Dominant Lithology (D) Calcareous Mud:
mottled olive brown (2.5Y 4/4) and very dark grayish brown (2.5Y 3/2) with gray (N5) mud streaks and ash patches. Also dark gray (5Y 4/1) calcareous mud, very dark brown (2.5Y 3/2) muddy ash, and gray (N6 and 5Y 5/1) ash. Sediments soft to firm.

Smears:

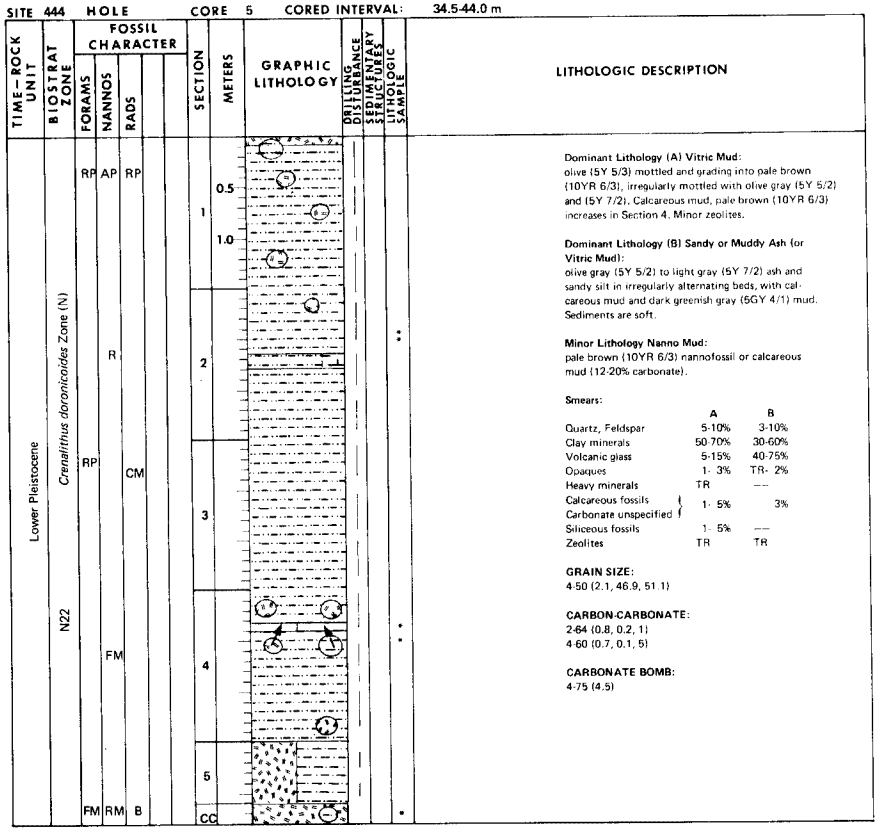
	A	B	C	D
Quartz, Feldspar	1- 4%	TR	1- 4%	1- 5%
Clay minerals	75-83%	20%	8-30%	63%
Volcanic glass	5- 7%	+	48-85%	3- 7%
Calcareous fossils	---	<60%	—	TR-10%
Carbonate unspecified	2-10%	<20%	0- 2%	10-15%
Siliceous fossils	6- 7%	--	—	1- 4%
Opaques	1- 2%	TR	1- 2%	1- 2%

GRAIN SIZE:
2-27 (16.5, 52.1, 31.4)
4-44 (4.4, 48.3, 47.2)

CARBON-CARBONATE:
2-32 (0.2, 0.2, 1)
4-64 (0.3, 0.2, 1)

CARBONATE BOMB:
3-103 (6)
4-15 (4)
4-101 (4)

SITE 444 HOLE CORE 5 CORED INTERVAL: 34.5-44.0 m



Dominant Lithology (A) Vitric Mud:
olive (5Y 5/3) mottled and grading into pale brown (10YR 6/3), irregularly mottled with olive gray (5Y 5/2) and (5Y 7/2). Calcareous mud, pale brown (10YR 6/3) increases in Section 4. Minor zeolites.

Dominant Lithology (B) Sandy or Muddy Ash (or Vitric Mud):
olive gray (5Y 5/2) to light gray (5Y 7/2) ash and sandy silt in irregularly alternating beds, with calcareous mud and dark greenish gray (5GY 4/1) mud. Sediments are soft.

Minor Lithology Nanno Mud:
pale brown (10YR 6/3) nannofossil or calcareous mud (12-20% carbonate).

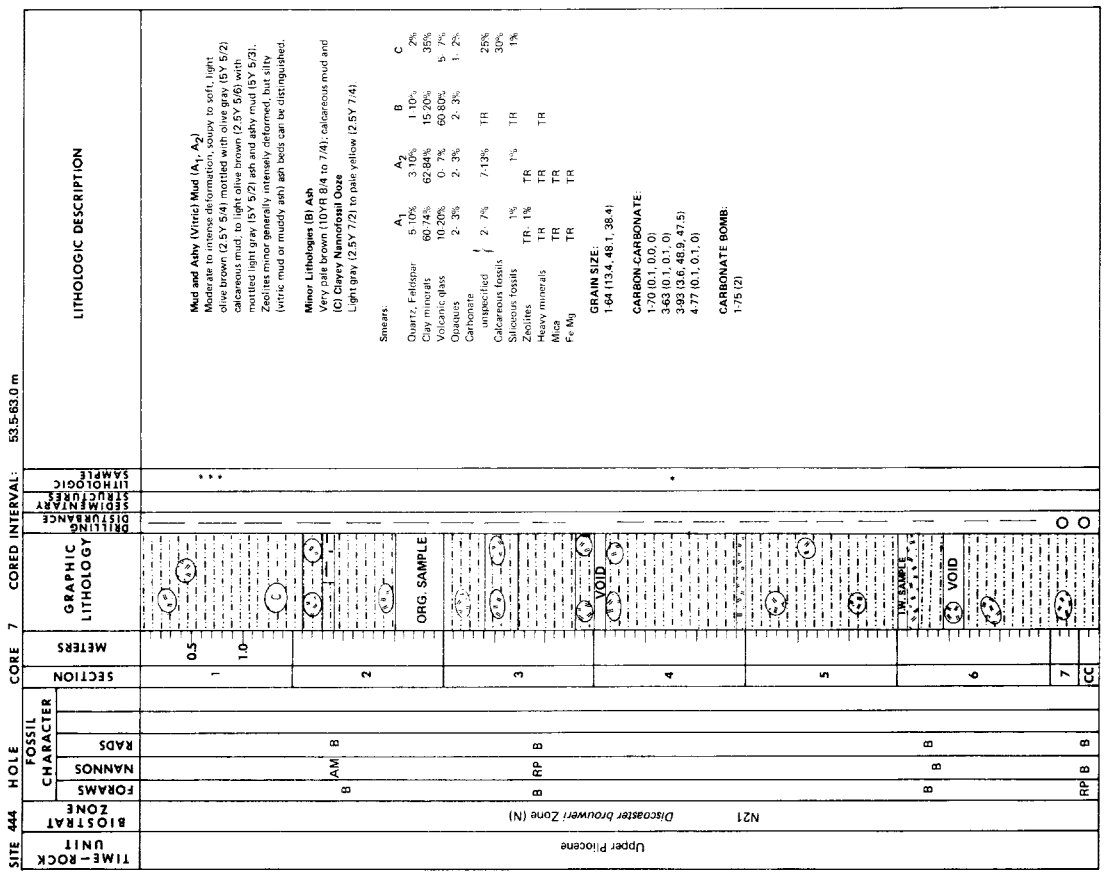
Smears:

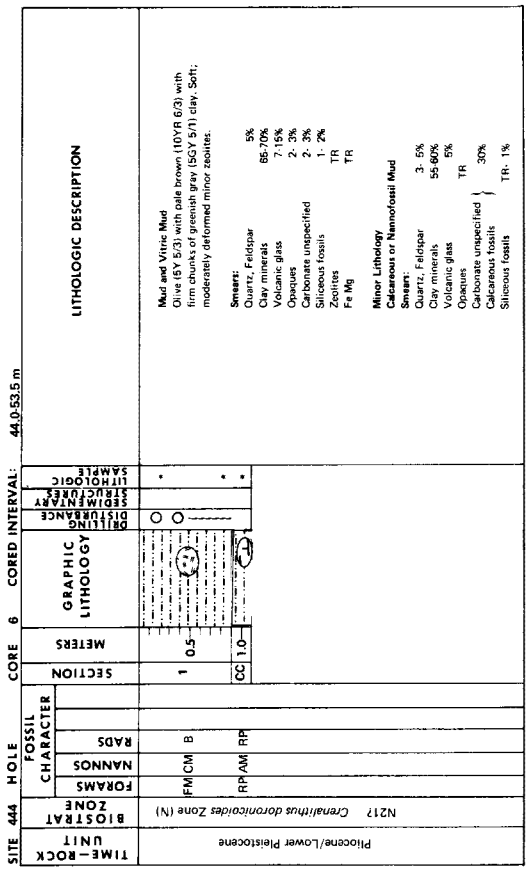
	A	B
Quartz, Feldspar	5-10%	3-10%
Clay minerals	50-70%	30-60%
Volcanic glass	5-15%	40-75%
Opaques	1- 3%	TR- 2%
Heavy minerals	TR	---
Calcareous fossils / Carbonate unspecified	1- 5%	3%
Siliceous fossils	1- 5%	---
Zeolites	TR	TR

GRAIN SIZE:
4-50 (2.1, 46.9, 51.1)

CARBON-CARBONATE:
2-64 (0.8, 0.2, 1)
4-60 (0.7, 0.1, 5)

CARBONATE BOMB:
4-75 (4.5)


SITE 444 HOLE CORE 7 CORED INTERVAL: 53.5-63.0 m
TIME–ROCK UNIT
Upper Pliocene
BIOSTRAT ZONE
N21
Discoaster brouweri Zone (N)
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Mud and Ashy (Vitric) Mud (A1, A2)
Minor Lithologies (B) Ash
(C) Clayey Nannofossil Ooze
Smears:
GRAIN SIZE:
CARBON-CARBONATE:
CARBONATE BOMB:
ORG. SAMPLE
VOID
TR SAMPLE


SITE 444 HOLE CORE 6 CORED INTERVAL: 44.0-53.5 m
TIME–ROCK UNIT
Pliocene/Lower Pleistocene
BIOSTRAT ZONE
N21? Crenalithus doronicoides Zone (N)
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Mud and Vitric Mud
Olive (5Y 5/3) with pale brown (10YR 6/3) with firm chunks of greenish gray (5GY 5/1) clay. Soft; moderately deformed minor zeolites.
Smears:
Minor Lithology
Calcareous or Nannofossil Mud
Smear:

SITE 444 HOLE CORE 8 CORED INTERVAL: 63.0-72.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Pliocene	*Discoaster brouweri* Zone (N) N21	B	AG	B	1	0.5				*
		RP	RM	B	CC					

LITHOLOGIC DESCRIPTION

Mud (A):
olive gray (5Y 5/2) to light olive brown (2.5Y 5/4). Very low silt content (10%) almost a clay (88% clay size). Minor zeolites.

Minor Lithologies are:
Nannofossil-bearing Ash (B)
Olive gray (5Y 5/2) and
Ash (C) (with ashy mud?).

Smears:

	A	B	C
Quartz, Feldspar	3%	2%	1%
Clay minerals	78%	15%	6%
Volcanic glass	5%	65%	90%
Opaques	2%	2%	+
Carbonate unspecified	10%	15%	2%
Calcareous fossils			
Siliceous fossils	TR	TR	
Heavy minerals	1%	---	TR
Zeolites	TR	---	

CARBONATE BOMB:
1-62 (1.5)

SITE 444 HOLE CORE 9 CORED INTERVAL: 72.5-82.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
		FM	B	B	1	0.5				*
		B	RM	B	CC	1.0			△	*

LITHOLOGIC DESCRIPTION

Vitric Mud (A)
Grayish brown (2.5Y 2/2) firm, with blackish streaks and tan patches.

Minor Lithologies include:
Ash (B)
Light gray (5Y 7/1), sandy texture (60% sand size) volcanic glass, in normal graded bed at 125-129 cm.
Mud (C)
Dark gray (5Y 4/1).

Smears:

	A	B	C
Quartz, Feldspar	2%	3- 5%	3%
Clay minerals	75%	16-25%	70%
Volcanic glass	15%	65-80%	10%
Opaques	+	1- 2%	3%
Heavy minerals	1%	TR- 2%	2%
Carbonate unspecified	3%	TR- 2%	10%
Calcareous fossils			
Siliceous fossils	---	TR	TR
Zeolites		TR	TR

SITE 444 HOLE CORE 10 CORED INTERVAL: 82.0-91.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
Upper Miocene or Lower Pliocene	*Ceratolithus tricorniculatus* Zone (N)	B	B	B	1	0.5				
						1.0				
		RP	AG	RP	2					*
		RP	AG	RP	CC					*

LITHOLOGIC DESCRIPTION

Sediments are "soupy" to soft to firm.
Dominant Lithologies are:
(A) Mud and (B) Vitric Mud:
brown (10YR 5/3) to grayish brown (2.5Y 5/2). No visible sediment structures.

Minor Lithologies include:
(C) Ash) (at Section 1, 62 cm)
light grayish brown (2.5Y 6/2) to light brownish gray (10YR 6/2). Pumice lapillae make up 80% of Core-Catcher material.
(D) Nannofossil Ooze (at Section 2, 122 cm)
light grayish brown (2.5Y 6/2).
(E) Clay (at Section 3, 40 cm)
brown (10YR 5/3).

Smears:

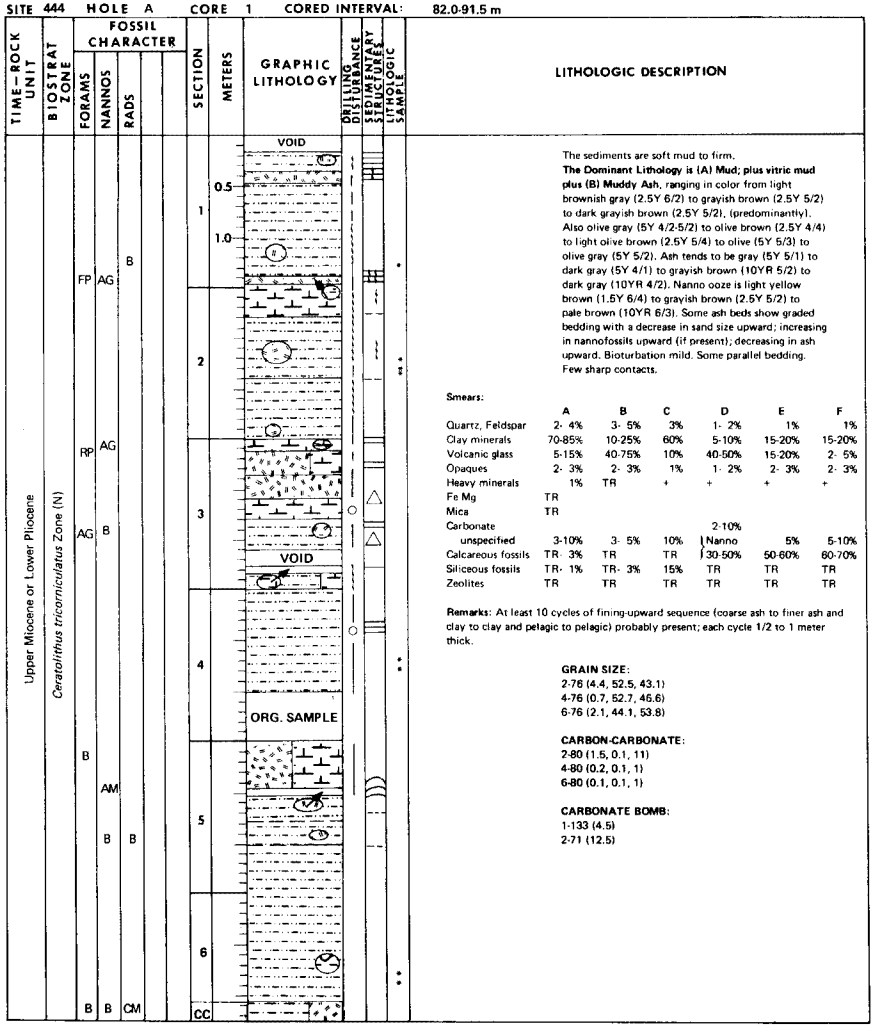
	A	B	C	D	E
Quartz, Feldspar	2- 3%	2%	2%	+	2%
Clay minerals	79-85%	68%	10%	25%	86%
Volcanic glass	3- 5%	20%	85%	5%	7%
Opaques	?	2%	1%	2%	2%
Heavy minerals	---	+	+	+	---
Zeolites	---	+	?	---	+
Calcareous fossils	6%	5%	TR	65	1%
Carbonate unspecified		---			
Siliceous fossils	TR	2%	TR	---	TR

GRAIN SIZE:
2-38 (0.8, 43.4, 55.8)

CARBON-CARBONATE:
2-42 (0.2, 0.1, 1)

CARBONATE BOMB:
2-75 (2.2)

SITE 444 HOLE A CORE 1 CORED INTERVAL: 82.0-91.5 m



LITHOLOGIC DESCRIPTION

The sediments are soft mud to firm.
The Dominant Lithology is (A) Mud; plus vitric mud plus (B) Muddy Ash, ranging in color from light brownish gray (2.5Y 6/2) to grayish brown (2.5Y 5/2) to dark grayish brown (2.5Y 5/2), (predominantly). Also olive gray (5Y 4/2-5/2) to olive brown (2.5Y 4/4) to light olive brown (2.5Y 5/4) to olive (5Y 5/3) to olive gray (5Y 5/2). Ash tends to be gray (5Y 5/1) to dark gray (5Y 4/1) to grayish brown (10YR 5/2) to dark gray (10YR 4/2). Nanno ooze is light yellow brown (1.5Y 6/4) to grayish brown (2.5Y 5/2) to pale brown (10YR 6/3). Some ash beds show graded bedding with a decrease in sand size upward; increasing in nannofossils upward (if present); decreasing in ash upward. Bioturbation mild. Some parallel bedding. Few sharp contacts.

Smears:

	A	B	C	D	E	F
Quartz, Feldspar	2- 4%	3- 5%	3%	1- 2%	1%	1%
Clay minerals	70-85%	10-25%	60%	5-10%	15-20%	15-20%
Volcanic glass	5-15%	40-75%	10%	40-50%	15-20%	2- 5%
Opaques	2- 3%	2- 3%	1%	1- 2%	2- 3%	2- 3%
Heavy minerals	1%	TR	+	+	+	+
Fe Mg	TR					
Mica	TR					
Carbonate unspecified	3-10%	3- 5%	10%	2-10% (Nanno) 30-50%	5% 50-60%	5-10% 60-70%
Calcareous fossils	TR- 3%	TR	TR			
Siliceous fossils	TR- 1%	TR- 3%	15%	TR	TR	TR
Zeolites	TR	TR	TR	TR	TR	TR

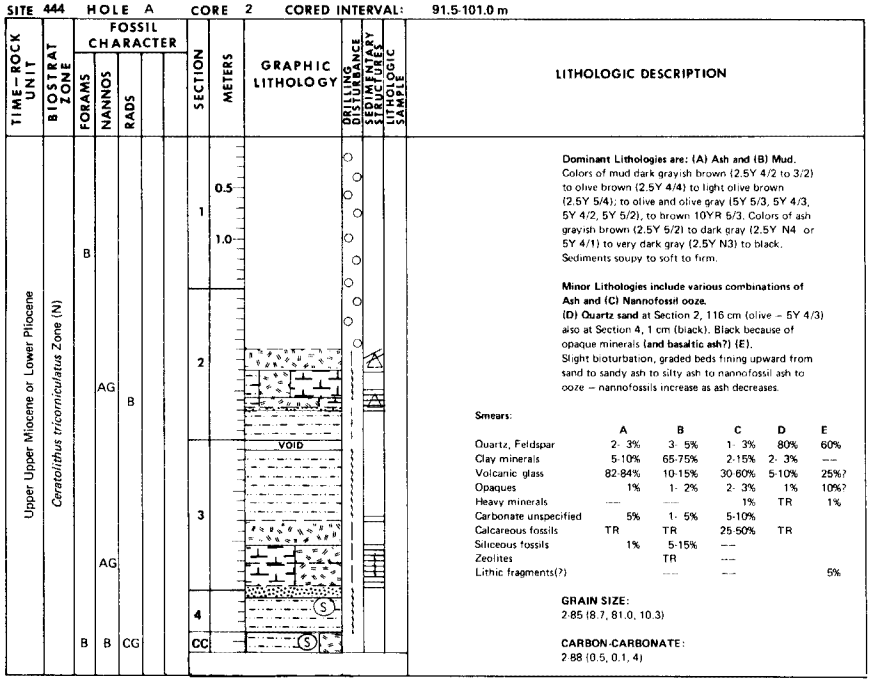
Remarks: At least 10 cycles of fining-upward sequence (coarse ash to finer ash and clay to clay and pelagic to pelagic) probably present; each cycle 1/2 to 1 meter thick.

GRAIN SIZE:
2-76 (4.4, 52.5, 43.1)
4-76 (0.7, 52.7, 46.6)
6-76 (2.1, 44.1, 53.8)

CARBON-CARBONATE:
2-80 (1.5, 0.1, 11)
4-80 (0.2, 0.1, 1)
6-80 (0.1, 0.1, 1)

CARBONATE BOMB:
1-133 (4.5)
2-71 (12.5)

SITE 444 HOLE A CORE 2 CORED INTERVAL: 91.5-101.0 m



LITHOLOGIC DESCRIPTION

Dominant Lithologies are: (A) Ash and (B) Mud.
Colors of mud dark grayish brown (2.5Y 4/2 to 3/2) to olive brown (2.5Y 4/4) to light olive brown (2.5Y 5/4); to olive and olive gray (5Y 5/3, 5Y 4/3, 5Y 4/2, 5Y 5/2), to brown 10YR 5/3. Colors of ash grayish brown (2.5Y 5/2) to dark gray (2.5Y N4 or 5Y 4/1) to very dark gray (2.5Y N3) to black. Sediments soupy to soft to firm.

Minor Lithologies include various combinations of Ash and (C) Nannofossil ooze.
(D) Quartz sand at Section 2, 116 cm (olive – 5Y 4/3) also at Section 4, 1 cm (black). Black because of opaque minerals **(and basaltic ash?) (E).**
Slight bioturbation, graded beds fining upward from sand to sandy ash to silty ash to nannofossil ash to ooze – nannofossils increase as ash decreases.

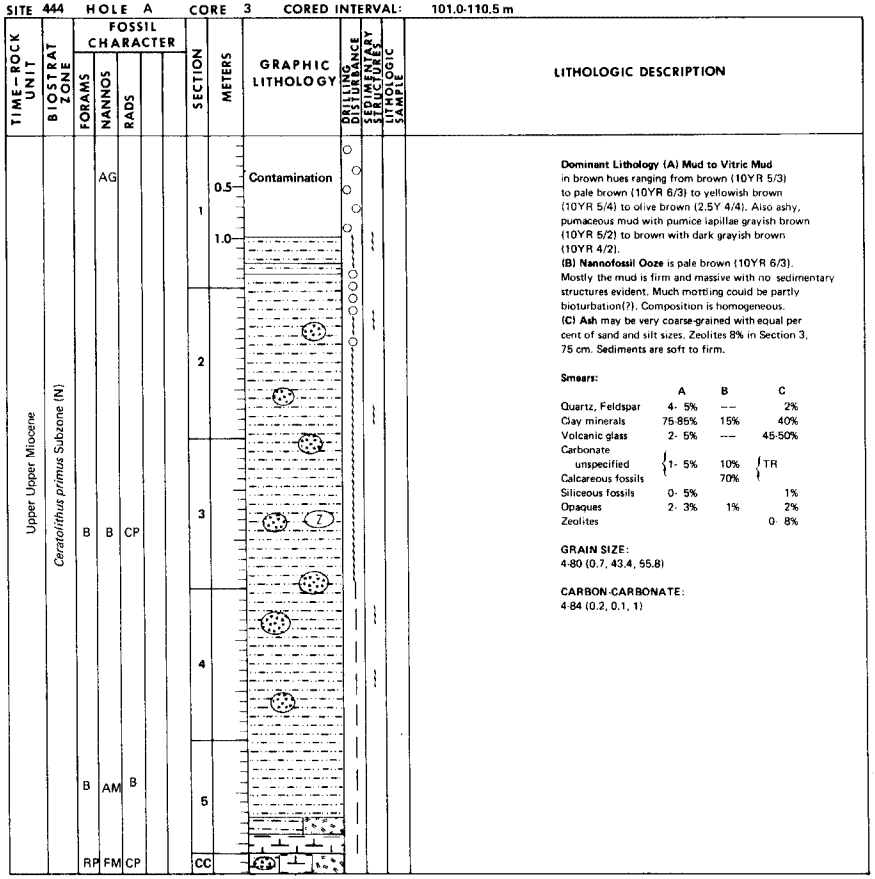
Smears:

	A	B	C	D	E
Quartz, Feldspar	2- 3%	3- 5%	1- 3%	80%	60%
Clay minerals	5-10%	65-75%	2-15%	2- 3%	---
Volcanic glass	82-84%	10-15%	30-60%	5-10%	25%?
Opaques	1%	1- 2%	2- 3%	1%	10%?
Heavy minerals	---	---	1%	TR	1%
Carbonate unspecified	5%	1- 5%	5-10%		
Calcareous fossils	TR	TR	25-50%	TR	
Siliceous fossils	1%	5-15%	---		
Zeolites		TR	---		
Lithic fragments(?)		---	---		5%

GRAIN SIZE:
2-85 (8.7, 81.0, 10.3)

CARBON-CARBONATE:
2-88 (0.5, 0.1, 4)

SITE 444 HOLE A CORE 3 CORED INTERVAL: 101.0-110.5 m



Dominant Lithology (A) Mud to Vitric Mud in brown hues ranging from brown (10YR 5/3) to pale brown (10YR 6/3) to yellowish brown (10YR 5/4) to olive brown (2.5Y 4/4). Also ashy, pumaceous mud with pumice lapillae grayish brown (10YR 5/2) to brown with dark grayish brown (10YR 4/2).

(B) Nannofossil Ooze is pale brown (10YR 6/3). Mostly the mud is firm and massive with no sedimentary structures evident. Much mottling could be partly bioturbation(?). Composition is homogeneous.

(C) Ash may be very coarse-grained with equal per cent of sand and silt sizes. Zeolites 8% in Section 3, 75 cm. Sediments are soft to firm.

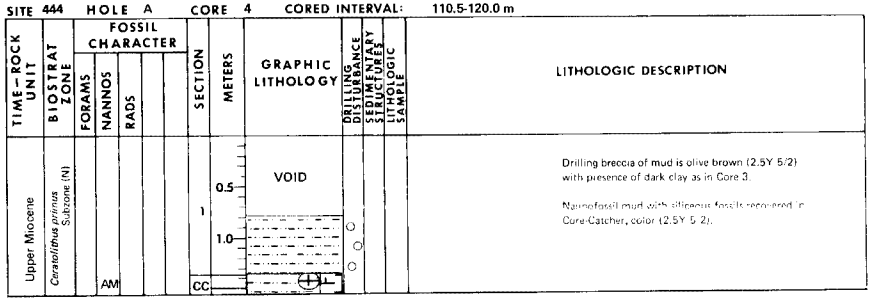
Smears:

	A	B	C
Quartz, Feldspar	4- 5%	---	2%
Clay minerals	75-85%	15%	40%
Volcanic glass	2- 5%	---	45-50%
Carbonate unspecified	1- 5%	10%	TR
Calcareous fossils		70%	
Siliceous fossils	0- 5%		1%
Opaques	2- 3%	1%	2%
Zeolites			0- 8%

GRAIN SIZE:
4-80 (0.7, 43.4, 55.8)

CARBON-CARBONATE:
4-84 (0.2, 0.1, 1)

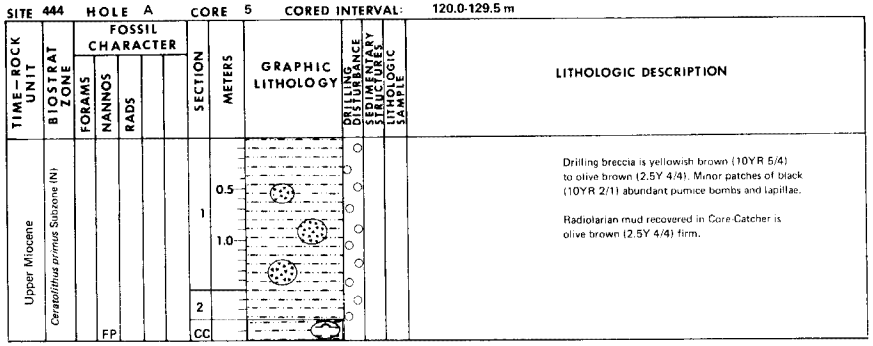
SITE 444 HOLE A CORE 4 CORED INTERVAL: 110.5-120.0 m



Drilling breccia of mud is olive brown (2.5Y 5/2) with presence of dark clay as in Core 3.

Nannofossil mud with siliceous fossils recovered in Core-Catcher, color (2.5Y 5/2).

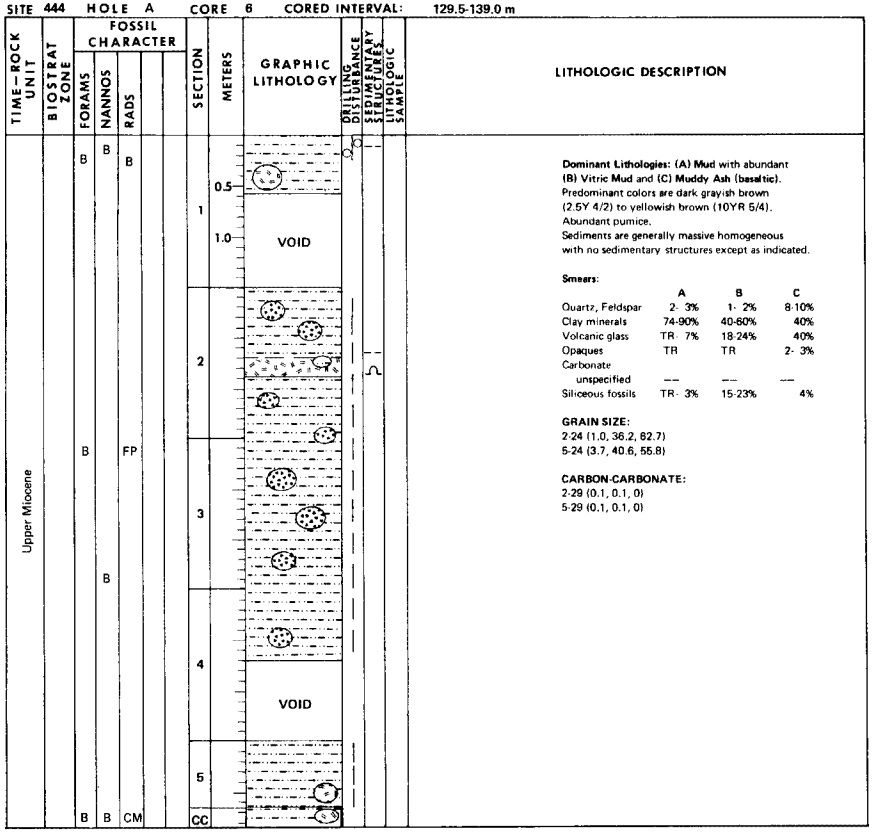
SITE 444 HOLE A CORE 5 CORED INTERVAL: 120.0-129.5 m



Drilling breccia is yellowish brown (10YR 5/4) to olive brown (2.5Y 4/4). Minor patches of black (10YR 2/1) abundant pumice bombs and lapillae.

Radiolarian mud recovered in Core-Catcher is olive brown (2.5Y 4/4) firm.

SITE 444 HOLE A CORE 6 CORED INTERVAL: 129.5-139.0 m



LITHOLOGIC DESCRIPTION

Dominant Lithologies: (A) Mud with abundant **(B) Vitric Mud** and **(C) Muddy Ash (basaltic).** Predominant colors are dark grayish brown (2.5Y 4/2) to yellowish brown (10YR 5/4). Abundant pumice. Sediments are generally massive homogeneous with no sedimentary structures except as indicated.

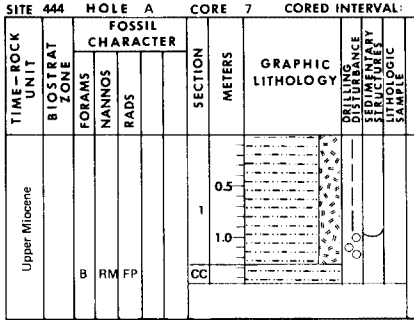
Smears:

	A	B	C
Quartz, Feldspar	2- 3%	1- 2%	8-10%
Clay minerals	74-90%	40-60%	40%
Volcanic glass	TR- 7%	18-24%	40%
Opaques	TR	TR	2- 3%
Carbonate unspecified	—	—	—
Siliceous fossils	TR- 3%	15-23%	4%

GRAIN SIZE:
2-24 (1.0, 36.2, 82.7)
5-24 (3.7, 40.6, 55.8)

CARBON-CARBONATE:
2-29 (0.1, 0.1, 0)
5-29 (0.1, 0.1, 0)

SITE 444 HOLE A CORE 7 CORED INTERVAL: 139.0-148.5 m



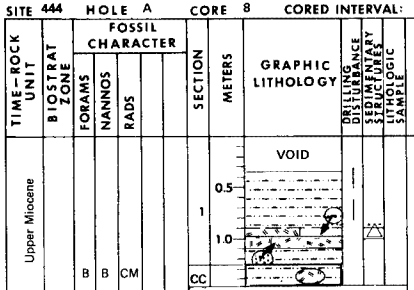
LITHOLOGIC DESCRIPTION

Mud to Vitric Mud
yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/4). No sedimentary structures. Sediments are firm.
Smear at 75 cm = Vitric Mud.

GRAIN SIZE:
1-33 (1.7, 41.6, 56.7)

CARBON-CARBONATE:
1-39 (0.1, 0.1, 0)

SITE 444 HOLE A CORE 8 CORED INTERVAL: 148.5-158.0 m



LITHOLOGIC DESCRIPTION

Dominant Lithology: Mud
yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/4).

Minor Lithology: Ash
dark gray (10YR 4/1) to very dark gray (10YR 3/2) (basaltic ash – opaques). No sedimentary structures except sharp contact at base of ash bed at 106 cm; gradational contact upward from ash to mud. Possibly graded bed. Sediments firm.

Smears:

	A	B
Quartz, Feldspar	3-10%	10-15%
Clay minerals	77-85%	20-50%
Volcanic glass	3- 5%	30-60%
Opaques	1%	2- 3%
Carbonate unspecified	0- 2%	—
Radiolarians	1- 8%	1%

Remarks: Two different ash types are present: one black opaque glass; the other clear, non-opaque glass.

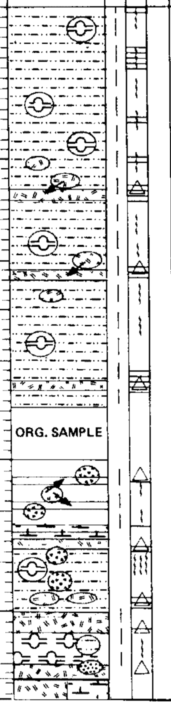
GRAIN SIZE:
1-48 (0.4, 30.6, 69.0)

CARBON-CARBONATE:
1-53 (0.1, 0.1, 0)

SITE 444 HOLE A CORE 9 CORED INTERVAL: 158.0-167.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS
Lower Upper Miocene	*Discoaster neohamatus* Zone (N)	B		AM	1	0.5, 1.0
					2	
		B		AM	3	
			AM		4	
					5	
		B	AP	CM	CC	

GRAPHIC LITHOLOGY



LITHOLOGIC DESCRIPTION

Dominant Lithology:
(A) Siliceous Mud: dark brown (10YR 3/3) to very dark brown (10YR 2/2), to 10YR 3/2, and very dark grayish brown (10YR 3/2).

Dominant Lithology:
(B) Numerous zones of ash and muddy ash with opaque glass in several ("basaltic" ash), very dark grayish or (10YR 3/2), very dark brown (10YR 2/2) when "pure" ash; also lighter-colored ash (C).
Highly bioturbated and mottled almost throughout.
Ash beds are graded; laminations in upper parts; generally sharp contacts at base.
Sediments generally firm.
Pumice lapillae (1-2 cm) yellow-brown.

Minor Lithologies:
Nannofossil Ooze: very dark grayish brown (10YR 3/2) to dark gray (10YR 4/1), 74% nannofossils.
Muddy Radiolarian Ooze: dark brown (10YR 3/3); 40% radiolarians.
Sandy Nannofossil Ash: dark gray (10YR 4/1); 44% volcanic glass, 32% nannofossils.

Smears:

	A	B	C
Quartz, Feldspar	5-10%	10-15%	1- 2%
Clay minerals	50-65%	10-25%	10-12%
Volcanic glass	8-12%	40-60%	80%
Opaques	2- 3%	TR	3%
Carbonate			2- 3%
unspecified	5- 6%		1%
Siliceous fossils (Radiolarians)	12-30%	5-10%	

Remarks: Although the cyclic sequences are poorly defined because of mottling and bioturbation, there are at least eight, (probably more) fining-upward cycles in 6.6 meters. Bioturbation most prominent at top of each cycle.

GRAIN SIZE:
2-98 (14.9, 56.7, 28.4)
4-75 (0.5, 42.5, 57.0)

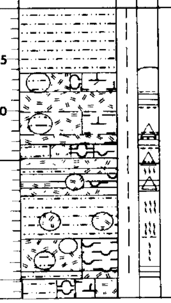
CARBON-CARBONATE:
2-103 (0.1, 0.0, 0)
4-80 (2.0, 0.1, 16)

CARBONATE BOMB:
4-83 (8.5)

SITE 444 HOLE A CORE 10 CORED INTERVAL: 167.5-177.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS
Upper Miocene	*Discoaster hamatus* Zone (N) / *D. neohamatus* Zone (N)	RP	AP	CM	1	0.5, 1.0
			AM		2	
			AP			
		RP	AG	AG	CC	

GRAPHIC LITHOLOGY



LITHOLOGIC DESCRIPTION

Dominant Lithologies:
(A) Mud: yellowish brown (10YR 5/2) massive, homogeneous; no sedimentary structures.
(B) Sandy Nannofossil Ash: olive gray (5Y 5/2 – 4/2) ash mottling, to olive 5Y 4/3 **Nannofossil Ash.** Intense bioturbation. Many ashy nannofossil-mud layers, olive-brown (2.5Y 4/4).
(C) Ash: reddish black (10R 2/1) and olive brown (2.5Y4) ash, occurring as sandy-silty sized layers fining upward, or as laminations in olive-gray mud, or as mottles. Occurs as siliceous (rad-bearing) ashy mud or muddy ash in lower part of Section 1 (30% volcanic glass; 20% siliceous fossils). Sediments firm.

Minor Lithologies:
(D) Muddy Radiolarian Ash (23% radiolarians).
(E) Radiolarian-Nannofossil Ooze (70% nannofossils).

Smears:

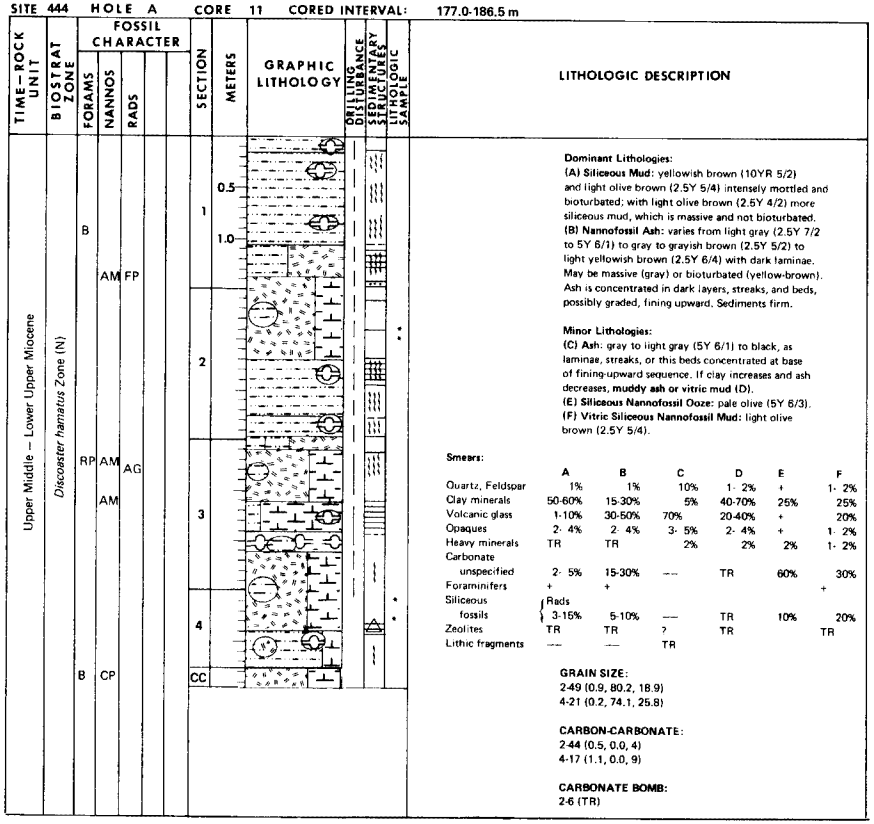
	A	B	C	D	E
Quartz, Feldspar	2%	2- 3%	5-10%	TR	1- 2%
Clay minerals	83%	15-30%	20%	40%	20%
Volcanic glass	10%	40-45%	60-65%	30%	—
Opaques	1%	3- 5%		TR	1- 2%
Carbonate unspecified / Calcareous fossils	—	10-20%			Nannos 70%
Siliceous fossils	3%	6-10%		23%	5%

GRAIN SIZE:
2-57 (14.8, 55.6, 29.7)

CARBON-CARBONATE:
2-62 (0.1, 0.1, 0)

CARBONATE BOMB:
1-75 (TR)

SITE 444 HOLE A CORE 11 CORED INTERVAL: 177.0-186.5 m



LITHOLOGIC DESCRIPTION

Dominant Lithologies:

(A) Siliceous Mud: yellowish brown (10YR 5/2) and light olive brown (2.5Y 5/4) intensely mottled and bioturbated; with light olive brown (2.5Y 4/2) more siliceous mud, which is massive and not bioturbated.

(B) Nannofossil Ash: varies from light gray (2.5Y 7/2 to 5Y 6/1) to gray to grayish brown (2.5Y 5/2) to light yellowish brown (2.5Y 6/4) with dark laminae. May be massive (gray) or bioturbated (yellow-brown). Ash is concentrated in dark layers, streaks, and beds, possibly graded, fining upward. Sediments firm.

Minor Lithologies:

(C) Ash: gray to light gray (5Y 6/1) to black, as laminae, streaks, or thin beds concentrated at base of fining-upward sequence. If clay increases and ash decreases, **muddy ash or vitric mud (D).**

(E) Siliceous Nannofossil Ooze: pale olive (5Y 6/3).

(F) Vitric Siliceous Nannofossil Mud: light olive brown (2.5Y 5/4).

Smears:

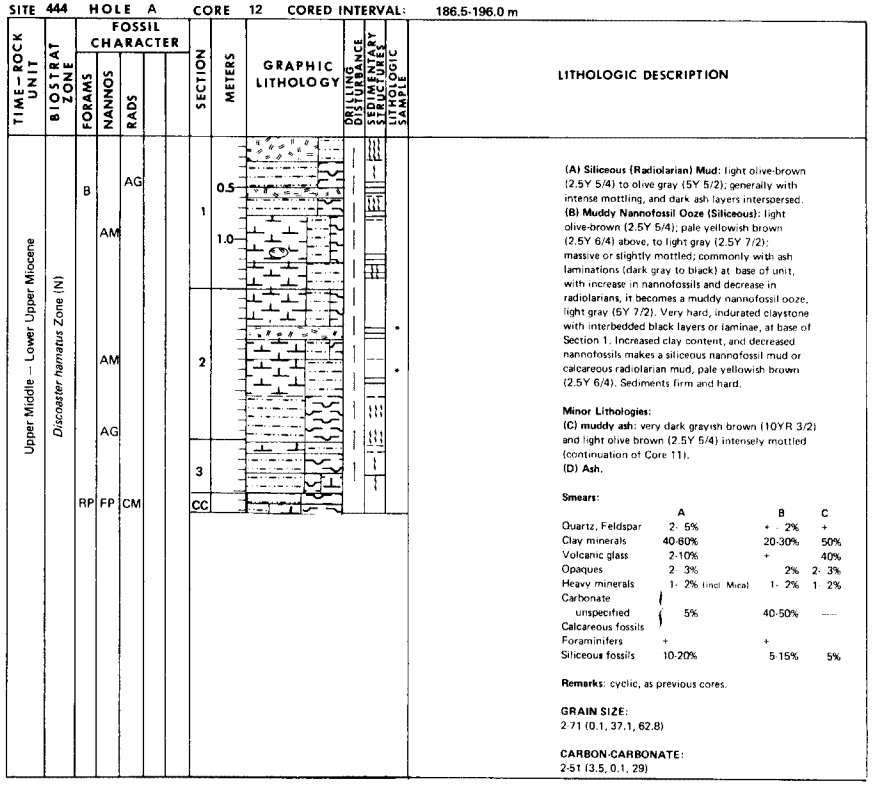
	A	B	C	D	E	F
Quartz, Feldspar	1%	1%	10%	1-2%	+	1-2%
Clay minerals	50-60%	15-30%	5%	40-70%	25%	25%
Volcanic glass	1-10%	30-50%	70%	20-40%	+	20%
Opaques	2-4%	2-4%	3-5%	2-4%	+	1-2%
Heavy minerals	TR	TR	2%	2%	2%	1-2%
Carbonate unspecified	2-5%	15-30%	—	TR	60%	30%
Foraminifers	+	+				+
Siliceous fossils	Rads 3-15%	5-10%	—	TR	10%	20%
Zeolites	TR	TR	?	TR		TR
Lithic fragments	—	—	TR			

GRAIN SIZE:
2-49 (0.9, 80.2, 18.9)
4-21 (0.2, 74.1, 25.8)

CARBON-CARBONATE:
2-44 (0.5, 0.0, 4)
4-17 (1.1, 0.0, 9)

CARBONATE BOMB:
2-6 (TR)

SITE 444 HOLE A CORE 12 CORED INTERVAL: 186.5-196.0 m



LITHOLOGIC DESCRIPTION

(A) Siliceous (Radiolarian) Mud: light olive-brown (2.5Y 5/4) to olive gray (5Y 5/2); generally with intense mottling, and dark ash layers interspersed.

(B) Muddy Nannofossil Ooze (Siliceous): light olive-brown (2.5Y 5/4); pale yellowish brown (2.5Y 6/4) above, to light gray (2.5Y 7/2); massive or slightly mottled; commonly with ash laminations (dark gray to black) at base of unit, with increase in nannofossils and decrease in radiolarians, it becomes a muddy nannofossil ooze, light gray (5Y 7/2). Very hard, indurated claystone with interbedded black layers or laminae, at base of Section 1. Increased clay content, and decreased nannofossils makes a siliceous nannofossil mud or calcareous radiolarian mud, pale yellowish brown (2.5Y 6/4). Sediments firm and hard.

Minor Lithologies:

(C) muddy ash: very dark grayish brown (10YR 3/2) and light olive brown (2.5Y 5/4) intensely mottled (continuation of Core 11).

(D) Ash.

Smears:

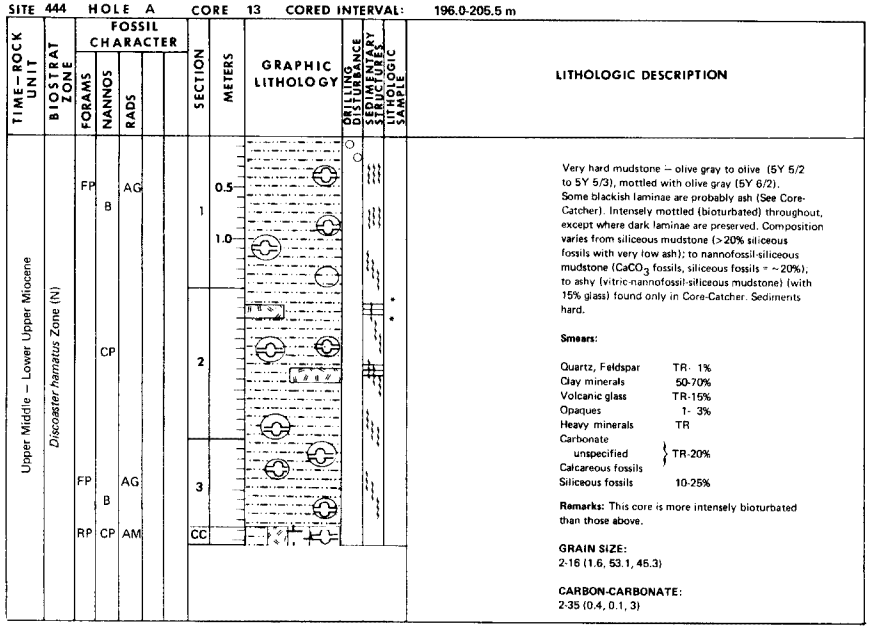
	A	B	C
Quartz, Feldspar	2-5%	+ - 2%	+
Clay minerals	40-60%	20-30%	50%
Volcanic glass	2-10%	+	40%
Opaques	2-3%	2%	2-3%
Heavy minerals	1-2% (incl. Mica)	1-2%	1-2%
Carbonate unspecified	5%	40-50%	—
Calcareous fossils			
Foraminifers	+	+	
Siliceous fossils	10-20%	5-15%	5%

Remarks: cyclic, as previous cores.

GRAIN SIZE:
2-71 (0.1, 37.1, 62.8)

CARBON-CARBONATE:
2-51 (3.5, 0.1, 29)

SITE 444 HOLE A CORE 13 CORED INTERVAL: 196.0-205.5 m



LITHOLOGIC DESCRIPTION

Very hard mudstone – olive gray to olive (5Y 5/2 to 5Y 5/3), mottled with olive gray (5Y 6/2). Some blackish laminae are probably ash (See Core-Catcher). Intensely mottled (bioturbated) throughout, except where dark laminae are preserved. Composition varies from siliceous mudstone (>20% siliceous fossils with very low ash); to nannofossil-siliceous mudstone ($CaCO_3$ fossils, siliceous fossils = ~20%), to ashy (vitric-nannofossil-siliceous mudstone) (with 15% glass) found only in Core-Catcher. Sediments hard.

Smears:

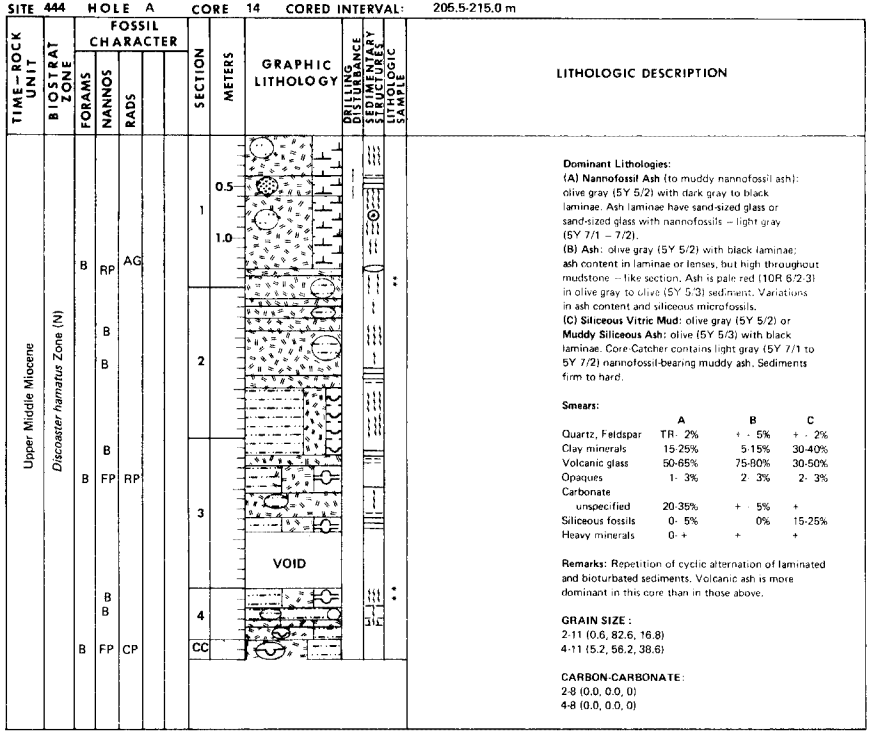
Quartz, Feldspar	TR- 1%
Clay minerals	50-70%
Volcanic glass	TR-15%
Opaques	1- 3%
Heavy minerals	TR
Carbonate unspecified	TR-20%
Calcareous fossils	
Siliceous fossils	10-25%

Remarks: This core is more intensely bioturbated than those above.

GRAIN SIZE:
2-16 (1.6, 53.1, 46.3)

CARBON-CARBONATE:
2-35 (0.4, 0.1, 3)

SITE 444 HOLE A CORE 14 CORED INTERVAL: 205.5-215.0 m



LITHOLOGIC DESCRIPTION

Dominant Lithologies:
(A) Nannofossil Ash (to muddy nannofossil ash): olive gray (5Y 5/2) with dark gray to black laminae. Ash laminae have sand-sized glass or sand-sized glass with nannofossils – light gray (5Y 7/1 – 7/2).
(B) Ash: olive gray (5Y 5/2) with black laminae; ash content in laminae or lenses, but high throughout mudstone – like section. Ash is pale red (10R 6/2-3) in olive gray to olive (5Y 5/3) sediment. Variations in ash content and siliceous microfossils.
(C) Siliceous Vitric Mud: olive gray (5Y 5/2) or **Muddy Siliceous Ash:** olive (5Y 5/3) with black laminae. Core-Catcher contains light gray (5Y 7/1 to 5Y 7/2) nannofossil-bearing muddy ash. Sediments firm to hard.

Smears:

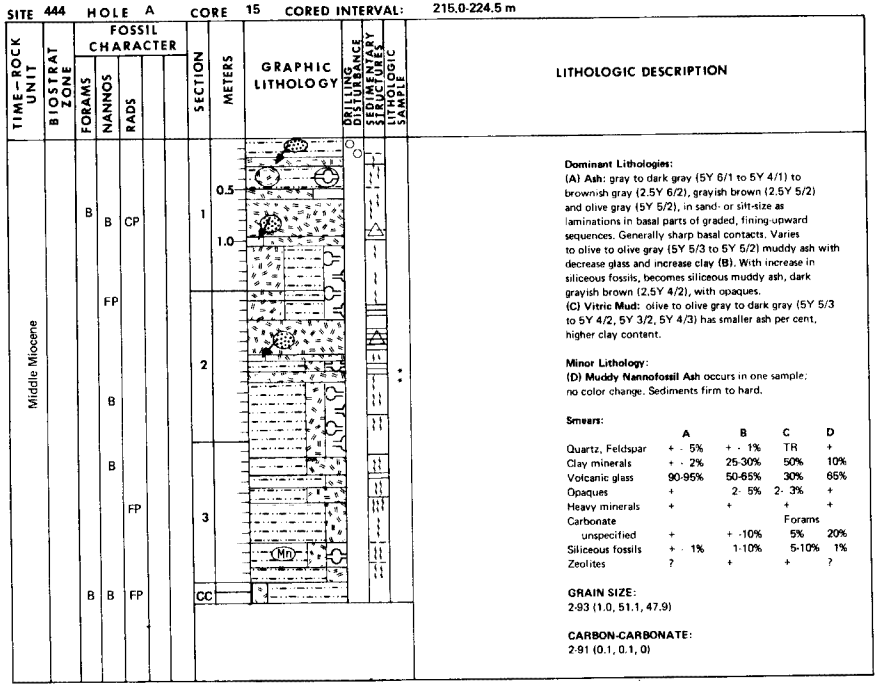
	A	B	C
Quartz, Feldspar	TR- 2%	+ - 5%	+ - 2%
Clay minerals	15-25%	5-15%	30-40%
Volcanic glass	50-65%	75-80%	30-50%
Opaques	1- 3%	2- 3%	2- 3%
Carbonate unspecified	20-35%	+ 5%	+
Siliceous fossils	0- 5%	0%	15-25%
Heavy minerals	0- +	+	+

Remarks: Repetition of cyclic alternation of laminated and bioturbated sediments. Volcanic ash is more dominant in this core than in those above.

GRAIN SIZE:
2-11 (0.6, 82.6, 16.8)
4-11 (5.2, 56.2, 38.6)

CARBON-CARBONATE:
2-8 (0.0, 0.0, 0)
4-8 (0.0, 0.0, 0)

SITE 444 HOLE A CORE 15 CORED INTERVAL: 215.0-224.5 m



LITHOLOGIC DESCRIPTION

Dominant Lithologies:
(A) Ash: gray to dark gray (5Y 6/1 to 5Y 4/1) to brownish gray (2.5Y 6/2), grayish brown (2.5Y 5/2) and olive gray (5Y 5/2), in sand- or silt-size as laminations in basal parts of graded, fining-upward sequences. Generally sharp basal contacts. Varies to olive to olive gray (5Y 5/3 to 5Y 5/2) muddy ash with decrease glass and increase clay **(B)**. With increase in siliceous fossils, becomes siliceous muddy ash, dark grayish brown (2.5Y 4/2), with opaques.
(C) Vitric Mud: olive to olive gray to dark gray (5Y 5/3 to 5Y 4/2, 5Y 3/2, 5Y 4/3) has smaller ash per cent, higher clay content.

Minor Lithology:
(D) Muddy Nannofossil Ash occurs in one sample; no color change. Sediments firm to hard.

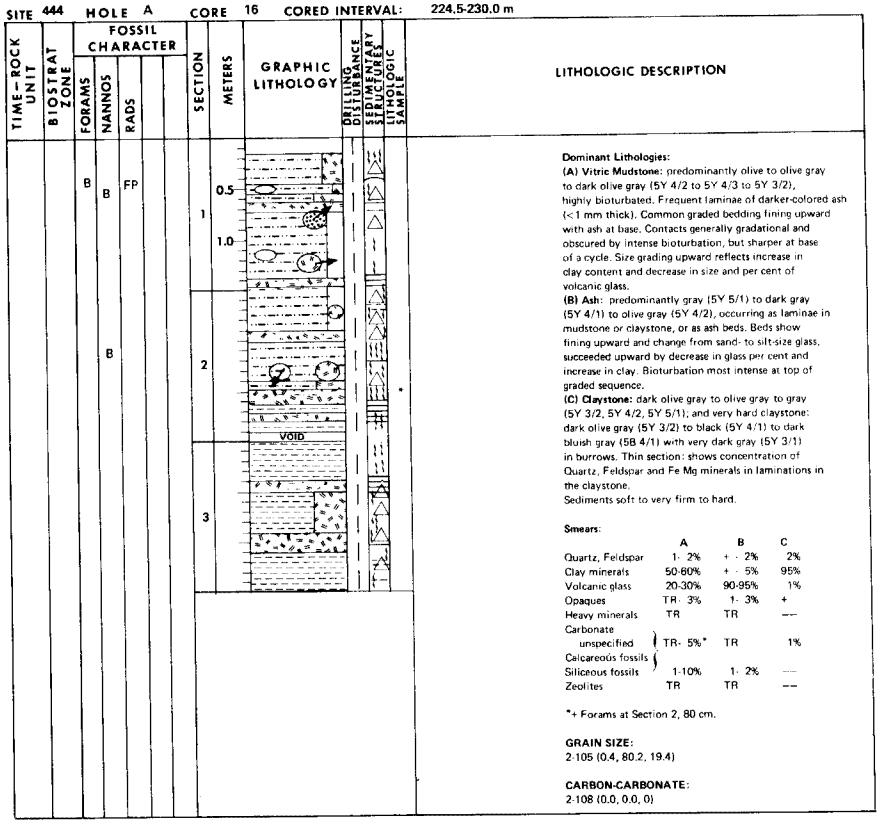
Smears:

	A	B	C	D
Quartz, Feldspar	+ - 5%	+ - 1%	TR	+
Clay minerals	+ - 2%	25-30%	50%	10%
Volcanic glass	90-95%	50-65%	30%	65%
Opaques	+	2- 5%	2- 3%	+
Heavy minerals	+	+	+	+
Carbonate unspecified	+	+ -10%	Forams 5%	20%
Siliceous fossils	+ - 1%	1-10%	5-10%	1%
Zeolites	?	+	+	?

GRAIN SIZE:
2-93 (1.0, 51.1, 47.9)

CARBON-CARBONATE:
2-91 (0.1, 0.1, 0)

SITE 444 HOLE A CORE 16 CORED INTERVAL: 224.5-230.0 m



LITHOLOGIC DESCRIPTION

Dominant Lithologies:
(A) Vitric Mudstone: predominantly olive to olive gray to dark olive gray (5Y 4/2 to 5Y 4/3 to 5Y 3/2), highly bioturbated. Frequent laminae of darker-colored ash (<1 mm thick). Common graded bedding fining upward with ash at base. Contacts generally gradational and obscured by intense bioturbation, but sharper at base of a cycle. Size grading upward reflects increase in clay content and decrease in size and per cent of volcanic glass.
(B) Ash: predominantly gray (5Y 5/1) to dark gray (5Y 4/1) to olive gray (5Y 4/2), occurring as laminae in mudstone or claystone, or as ash beds. Beds show fining upward and change from sand- to silt-size glass, succeeded upward by decrease in glass per cent and increase in clay. Bioturbation most intense at top of graded sequence.
(C) Claystone: dark olive gray to olive gray to gray (5Y 3/2, 5Y 4/2, 5Y 5/1); and very hard claystone: dark olive gray (5Y 3/2) to black (5Y 4/1) to dark bluish gray (5B 4/1) with very dark gray (5Y 3/1) in burrows. Thin section: shows concentration of Quartz, Feldspar and Fe Mg minerals in laminations in the claystone.
Sediments soft to very firm to hard.

Smears:

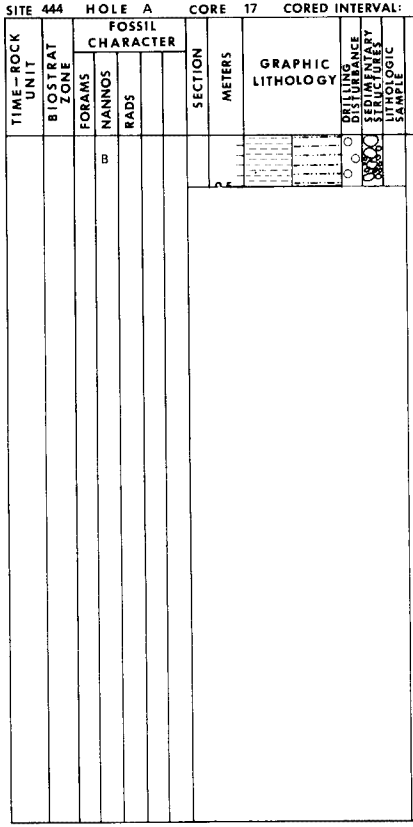
	A	B	C
Quartz, Feldspar	1- 2%	+ - 2%	2%
Clay minerals	50-60%	+ - 5%	95%
Volcanic glass	20-30%	90-95%	1%
Opaques	TR- 3%	1- 3%	+
Heavy minerals	TR	TR	—
Carbonate unspecified	TR- 5%*	TR	1%
Calcareous fossils			
Siliceous fossils	1-10%	1- 2%	—
Zeolites	TR	TR	—

*+ Forams at Section 2, 80 cm.

GRAIN SIZE:
2-105 (0.4, 80.2, 19.4)

CARBON-CARBONATE:
2-108 (0.0, 0.0, 0)

SITE 444 HOLE A CORE 17 CORED INTERVAL: 230.0-234.0 m



LITHOLOGIC DESCRIPTION

Sediments are lithified. Five large chunks and ~sixteen chunks of hard rock with drilling breccia recovered. Lithologic descriptions are in order as observed in core, but do not necessarily represent any stratigraphic order: observation from top down:
Very hard claystone, same as bottom of Core 16, Section 3, dark greenish gray to black; bioturbated.
No CO_3 (10 cm);
Very hard claystone, gray (2.5YN/6), parallel laminations, no CO_3 (~10 cm);

Smear:

Feldspar	64%
Clay material	93%

(Including ~20% clay minerals and 73% isotropic "glassy" material which resembles "amorphous silica" – possible alteration product),

Very hard mudstone, greenish gray (5G 5/1) speckled with dark gray; no CO_3 parallel laminations; bioturbation with black mudstone in burrows (~10 cm);

Smear:

Feldspar (including quartz?)	10%
Fe Mg minerals	5%
Clay minerals*	80%
Volcanic glass	5%

*clay + "amorphous silica";

Very hard claystone(?), dark gray (5Y 4/1) with light streaks (bioturbation parallel with bedding planes) greenish gray (5GY 5/1), no CO_3 (~10 cm);
Very hard mudstone, fine parallel laminations of greenish gray (5BG 5/1) in lighter gray (2.5YN/6 to 2.5YN/7) (~5 cm).

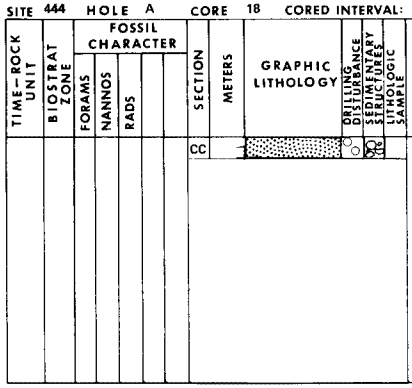
Smear:

Feldspar, (?) quartz, Mica	15%
Clay (equals clay minerals + "amorphous SiO_2")	85%;

Small fragments, mudstone – greenish gray (5G 5/1 to 5BG 5/1) massive, no laminations; sandy texture.

CARBON-CARBONATE:
1-21 (0.1, 0.1, 0)

SITE 444 HOLE A CORE 18 CORED INTERVAL: 234.0-240.0 m



LITHOLOGIC DESCRIPTION

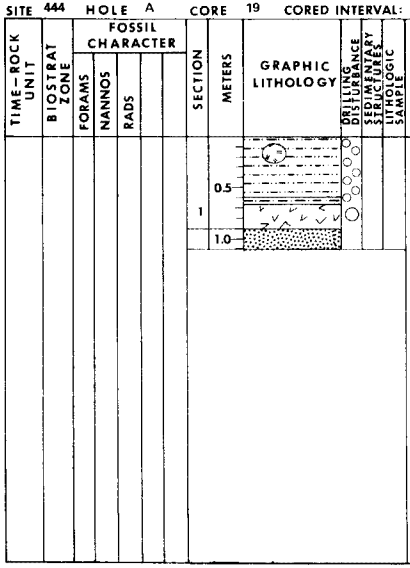
Recovered 3 chunks of rock as a drilling breccia in Core-Catcher.
Sandstone or mudstone (sandy), light gray (5Y 7/1) silty to sandy with "arkosic" composition; parallel laminations of dark minerals – no orientation possible; could be parts of graded beds(?).

Smear:

Feldspar (and quartz?)	75%
Mica	10%
Clay minerals	10%
Heavy minerals, opaques, lithic fragments	5%

(Most of the grains are covered with impurities such as oxides or siliceous cement.)

SITE 444 HOLE A CORE 19 CORED INTERVAL: 240.0-243.5 m



LITHOLOGIC DESCRIPTION

Sixty-three centimeters of drilling breccia overlying basalt chunk; all colors tan to gray to black to brown, most representing contamination.

Smears:
(1) In brown clay rad-bearing vitric mud (contamination?). No evidence of baking.
(2) In black crumbly basaltic rock powder: sandy mudstone.

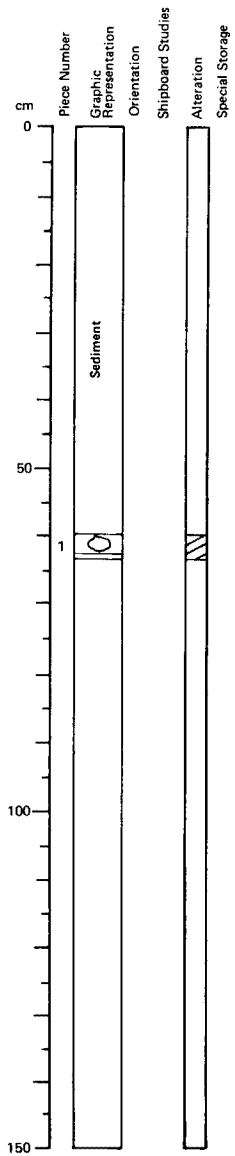
Quartz, Feldspar	15% (Plagioclase)
Clay minerals	55%
Volcanic glass	15%
Altered volcanic glass	10%
Fe Mg	5% (Pyroxene)

Feldspar and pyroxene relatively fresh, not weathered; either transported short distance (first cycle) or derived in situ from underlying basalt.
(3) Core-Catcher – hard rock
Sandstone.

Quartz, Feldspar	70% (including 10% quartz?)
Mica	6%
Heavy minrals	14%
Opaques	7%
Carbonate unspecified	3%

(calcite or dolomite – not organic in origin)

Core 20 is basalt.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	4	A	1	9	1

Depth: 240.0 to 240.6 m

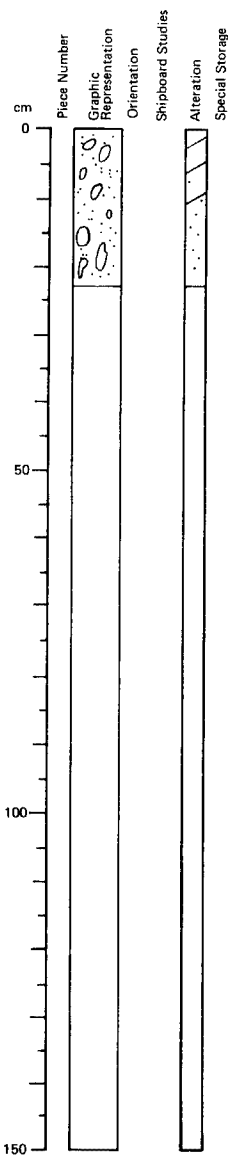
Visual Description

Structure: 1 piece of basaltic breccia, no evidence of chill zone or baked contact with sediments above.

Texture: dark greenish-black, friable, medium-grained, aphyric.

Mineralogy: plagioclase, clinopyroxene plus magnetite(?) needles or chlorite plates.

Alteration: calcite and zeolites on surface; a few drops of diluted HCl evolved H_2S – sulphides present?



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	4	A	1	9	CC

Depth: 240.6 to 240.9 m

Visual Description

Structure: basaltic breccia, mixture of pebbles and basaltic sand.

Texture: medium-grained, aphyric.

Mineralogy: plagioclase, clinopyroxene, magnetite needles or chlorite plates(?).

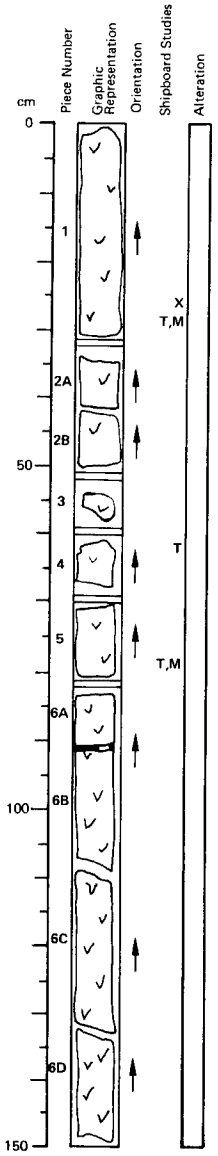
Alteration: 0-10 cm; greenish-black pebbles, friable, similar to pebble in Core 19, Section 1, 60-63 cm. 10-23 cm; light gray pebbles predominate, solid. Calcite and zeolites present on surface of some pebbles.

Thin Section Description

Plagioclase, 35%, 0.05-0.8 mm, $>An_{63}$; clinopyroxene, 25%, 0.05-1.2 mm; magnetite, 5%, 0.02-0.05 mm granular or up to 0.8 mm as elongate needles; cryptocrystalline/chloritic matrix, 33%.

Vesicles: 2% empty.

Texture: intersertal, subophitic.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 0	1

Depth: 243.5 to 245.0 m

Visual Description
Structure: basaltic/diabase sill.
Texture: massive, medium-grained, coarser section 53-81 cm.
Mineralogy: plagioclase, clinopyroxene.
Alteration: fresh, some large plagioclase cores sausseritized.

Thin Section Description – 27-29 cm
Plagioclase, 35%, 0.1-1 mm, An_{82}; clinopyroxene, 20%, 0.05-1 mm; magnetite, 3%, 0.02-0.3 mm; olivine, 1%, 0.02-0.05 mm, relict; zeolites, 0.5%, 0.05 mm; cryptocrystalline/chloritic matrix, 45%; accessory chrome spinel.

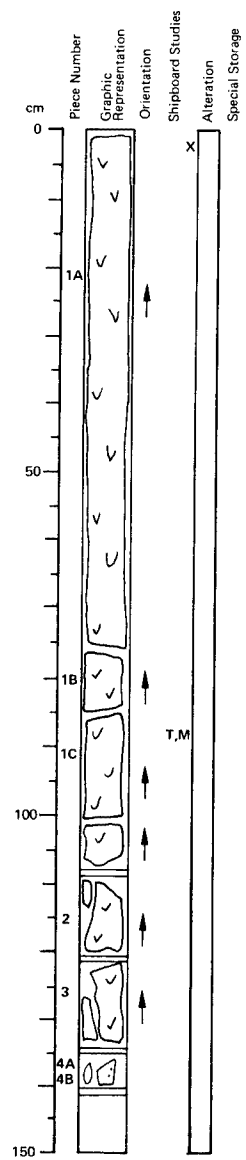
Thin Section Description – 62-64 cm and 71-73 cm
Plagioclase, 40%, 0.1-1.5 mm; clinopyroxene, 10-25%, 0.1-1.5 mm, pinkish-brown; magnetite, 2-10%, 0.02-0.05 mm, granular or 0.05-1 mm, acicular; chlorite and chloritic matrix, 30-40%; accessory apatite, iddingsite.
Texture: holocrystalline aggregates and crystals in chloritic matrix.

Shipboard Data

Bulk Analysis:	22 cm	73 cm
SiO_2	48.10	50.68
Al_2O_3	15.23	15.56
Fe_2O_3	1.14	1.08
FeO	7.54	7.16
MgO	10.55	6.94
CaO	8.05	8.59
Na_2O	3.52	4.49
K_2O	2.00	2.60
TiO_2	1.50	1.87
P_2O_5	0.30	0.39
MnO	0.15	0.15
LOI	---	---
H_2O^+	---	---
H_2O^-	---	---
CO_2	---	---
Cr	222.00	127.00
Ni	137.00	26.00
Sr	336.00	391.00
Zr	158.00	209.00

Magnetic Data:	27 cm	71 cm
Intensity (emu/cc)	58.9	119.8
Inclination before demag.	–55.3	–54.6
Stable Inclination	–60.9	–60.2

Physical Properties:	45 cm
$\bar{V}p$ (km/s)	5.03



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 0	2

Depth: 245.0 to 246.4 m

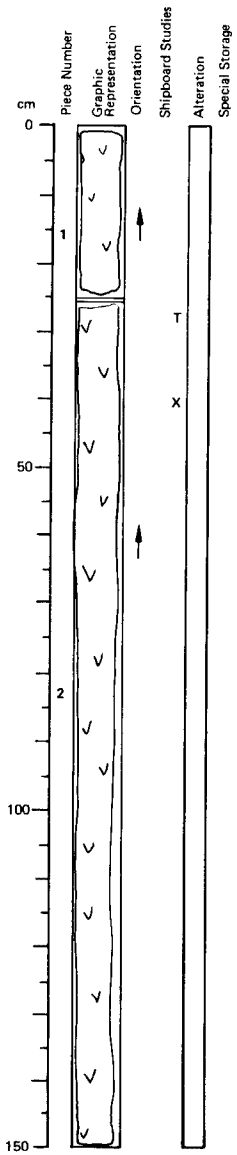
Visual Description
Structure: basaltic/diabase sill continued from previous section.
Texture: massive, medium-grained.
Mineralogy: plagioclase, clinopyroxene, chlorite.
Alteration: fresh with talcose vein/fracture lining on Pieces 2 and 3.

Thin Section Description – 88-90 cm
Plagioclase, 33%, 0.05-1 mm, > An_{60}; clinopyroxene, 20%, 0.05-1 mm; olivine, 5%, 0.05-0.2 mm, relict; magnetite, 2%, 0.02-0.1 mm granular, 0.01-0.5 mm elongate aggregates; cryptocrystalline/chloritic matrix, 40%; accessory apatite.
Texture: intersertal aggregates of plagioclase or plagioclase and clinopyroxene in chloritic matrix.

Shipboard Data

Bulk Analysis:	0 cm
SiO_2	47.78
Al_2O_3	15.87
Fe_2O_3	1.13
FeO	7.44
MgO	9.11
CaO	8.42
Na_2O	4.20
K_2O	2.14
TiO_2	1.37
P_2O_5	0.33
MnO	0.16
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	246.00
Ni	180.00
Sr	295.00
Zr	146.00

Magnetic Data:	88 cm
Intensity (emu/cc)	27.0
Inclination before demag.	–26.2
Stable Inclination	–51.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4	A	2 0	3

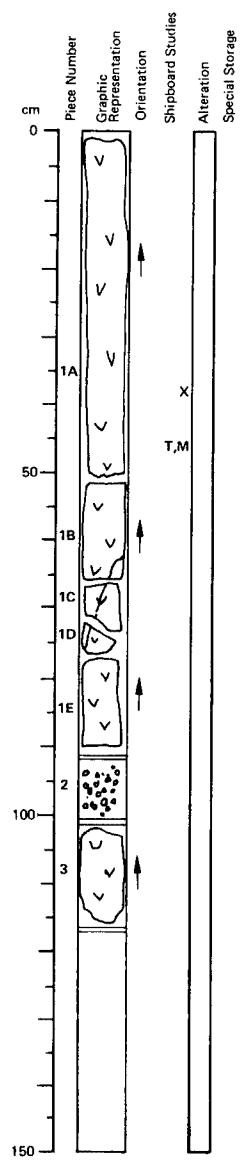
Depth: 246.4 to 247.9 m

Visual Description
Structure: basaltic/diabase sill continued from previous section.
Texture: massive, medium-grained.
Mineralogy: plagioclase, clinopyroxene, chlorite.

Thin Section Description — 30-32 cm
Plagioclase, 40%, 0.05-1 mm, > An_{60}; clinopyroxene, 20%, 0.05-1 mm; olivine, 5%, 0.05-0.2 mm, relict or inclusions in pyroxene magnetite, 2%, 0.02-0.1 mm; cryptocrystalline/chloritic matrix, 33%; accessory chrome spinel.
Texture: intersertal aggregates of plagioclase or plagioclase and pyroxene in chloritic matrix.

Shipboard Data

Bulk Analysis:	**39 cm**
SiO_2	47.71
Al_2O_3	15.58
Fe_2O_3	1.13
FeO	7.39
MgO	9.39
CaO	8.77
Na_2O	4.13
K_2O	2.03
TiO_2	1.38
P_2O_5	0.28
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	234.00
Ni	172.00
Sr	284.00
Zr	149.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4	A	2 0	4

Depth: 247.9 to 249.1 m

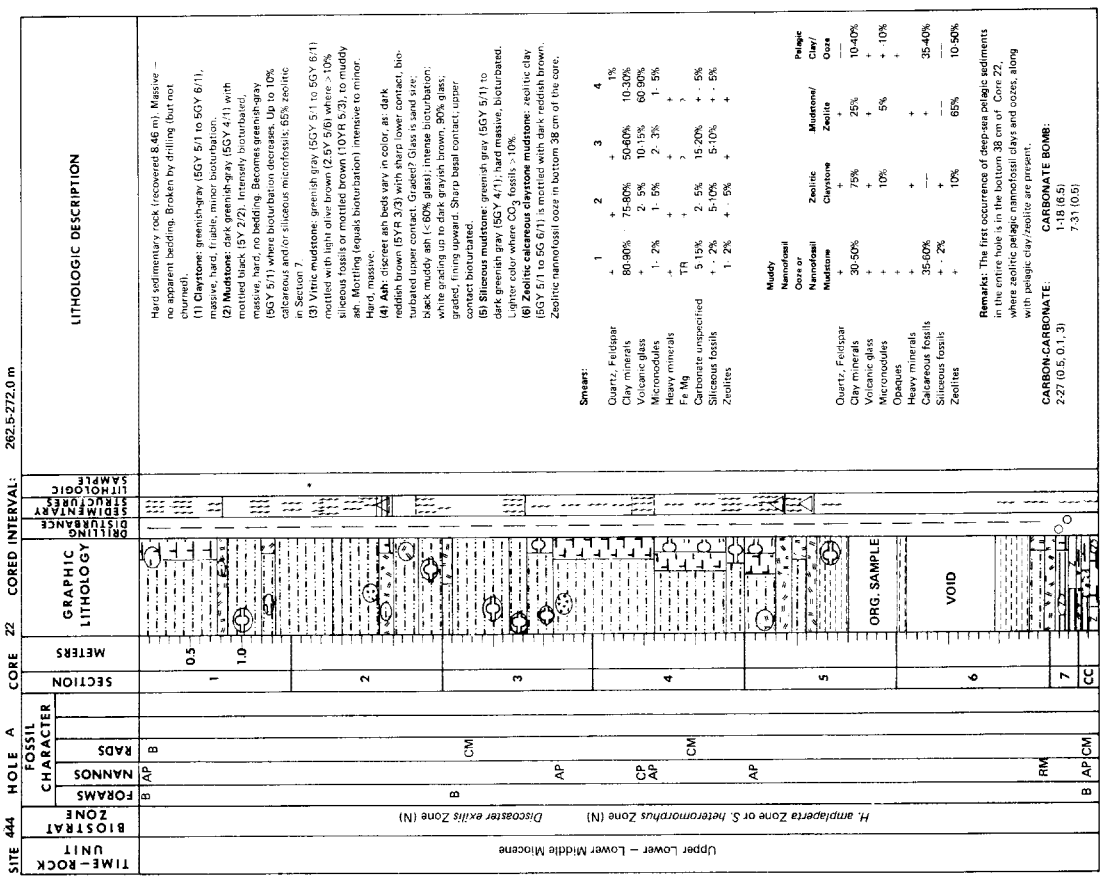
Visual Description
Structure: basaltic/diabase sill continued from previous section.
Texture: massive, medium- to fine-grained.
Mineralogy: plagioclase, clinopyroxene, chlorite.
Alteration: fresh appearance, talcose vein, 1 mm wide 63-75 cm.

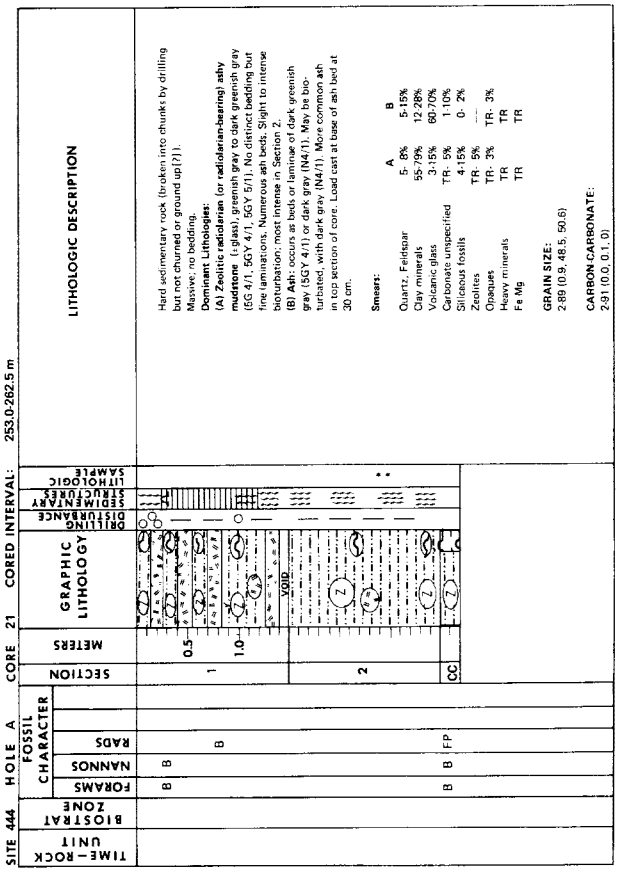
Thin Section Description — 46-48 cm
Plagioclase, 25%, 0.05-0.5 mm; clinopyroxene, 20%, 0.05-0.5 mm, pinkish-brown; olivine, 15%, 0.05-0.3 mm, relict; magnetite, 3%, 0.01-0.1 mm granular or 0.05-0.5 mm elongate aggregates; cryptocrystalline/chloritic matrix, 37%; accessory chrome spinel, apatite, zeolites.
Texture: intersertal aggregates of plagioclase or plagioclase and clinopyroxene in chloritic matrix.

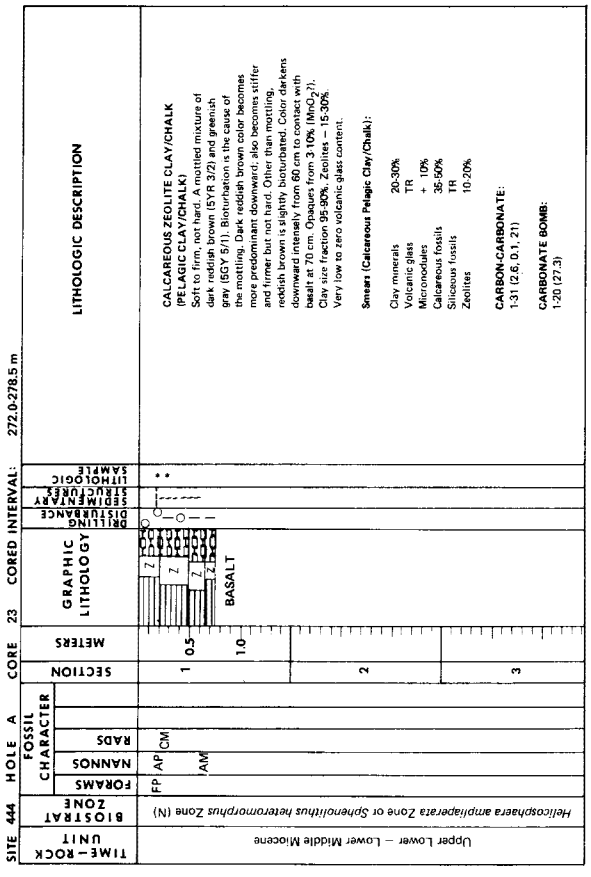
Shipboard Data

Bulk Analysis:	**37 cm**
SiO_2	47.46
Al_2O_3	16.00
Fe_2O_3	1.12
FeO	7.37
MgO	9.10
CaO	8.08
Na_2O	4.56
K_2O	2.32
TiO_2	1.38
P_2O_5	0.25
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	245.00
Ni	182.00
Sr	280.00
Zr	145.00

Magnetic Data:	**46 cm**
Intensity (emu/cc)	31.9
Inclination before demag.	–69.8
Stable Inclination	–61.7


SITE 444
HOLE A
CORE 22
CORED INTERVAL: 262.5-272.0 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Upper Lower – Lower Middle Miocene
H. amplaperta Zone or S. heteromorphus Zone (N)
Discoaster exilis Zone (N)
ORG. SAMPLE
VOID
Hard sedimentary rock (recovered 8.46 m). Massive – no apparent bedding. Broken by drilling (but not churned).
(1) Claystone: greenish-gray (5GY 5/1 to 5GY 6/1), massive, hard, friable, minor bioturbation.
(2) Mudstone: dark greenish-gray (5GY 4/1) with mottled black (5Y 2/2). Intensely bioturbated, massive, hard, no bedding. Becomes greenish-gray (5GY 5/1) where bioturbation decreases. Up to 10% calcareous and/or siliceous microfossils; 65% zeolitic in Section 7.
(3) Vitric mudstone: greenish gray (5GY 5/1 to 5GY 6/1) mottled with light olive brown (2.5Y 5/6) where >10% siliceous fossils or mottled brown (10YR 5/3), to muddy ash. Mottling (equals bioturbation) intensive to minor. Hard, massive.
(4) Ash: discreet ash beds vary in color, as: dark reddish brown (5YR 3/3) with sharp lower contact, bioturbated upper contact. Graded? Glass is sand size: black muddy ash (<60% glass); intense bioturbation: white grading up to dark grayish brown, 90% glass; graded, fining upward. Sharp basal contact, upper contact bioturbated.
(5) Siliceous mudstone: greenish gray (5GY 5/1) to dark greenish gray (5GY 4/1); hard massive, bioturbated. Lighter color where CO_3 fossils >10%.
(6) Zeolitic calcareous claystone mudstone: zeolitic clay (5GY 5/1 to 5G 6/1) is mottled with dark reddish brown. Zeolitic nannofossil ooze in bottom 38 cm of the core.
Smears:
Muddy Nannofossil Ooze or Nannofossil Mudstone
Zeolitic Claystone
Mudstone/ Zeolite
Pelagic Clay/ Ooze
Quartz, Feldspar
Clay minerals
Volcanic glass
Micronodules
Opaques
Heavy minerals
Calcareous fossils
Siliceous fossils
Zeolites
30-50%
75%
25%
10-40%
10%
5%
35-60%
65%
10-50%
CARBON-CARBONATE:
2-27 (0.5, 0.1, 3)
CARBONATE BOMB:
1-18 (6.5)
7-31 (0.5)
Remarks: The first occurrence of deep-sea pelagic sediments in the entire hole is in the bottom 38 cm of Core 22, where zeolitic pelagic nannofossil clays and oozes, along with pelagic clay/zeolite are present.


SITE 444
HOLE A
CORE 21
CORED INTERVAL: 253.0-262.5 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
VOID
Hard sedimentary rock (broken into chunks by drilling but not churned or ground up) (?1).
Massive, no bedding.
Dominant Lithologies:
(A) Zeolitic radiolarian (or radiolarian-bearing) ashy mudstone (±glass), greenish gray to dark greenish gray (5G 4/1, 5GY 4/1, 5GY 5/1). No distinct bedding but fine laminations. Numerous ash beds. Slight to intense bioturbation; most intense in Section 2.
(B) Ash: occurs as beds or laminae of dark greenish gray (5GY 4/1) or dark gray (N4/1). May be bioturbated, with dark gray (N4/1). More common ash in top section of core. Load cast at base of ash bed at 30 cm.
Smears:
A
B
Quartz, Feldspar 5-8% 5-15%
Clay minerals 55-79% 12-28%
Volcanic glass 3-15% 60-70%
Carbonate unspecified TR-5% 1-10%
Siliceous fossils 4-15% 0-2%
Zeolites TR-5% —
Opaques TR-3% TR-3%
Heavy minerals TR TR
Fe Mg TR TR
GRAIN SIZE:
2-89 (0.9, 48.5, 50.6)
CARBON-CARBONATE:
2-91 (0.0, 0.1, 0)


SITE 444 HOLE A CORE 23 CORED INTERVAL: 272.0-278.5 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Upper Lower – Lower Middle Miocene
Helicosphaera ampliaperata Zone or Sphenolithus heteromorphus Zone (N)
FP AP CM AM
BASALT
CALCAREOUS ZEOLITE CLAY/CHALK (PELAGIC CLAY/CHALK)
Soft to firm, not hard. A mottled mixture of dark reddish brown (5YR 3/2) and greenish gray (5GY 5/1). Bioturbation is the cause of the mottling. Dark reddish brown color becomes more predominant downward; also becomes stiffer and firmer but not hard. Other than mottling, reddish brown is slightly bioturbated. Color darkens downward intensely from 60 cm to contact with basalt at 70 cm. Opaques from 3-10% (MnO_2?). Clay size fraction 95-90%. Zeolites – 15-30%. Very low to zero volcanic glass content.
Smears (Calcareous Pelagic Clay/Chalk):
Clay minerals 20-30%
Volcanic glass TR
Micromodules + 10%
Calcareous fossils 35-50%
Siliceous fossils TR
Zeolites 10-20%
CARBON-CARBONATE:
1-31 (2.6, 0.1, 21)
CARBONATE BOMB:
1-20 (27.3)

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5	8 4 4	A	2	3 2

Depth: 272.7 to 274.2 m

Visual Description
Structure: top section of basaltic sill.
Texture: 0-10 cm: glassy, phenocryst-rich basalt with ropey pahoehoe texture to surface, 5% vesicles (0.5-2 mm) grades into – 10-150 cm: amygdaloidal, plagioclase phyric basalt; amygdules less abundant at base of section.
Mineralogy: 0-10 cm: 5-15% plagioclase phenocrysts (spinel[?] inclusions), 2-10 mm; 1% olivine phenocrysts, 2-3 mm – 10-150 cm: 5-20% plagioclase phenocrysts, 2-6 mm.
Alteration: fresh appearance, 10-150 cm – 5-20% clay filled amygdules, calcite and pyrite on fracture surfaces, 28-30 cm large zeolite filled vug.

Thin Section Description – 87-89 cm and 138-140 cm
Phenocrysts: plagioclase, 5-15%, 0.6-2.5 mm, some zoned.
Groundmass: plagioclase, 15-25%, 0.05-0.6 mm; clinopyroxene, 25-30%, 0.05-0.5 mm; magnetite, 2-5%, 0.05-0.5 mm; cryptocrystalline/chloritic matrix, 15-30%.
Vesicles: 5-25%, 0.1-2 mm, 90% clay filled, accessory fillings of calcite, zeolites or pyrite.
Texture: intersertal.

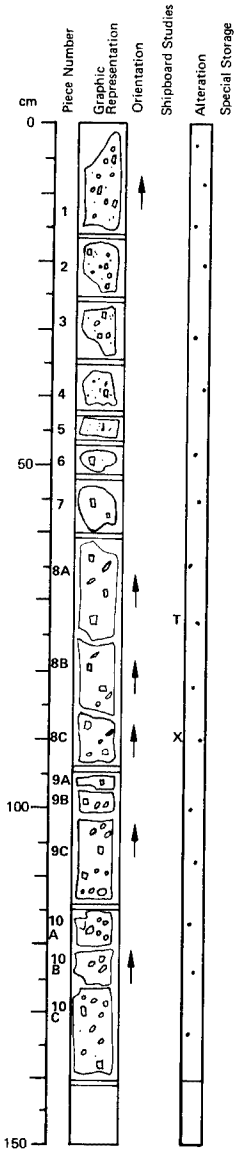
Shipboard Data

Bulk Analysis:	**94 cm**
SiO_2	49.82
Al_2O_3	15.06
Fe_2O_3	1.23
FeO	8.10
MgO	8.07
CaO	12.51
Na_2O	3.13
K_2O	0.29
TiO_2	1.45
P_2O_5	0.18
MnO	0.31
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	253.00
Ni	71.00
Sr	163.00
Zr	118.00

Magnetic Data:	**87 cm**	**138 cm**
Intensity (emu/cc)	217.3	311.5
Inclination before demag.	–8.7	–11.2
Stable Inclination	–16.2	–13.4

Physical Properties:	**87 cm**
$\bar{V}p$ (km/s)	4.25

Other Data:	**87 cm**
Therm. cond. (mcal/cm-s-°C)	3.40



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 4	1

Depth: 278.5 to 279.9 m

Visual Description
Structure: basaltic sill continued from previous core.
Texture: fine- to medium-grained, amygdaloidal, plagioclase phyric. 0-45 cm, 5-10% amygdules, 2 mm; grading to 45-140 cm, 1-3% amygdules, 3-10 mm.
Mineralogy: 5-10% plagioclase phenocrysts, 2-5 mm.
Alteration: fresh appearance, clay with calcite and/or zeolites filling amygdules.

Thin Section Description — 73-75 cm
Phenocrysts: plagioclase, 2%, 1-2 mm, some zoned, some chrome spinel inclusions.
Groundmass: plagioclase, 33%, 0.05-1 mm; clinopyroxene, 30%, 0.05-0.5 mm; magnetite, 2%, 0.02-0.05 mm; cryptocrystalline/chloritic matrix, 30%.
Vesicles: 1%, 0.5-1 mm, clay filled or lined.
Texture: intersertal.

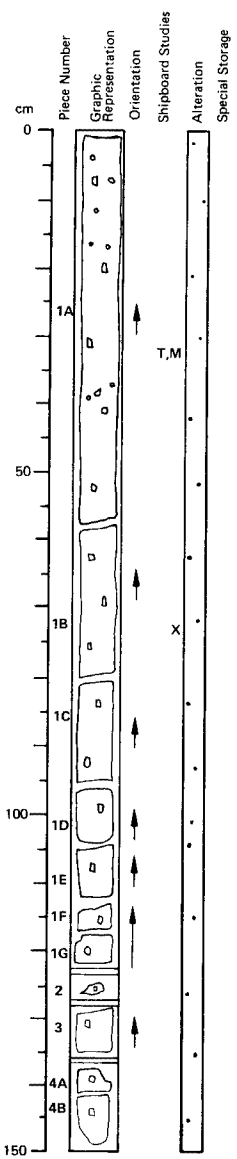
Shipboard Data

Bulk Analysis:	87 cm
SiO_2	49.86
Al_2O_3	15.11
Fe_2O_3	1.26
FeO	8.28
MgO	7.89
CaO	11.34
Na_2O	3.12
K_2O	0.20
TiO_2	1.52
P_2O_5	0.20
MnO	0.16
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	238.00
Ni	59.00
Sr	160.00
Zr	130.00

Magnetic Data:	73 cm
Intensity (emu/cc)	152.6
Inclination before demag.	–33.5
Stable Inclination	–16.2

Physical Properties:	62 cm
$\bar{V}p$ (km/s)	5.06

Other Data:	
Therm. cond. (mcal/cm-s-°C)	3.46



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 4	2

Depth: 279.9 to 281.4 m

Visual Description
Structure: basaltic/diabase sill continued from previous core section.
Texture: fine- to medium-grained, plagioclase phyric 0-20 cm; 2% vesicles, <2 mm — 20-150 cm; occasional vesicle <2 mm.
Mineralogy: plagioclase phenocrysts, 5%, 2-5 mm, plagioclase and pyroxene discernable.
Alteration: fresh appearance, clay lining to some vesicles.

Thin Section Description — 30-32 cm
Phenocrysts: plagioclase, 10%, 1-2 mm, zoned, An_{70}.
Groundmass: plagioclase, 30%, 0.1-1 mm; clinopyroxene, 25%, 0.1-1 mm; magnetite, 1%, 0.02-0.1 mm; cryptocrystalline/chloritic matrix, 34%.
Texture: intersertal/subophitic.

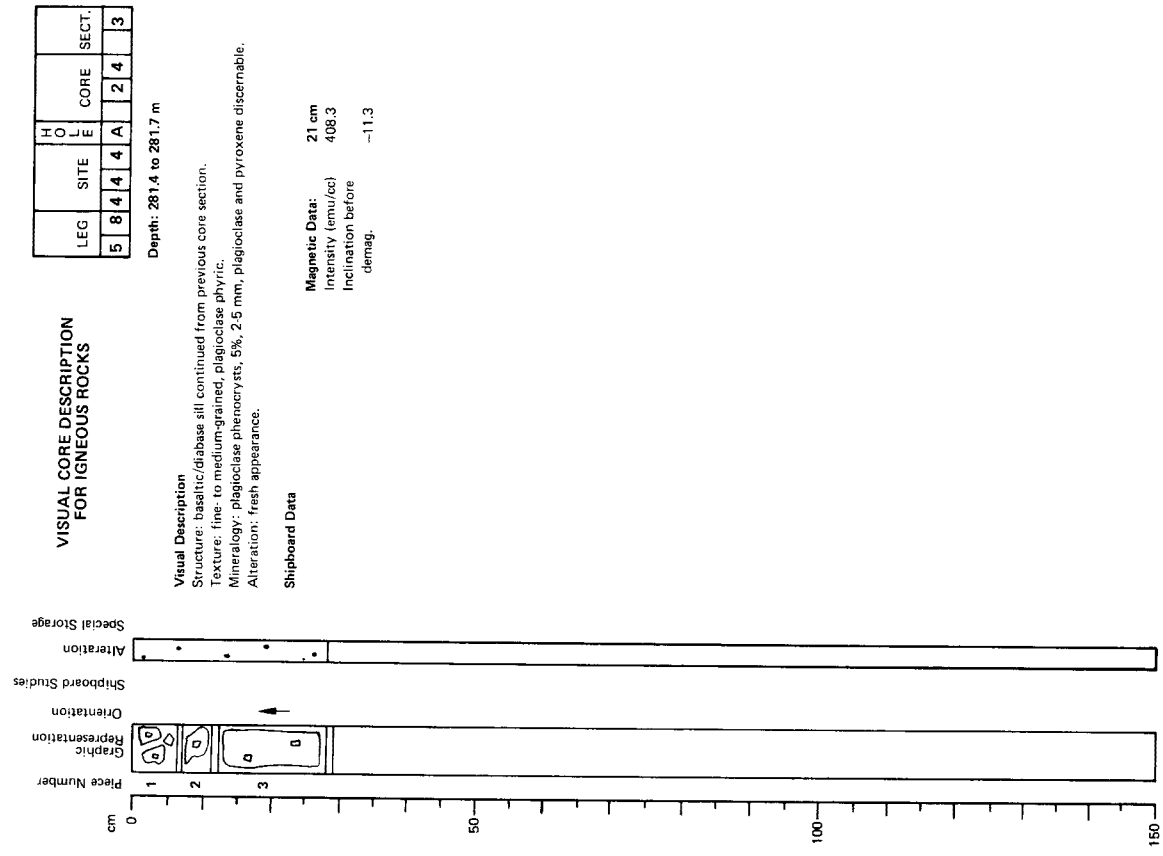
Shipboard Data

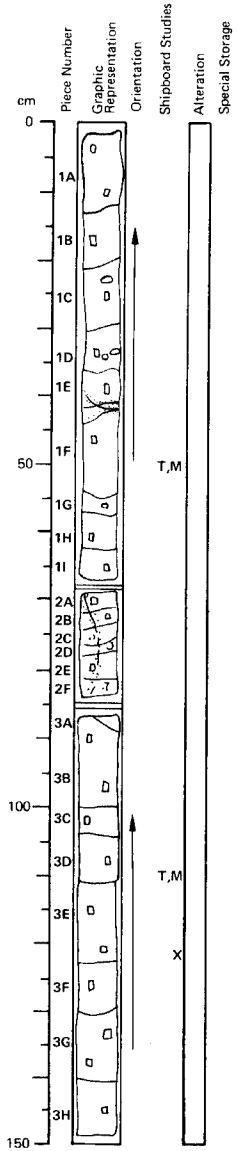
Bulk Analysis:	73 cm
SiO_2	50.29
Al_2O_3	15.15
Fe_2O_3	1.28
FeO	8.44
MgO	8.44
CaO	11.15
Na_2O	3.12
K_2O	0.26
TiO_2	1.54
P_2O_5	0.21
MnO	0.18
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	245.00
Ni	59.00
Sr	153.00
Zr	134.00

Magnetic Data:	30 cm
Intensity (emu/cc)	143.5
Inclination before demag.	–17.0
Stable Inclination	–11.8

Physical Properties:	30 cm
$\bar{V}p$ (km/s)	5.42

Other Data:	
Therm. cond. (mcal/cm-s-°C)	3.47





VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	4	A	2	5	1

Depth: 281.5 to 283.0 m

Visual Description
Structure: basaltic/diabase sill continued from previous core.
Texture: medium-grained, plagioclase phyric.
Mineralogy: plagioclase phenocrysts; 0-100 cm, 10%, increasing to 20% between 100-150 cm.
Alteration: odd clay filled vesicle, chloritic veins at 40-45 cm and 69-85 cm.

Thin Section Description — 48-50 cm
Phenocrysts: plagioclase, 5%, 1-2 mm.
Groundmass: plagioclase, 40%, 0.1-1 mm; clinopyroxene, 35%, 0.1-1.5 mm; magnetite, 2%, 0.02-0.2 mm; cryptocrystalline/chloritic matrix, 18%; accessory small relict olivine.
Texture: intersertal/subophitic.

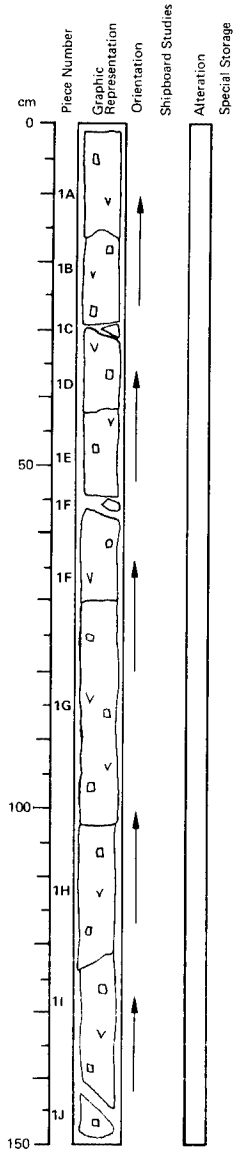
Shipboard Data

Bulk Analysis:	**118 cm**
SiO_2	50.67
Al_2O_3	15.38
Fe_2O_3	1.26
FeO	8.35
MgO	7.86
CaO	11.43
Na_2O	3.25
K_2O	0.20
TiO_2	1.64
P_2O_5	0.22
MnO	0.17
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	245.00
Ni	53.00
Sr	160.00
Zr	141.00

Magnetic Data:	**49 cm**
Intensity (emu/cc)	336.0
Inclination before demag.	−13.4
Stable Inclination	−12.8

Physical Properties:	**8 cm**
$\bar{V}p$ (km/s)	5.46
Porosity (%)	6.19
Wet Bulk Density	2.82
Grain Density	2.94

Other Data:	**45 cm**
Therm. cond. (mcal/cm-s-°C)	3.83



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	4	A	2	5	2

Depth: 283.0 to 284.5 m

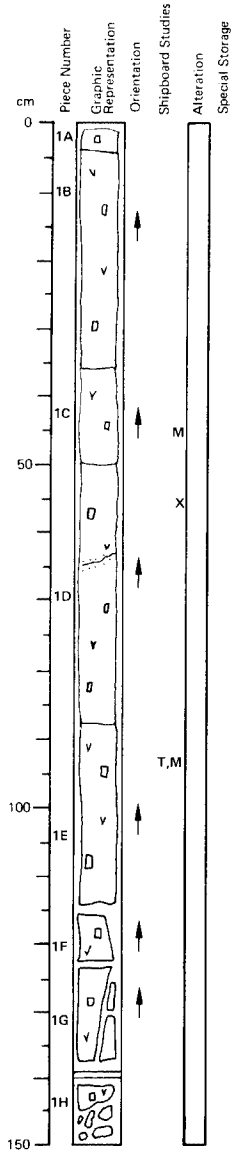
Visual Description
Structure: basaltic/diabase sill continued from previous core section.
Texture: medium-grained, plagioclase phyric.
Mineralogy: plagioclase phenocrysts, 20%, plagioclase and pyroxene.

Thin Section Description — 108-110 cm
Phenocrysts: plagioclase, 5%, 1-3 mm.
Groundmass: plagioclase, 40%, 0.1-1 mm; clinopyroxene, 30%, 0.1-1.5 mm; olivine, 6%, 0.1-0.4 mm, relict; magnetite, 3%, 0.02-0.3 mm; cryptocrystalline/chloritic matrix, 16%.
Texture: intersertal/subophitic.

Shipboard Data

Magnetic Data:	**50 cm**	**109 cm**
Intensity (emu/cc)	292.5	96.7
Inclination before demag.	−12.2	−7.7
Stable Inclination	−8.8	−13.8

Other Data:	**35 cm**
Therm. cond. (mcal/cm-s-°C)	3.56



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 5	3

Depth: 284.5 to 286.0 m

Visual Description
Structure: basaltic/diabase sill continued from previous core section.
Texture: medium-grained, plagioclase phyric.
Mineralogy: 20% plagioclase phenocrysts, plagioclase and pyroxene.

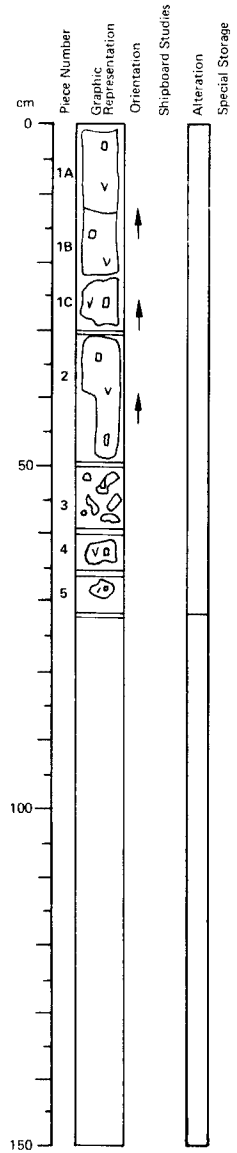
Thin Section Description – 91-93 cm
Phenocrysts: plagioclase, 15%, 1-3 mm.
Groundmass: plagioclase, 30%, 0.1-1 mm; clinopyroxene, 30%, 0.2-1 mm; olivine, 5%, 0.1-0.5 mm, relict; magnetite, 5%, 0.05-0.4 mm: cryptocrystalline/chloritic matrix, 15%.
Texture: intersertal/subophitic

Shipboard Data

Bulk Analysis:	50 cm
SiO_2	50.02
Al_2O_3	16.43
Fe_2O_3	1.21
FeO	8.00
MgO	7.87
CaO	11.68
Na_2O	3.03
K_2O	0.21
TiO_2	1.42
P_2O_5	0.19
MnO	0.16
LOI	--
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	235.00
Ni	57.00
Sr	159.00
Zr	120.00

Magnetic Data:	44 cm	92 cm
Intensity (emu/cc)	121.3	282.6
Inclination before demag.	–13.6	–11.3
Stable Inclination	–12.8	–13.6

Other Data:	40 cm	92 cm
Therm. cond. (mcal/cm-s- C)	3.60	3.61



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

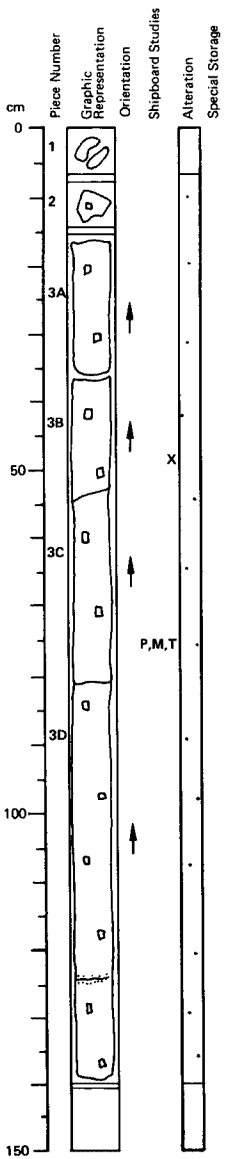
LEG	SITE	HOLE	CORE	SECT
5 8	4 4 4	A	2 5	4

Depth: 286.0 to 286.7 m

Visual Description
Structure: basaltic/diabase sill contained from previous core section.
Texture: medium-grained, plagioclase phyric.
Mineralogy: 20% plagioclase phenocrysts, plagioclase and pyroxene.

Shipboard Data

Magnetic Data:	38 cm
Intensity (emu/cc)	463.1
Inclination before demag.	–9.5
Stable Inclination	–12.4



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 6	1

Depth: 271.0 to 292.4 m

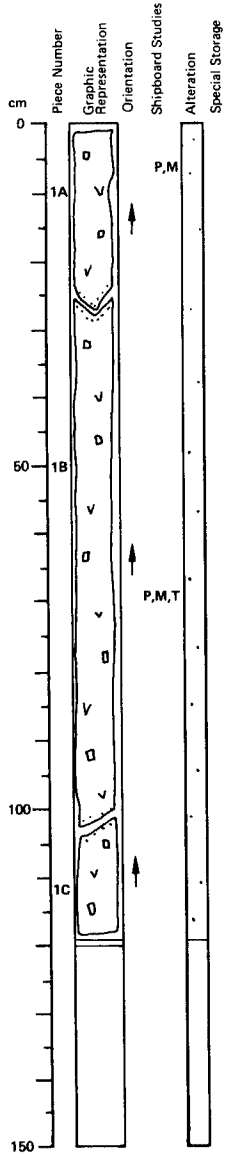
Visual Description
Structure: basaltic/diabase sill continued from previous core.
Texture: 0-7 cm; sediment similar to material in Core 22 7-14 cm; glassy basalt, similar to chilled material in Core 23, Section 2. This material appears to have been dropped from higher in the hole.
Mineralogy: 7-14 cm; 5% plagioclase phenocrysts, 1-5 mm; 14-150 cm; 15-20% plagioclase phenocrysts, 1-10 mm, plagioclase and pyroxene.

Thin Section Description — 74-76 cm
Phenocrysts: plagioclase, 10%, 1-4 mm.
Groundmass: plagioclase, 40%, 0.2-1 mm; clinopyroxene, 35%, 0.2-1 mm; olivine, 4%, 0.05-0.3 mm, relict; magnetite, 1%, 0.02-0.2 mm; cryptocrystalline/chloritic matrix, 10%; accessory calcite.
Texture: intersertal/subophitic.

Shipboard Data

Bulk Analysis:	**49 cm**
SiO_2	50.27
Al_2O_3	15.96
Fe_2O_3	1.22
FeO	8.06
MgO	7.64
CaO	11.94
Na_2O	3.07
K_2O	0.28
TiO_2	1.42
P_2O_5	0.20
MnO	0.17
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	234.00
Ni	62.00
Sr	159.00
Zr	123.00

Magnetic Data:	**75 cm**
Intensity (emu/cc)	210.7
Inclination before demag.	−12.3
Stable Inclination	−11.7
Other Data:	**65 cm**
Therm. cond. (mcal/cm-s-°C)	3.68



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 6	2

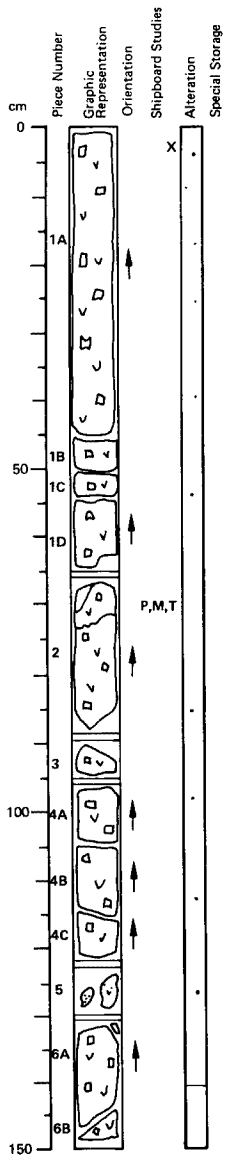
Depth: 292.4 to 253.6 m

Visual Description
Structure: basaltic/diabase sill continued from previous core section.
Texture: medium-grained, plagioclase phyric.
Mineralogy: plagioclase phenocrysts, 15-20%, 1-5 mm, plagioclase and pyroxene.
Alteration: 2 chloritic veins, with alteration zones 10-15 mm wide, at 26 and 108 cm. Pyrite present in veins.

Thin Section Description — 67-69 cm
Phenocrysts: plagioclase, 10%, 1-3 mm.
Groundmass: plagioclase, 40%, 0.05-1 mm; clinopyroxene, 30%, 0.05-0.8 mm; olivine, 4%, 0.05-0.3 mm; magnetite, 4%, 0.02-0.3 mm; cryptocrystalline/chloritic matrix, 12%.
Texture: intersertal/subophitic.

Shipboard Data

Magnetic Data:	**5 cm**	
Intensity (emu/cc)	96.8	
Inclination before demag.	−0.4	
Stable Inclination	−9.3	
Other Data:	**4 cm**	**110 cm**
Therm. cond. (mcal/cm-s-°C)	3.77	3.52



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 6	3

Depth: 293.6 to 295.1 m

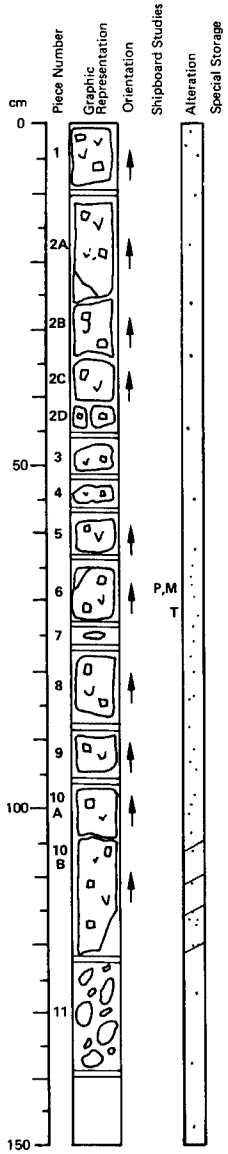
Visual Description
Structure: basaltic/diabase sill continued from previous core section.
Texture: light gray, medium-grained, plagioclase phyric.
Mineralogy: 15-20% plagioclase phenocrysts, 1-8 mm, plagioclase, pyroxene and olivine (0.5-1 mm).
Alteration: fresh appearance, some sausseritized cores in large plagioclase phenocrysts, odd carbonate filled vein.

Thin Section Description — 68-70 cm
Phenocrysts: plagioclase, 15%, 1-2 mm.
Groundmass: plagioclase, 35%, 0.05-1 mm; clinopyroxene, 30%, 0.05-0.8 mm; olivine, 8.5%, 0.05-0.6 mm, relict; magnetite, 1.5%, 0.02-0.2 mm; cryptocrystalline/chloritic matrix, 10%.
Texture: intersertal/subophitic.

Shipboard Data

Bulk Analysis:	**0 cm**
SiO_2	50.36
Al_2O_3	17.00
Fe_2O_3	1.17
FeO	7.71
MgO	7.37
CaO	12.32
Na_2O	3.16
K_2O	0.23
TiO_2	1.39
P_2O_5	0.19
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	273.00
Ni	69.00
Sr	167.00
Zr	123.00

Magnetic Data:	**68 cm**
Intensity (emu/cc)	64.2
Inclination before demag.	–6.6
Stable Inclination	–13.2
Other Data:	**66 cm**
Therm. cond. (mcal/cm-s-°C)	3.42



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 6	4

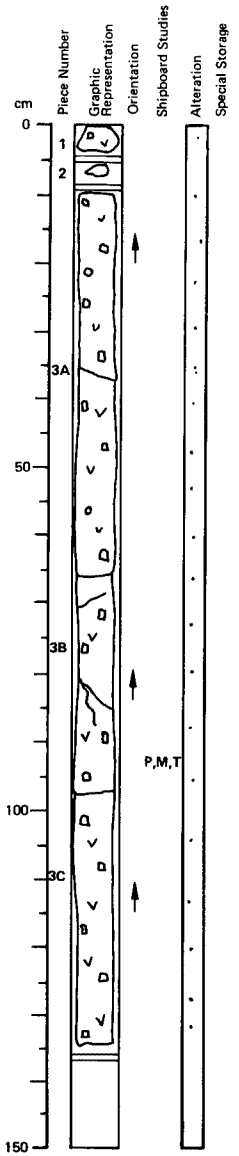
Depth: 295.1 to 296.5 m

Visual Description
Structure: basaltic/diabase sill continued from previous core section.
Texture: light gray, medium-grained, plagioclase phyric.
Mineralogy: plagioclase phenocrysts, 15-20%, 1-15 mm, plagioclase, pyroxene, odd olivine, 0.5-1 mm.
Alteration: fresh appearance, large plagioclase phenocrysts with sausseritized cores, odd carbonate vein; 110-121 cm; fracture or vein-lined by chloritic/clay/talc material and calcite, ferric oxide alteration on surface.

Thin Section Description — 63-65 cm
Phenocrysts: plagioclase, 30%, 1-10 mm
Groundmass: plagioclase, 25%, 0.1-1 mm; clinopyroxene, 25%, 0.05-0.5 mm; olivine, 2%, 0.05-0.2 mm; magnetite, 2%, 0.02-0.2 mm; cryptocrystalline/chloritic matrix, 16%.
Texture: intersertal

Shipboard Data

Magnetic Data:	**63 cm**
Intensity (emu/cc)	42.0
Inclination before demag.	–38.7
Stable Inclination	–15.0



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	4	A	2	7	1

Depth: 300.5 to 301.9 m

Visual Description

Structure: basaltic/diabase sill continued from previous core.
Texture: light gray, medium-grained, plagioclase phyric.
Mineralogy: plagioclase phenocrysts, 15-20%, 1-15 mm; plagioclase, pyroxene, 0.5-1 mm, odd larger olivine and pyroxene grains.
Alteration: some sausseritized plagioclase phenocryst cores, odd carbonate lined veins.

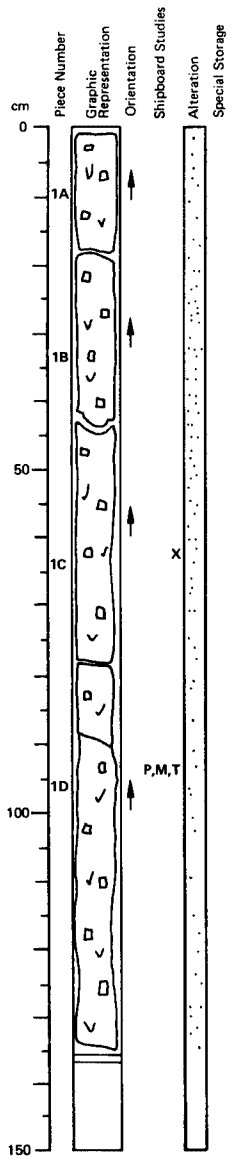
Thin Section Description – 90-92 cm

Phenocrysts: plagioclase, 20%, 1-4 mm.
Groundmass: plagioclase, 33%, 0.05-1 mm, > An_{60}; clinopyroxene, 25%, 0.05-0.6 mm; olivine, 1%, 0.05-0.1 mm, relict; magnetite, 1%, 0.02-0.2 mm granular, 1.5 x 0.05 mm elongate piece; cryptocrystalline/chloritic matrix, 20%.
Texture: intersertal.

Shipboard Data

Magnetic Data:	**90 cm**
Intensity (emu/cc)	46.4
Inclination before demag.	–15.1
Stable Inclination	–10.1

Other Data:	**90 cm**
Therm. cond. (mcal/cm-s-°C)	3.33



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	4	A	2	7	2

Depth: 301.9 to 303.2 m

Visual Description

Structure: basaltic/diabase sill continued from previous core section.
Texture: light gray, medium-grained, plagioclase phyric.
Mineralogy: plagioclase phenocrysts, 15-20%, 1-15 mm; plagioclase and pyroxene, 0.5-1 mm; odd larger pyroxene and olivine grain.
Alteration: odd carbonate filled vein, carbonate and chlorite/clay-lined fractures at 44 cm and 79 cm.

Thin Section Description – 93-95 cm

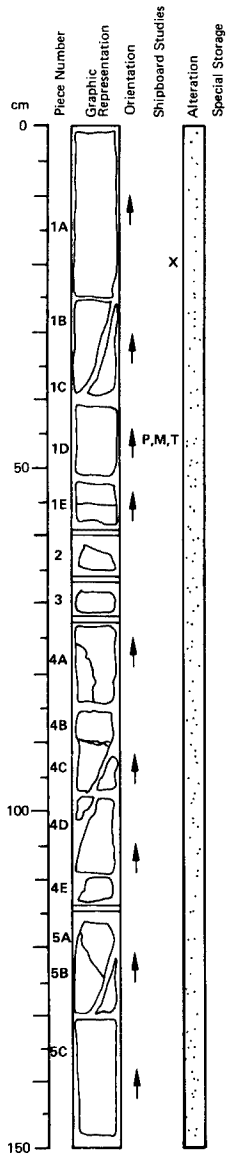
Phenocrysts: plagioclase, 20%, 1-4 mm.
Groundmass: plagioclase, 33%, 0.05-1 mm; clinopyroxene, 25%, 0.05-0.6 mm; olivine, 1%, 0.05-0.1 mm, relict; magnetite, 1%, 0.02-0.2 mm; cryptocrystalline/chloritic matrix, 20%.
Texture: intersertal.

Shipboard Data

Bulk Analysis:	**62 cm**
SiO_2	49.08
Al_2O_3	15.95
Fe_2O_3	1.16
FeO	7.67
MgO	9.69
CaO	11.02
Na_2O	3.09
K_2O	0.39
TiO_2	1.18
P_2O_5	0.16
MnO	0.19
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	262.00
Ni	97.00
Sr	266.00
Zr	109.00

Magnetic Data:	**93 cm**
Intensity (emu/cc)	51.9
Inclination before demag.	–25.0
Stable Inclination	–14.1

Other Data:	**90 cm**
Therm. cond. (mcal/cm-s-°C)	3.68



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 7	3

Depth: 303.2 to 304.7 m

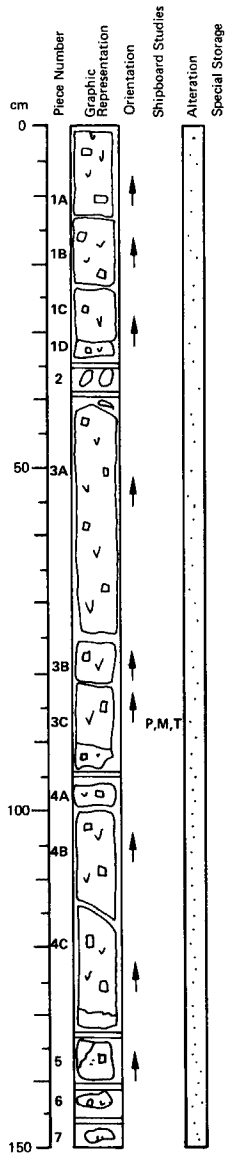
Visual Description
Structure: basaltic/diabase sill continued from previous core section.
Texture: light gray, medium-grained, plagioclase phyric.
Mineralogy: plagioclase phenocrysts, 15-20%, 1-15 mm; plagioclase, pyroxene, 0.5-1 mm, odd larger pyroxene grain, 2-3 mm.
Alteration: odd carbonate veins and carbonate with chlorite/clay-lined fractures; Between Pieces 1D and 1E acicular, 1-2 mm long, carbonate crystals on fracture surface.

Thin Section Description – 43-45 cm
Phenocrysts: plagioclase, 30%, 1-4 mm, $>An_{70}$.
Groundmass: plagioclase, 30%, 0.05-1 mm, $>An_{63}$; clinopyroxene, 30%, 0.05-0.5 mm; olivine, 1%, 0.05-0.1 mm, relict; magnetite, 1%, 0.05-0.2 mm; cryptocrystalline/chloritic matrix, 18%.
Texture: intersertal.

Shipboard Data

Bulk Analysis:	**21 cm**
SiO_2	49.92
Al_2O_3	16.12
Fe_2O_3	1.22
FeO	8.05
MgO	8.59
CaO	11.81
Na_2O	3.00
K_2O	0.28
TiO_2	1.36
P_2O_5	0.17
MnO	0.17
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	277.00
Ni	95.00
Sr	159.00
Zr	117.00

Magnetic Data:	**43 cm**
Intensity (emu/cc)	33.9
Inclination before demag.	5.5
Stable Inclination	–13.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 4	A	2 7	4

Depth: 304.7 to 306.2 m

Visual Description
Structure: basaltic/diabase sill continued from previous core section.
Texture: light gray, medium-grained, plagioclase phyric.
Mineralogy: plagioclase phenocrysts, 15-20%, 1-15 mm; plagioclase and pyroxene, 0.5-1 mm.
Alteration: odd carbonate and chlorite/clay-lined veins along which the rock has often fractured.

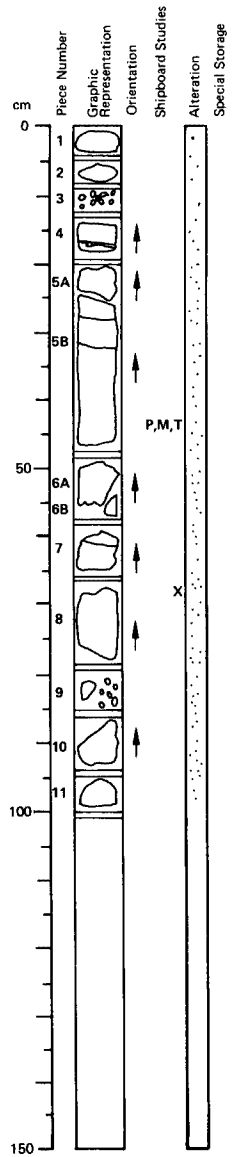
Thin Section Description – 83-85 cm
Phenocrysts: plagioclase, 15%, 1-3 mm.
Groundmass: plagioclase, 35%, 0.05-1 mm; clinopyroxene, 30%, 0.05-0.5 mm; olivine, 1%, 0.05-0.2 mm, relict; magnetite, 1%, 0.01-0.1 mm; cryptocrystalline/chloritic matrix, 18%.
Texture: intersertal.

Shipboard Data

Magnetic Data:	**83 cm**
Intensity (emu/cc)	39.4
Inclination before demag.	–13.0
Stable Inclination	–10.3

Physical Properties:	**3 cm**
$\bar{V}p$ (km/s)	5.60
Porosity (%)	5.36
Wet Bulk Density	2.87
Grain Density	2.98

Other Data:	**45 cm**
Therm. cond. (mcal/cm-s-°C)	3.68



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	4	A	2	7	5

Depth: 306.2 to 307.2 m

Visual Description

Structure: basaltic/diabase sill continued from previous core section.
Texture: light gray, medium-grained, plagioclase phyric.
Mineralogy: plagioclase phenocrysts, 15-20%, 1-15 mm; plagioclase and pyroxene, 0.5-1 mm, odd pyroxene 1-2 mm, odd olivine.
Alteration: thick carbonate vein Piece 4, 18 cm, several other veins/fractures lined by carbonate and chlorite/clay mineral.

Thin Section Description -- 39-41 cm

Phenocrysts: plagioclase, 10%, 1-4 mm.
Groundmass: plagioclase, 40%, 0.05-1 mm, $>An_{65}$; clinopyroxene, 30%, 0.05-0.5 mm; olivine, 1%, 0.05-0.2 mm, relict; magnetite, 1%, 0.01-0.1 mm; cryptocrystalline/chloritic matrix, 18%.
Texture: intersertal.

Shipboard Data

Bulk Analysis:	**68 cm**
SiO_2	49.26
Al_2O_3	14.48
Fe_2O_3	1.26
FeO	8.28
MgO	8.75
CaO	12.78
Na_2O	2.86
K_2O	0.26
TiO_2	1.41
P_2O_5	0.18
MnO	0.17
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	325.00
Ni	114.00
Sr	380.00
Zr	128.00

Magnetic Data:	**39 cm**
Intensity (emu/cc)	38.7
Inclination before demag.	3.5
Stable Inclination	-4.8

Other Data:	**39 cm**
Therm. cond. (mcal/cm-s-° C)	3.59

SITE SUMMARY SHEET

SITE 445

Date occupied	January 11, 1978
Date departed	January 17, 1978
Time on hole	6 days
Position: latitude	25° 31.36'N
longitude	133° 12.49'E
Water depth (sea level)	3377 corrected meters, echo sounding
Water depth (rig floor)	3387 corrected meters, echo sounding
Bottom felt at	3382 meters, drill pipe
Penetration	892.0 meters
Number of holes	1
Number of cores	94
Total length of cored section	892.0 meters
Total core recovered	619.52 meters
Percentage core recovery	69%

Oldest Sediment Cored

Depth sub-bottom	892.0 meters
Nature	conglomerate sandstone
Age	early middle Eocene
Measured velocity	3.6 km/s

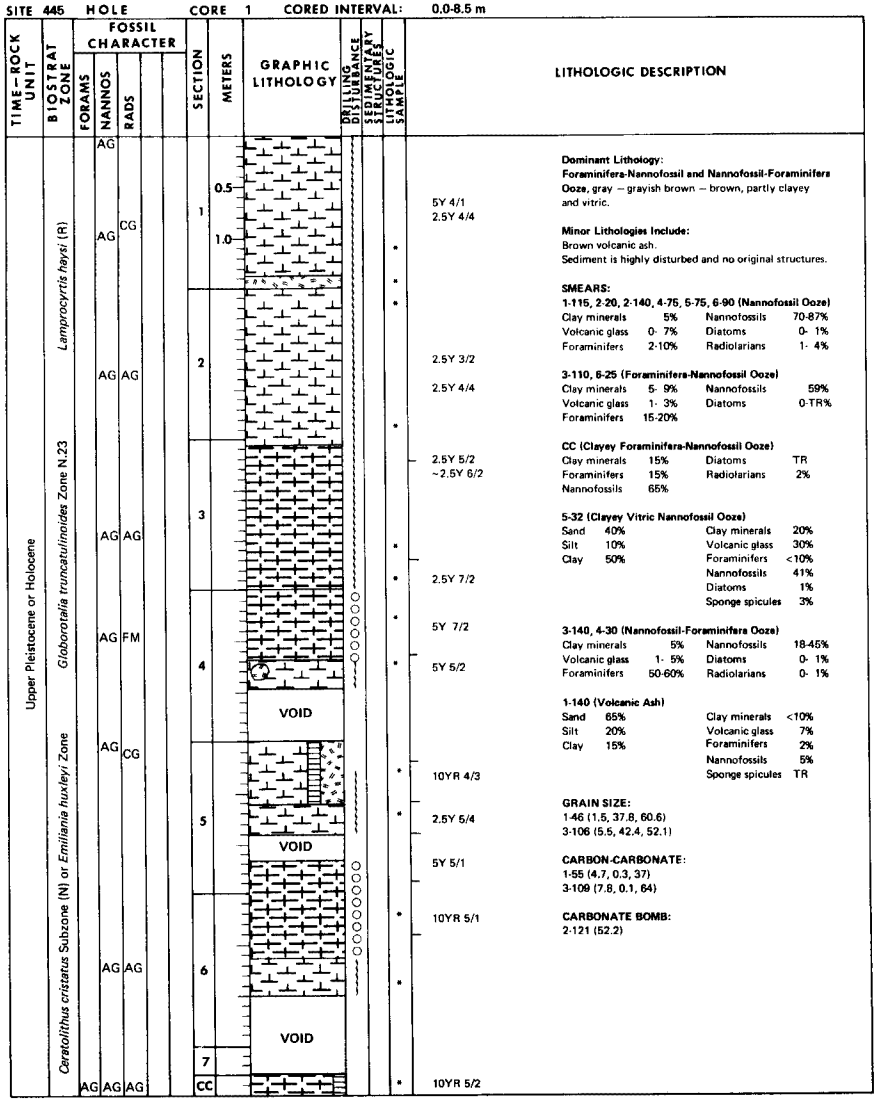
Basement

Depth sub-bottom	not reached
Nature	
Velocity range	

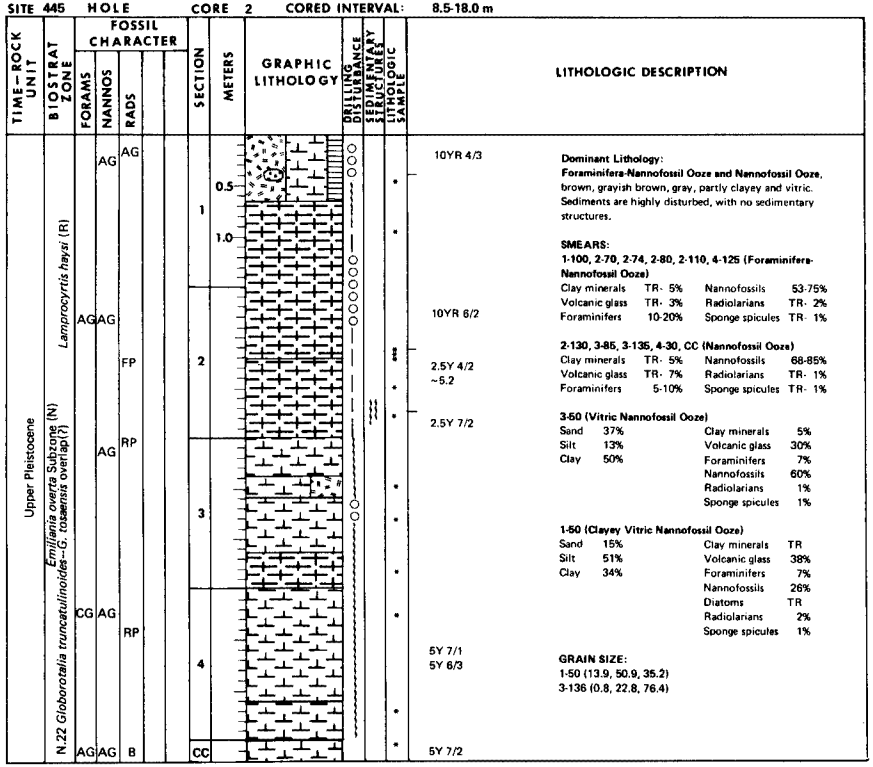
Principal Results:

Site 445 is located in a small basin in the Daito Ridge, northwestern Philippine Sea. The stratigraphic section consists of 141.5 meters of Pleistocene and Pliocene foraminifer-nannofossil ooze, 247.0 meters of early Pliocene through early Miocene foraminifer-nannofossil chalk, 275.5 meters of early Miocene through late Eocene limestone with chert nodules in the lower part, 71.0 meters of middle Eocene mudstone and sandstone with thin conglomerate beds, and 167 meters of middle Eocene sandstone and conglomerate. A hiatus in sedimentation occurred during early Oligocene. Occurrence of *Nummulites boninensis* is limited to resedimented debris flow conglomerate beds. Both the carbonate sediments, mudstones, sandstones and conglomerates are dominated by a history of resedimentation by slumping, debris flow and turbidity currents. Shipboard analysis of paleomagnetic inclination of samples indicate Site 445 to have migrated from an equatorial latitude to its present position over the last 50 million years.

SITE 445 HOLE CORE 1 CORED INTERVAL: 0.0-8.5 m



SITE 445 HOLE CORE 2 CORED INTERVAL: 8.5-18.0 m



SITE 445 HOLE CORE 3 CORED INTERVAL: 18.0-27.5 m

TIME-ROCK UNIT: Lower Pleistocene/Upper Pleistocene

BIOSTRAT ZONE: *Crenalithus doronicoides* Zone/*Emiliania ovata* Subzone (N) N.22

FOSSIL CHARACTER: *Globorotalia truncatulinoides–G. tosaensis*

FORAMS	NANNOS	RADS
AG	AG	
	AG	
AG	AG	
	AG	
CG	AG	
	AG	
AM		
AG	AG	B

GRAPHIC LITHOLOGY; DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE

SECTION	METERS	
1	0.5	5Y 6/1 5Y 7/1
	1.0	
2		10YR 6/2
3		
4		
5		10YR 6/2 ~6/1
6		10YR 7/2 ~7/1
7		10YR 6/2
CC		10YR7/1

LITHOLOGIC DESCRIPTION

Dominant Lithology:
Foraminifera-Nannofossil Ooze, Nannofossil Ooze, with Nannofossil-Foraminifera Ooze, partly vitric. Lower part of the core is clayey (up to 15%). Colors are light gray, light brownish gray, light olive gray, light brown. The sediments are firm to stiff.
Sedimentary structures:
Parallel bedding obvious even in intensely disturbed sediments. Intense to moderate bioturbation in Sections 3 and 4. Graded bed fining upward in Section 3, 102-117 cm: sand-sized at base grading upward into silt then white clay.

SMEARS:

1-75, 2-110, 3-75, 3-130, 4-75, 4-130, 6-120 (Nannofossil Ooze)

Clay minerals	TR- 5%	Nannofossils	68-70%
Volcanic glass	TR- 5%	Radiolarians	TR- 1%
Foraminifers	5-10%	Sponge spicules	0- 1%

1-130, 2-39, 3-95, 3-115 (Foraminifera-Nannofossil Ooze)

Clay minerals	5%	Nannofossils	55-71%
Volcanic glass	TR- 2%	Radiolarians	0-TR%
Foraminifers	15%	Sponge spicules	TR

5-105, 5-135, 7-10, CC (Clayey Nannofossil Ooze)

Sand	2- 5%	Clay minerals	10-15%
Silt	8-15%	Volcanic glass	TR- 2%
Clay	80-90%	Foraminifers	3- 7%
		Nannofossils	65-68%
		Radiolarians	0-TR%
		Sponge spicules	0- 1%

3-115 (Nannofossil-Foraminifera Ooze)

Clay minerals	TR	Carbonate unspecified	19%
Foraminifers	50%	Nannofossils	30%

1-20 (Vitric Nannofossil Ooze)

Sand	40%	Clay minerals	5%
Silt	20%	Volcanic glass	30%
Clay	40%	Foraminifers	5%
		Nannofossils	60%
		Radiolarians	TR
		Sponge spicules	1%

5-30 (Vitric Foraminifera-Nannofossil Ooze)

Sand	<10%	Clay minerals	<10%
Silt	>45%	Volcanic glass	15%
Clay	>40%	Foraminifers	15%
		Nannofossils	60%
		Sponge spicules	1%

GRAIN SIZE:
1-75 (1.7, 35.1, 63.2)
3-81 (1.6, 31.2, 67.3)
5-46 (6.4, 49.9, 43.7)

SITE 445 HOLE CORE 4 CORED INTERVAL: 27.5-37.0 m

TIME-ROCK UNIT: Lower Pleistocene

BIOSTRAT ZONE: *Crenalithus doronicoides* Zone (N) N.22

FOSSIL CHARACTER

FORAMS	NANNOS	RADS
CM	AG	
CM	AG	
	AG	
	AG	
AM	AG	
	AG	
AG	AG	B

GRAPHIC LITHOLOGY; DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE

SECTION	METERS	
1	0.5	10YR 5/3
	1.0	10YR 8/3
2		10YR 5/3, 10YR 8/3
3		10YR 6/3
4		10YR 7/3 10YR 7/3, 10YR 6/2 10YR 8/4
5		10YR 8/1 ~8/4
6		10YR 6/2
7		VOID
CC		VOID

LITHOLOGIC DESCRIPTION

Dominant Lithology:
Nannofossil-Foraminifera Ooze (upper sections) and **Nannofossil Ooze** (lower sections). Colors are light brown, brownish gray, brown. Volcanic glass rare. Sediments are soft to firm. Color mottling. Sedimentary structures not present except for bioturbation.

SMEARS:

1-15, 1-125, 4-65, 4-130, 5-17, 5-130, 6-75, 7-25, CC (Nannofossil Ooze)

Clay minerals	0- 8%	Nannofossils	71-90%
Volcanic glass	0- 3%	Sponge spicules	0- 1%
Foraminifers	1-10%		

2-38, 2-45, 2-115, 3-135, 4-20 (Foraminifera-Nannofossil Ooze)

Clay minerals	TR- 5%	Nannofossils	60-83%
Volcanic glass	TR- 3%	Sponge spicules	0-TR%
Foraminifers	10-25%		

5-10 (Nannofossil-Foraminifera Ooze)

Clay minerals	0%	Nannofossils	45%
Volcanic glass	5%	Radiolarians	TR
Foraminifers	50%		

GRAIN SIZE:
1-20 (1.2, 36.2, 62.6)
3-67 (2.7, 38.1, 61.2)
5-56 (0.0, 34.9, 65.0)

CARBONATE BOMB:
4-59 (58.5)

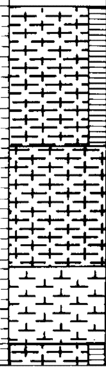
SITE 445 **HOLE** **CORE** 5 **CORED INTERVAL:** 37.0-46.5 m

TIME-ROCK UNIT: Lower Pleistocene

BIOSTRAT ZONE: *Crenalithus doronicoides* Zone (N); N.22 / N.21

Section	Meters	Forams	Nannos	Rads
1	0.5, 1.0	AG	AG	
2			AG	
3		AM	AG	
CC		AG	AG	B

GRAPHIC LITHOLOGY:



Color: 10YR 6/3

LITHOLOGIC DESCRIPTION

Dominant Lithology: Foraminifera-Nannofossil Ooze and Nannofossil Ooze (partly clayey), pale brown, soft. Volcanic glass 1-3%.
Sedimentary structures: bioturbation and mottling.

SMEARS:
2-30 (Foraminifera-Nannofossil Ooze)

Clay minerals	5%
Foraminifers	15%
Nannofossils	87%

2-135, 3-32, CC (Nannofossil Ooze)

Clay minerals	5%	Nannofossils	74-89%
Volcanic glass	1- 2%	Radiolarians	0- 1%
Foraminifers	2-10%	Sponge spicules	0- 1%

1-125 (Clayey Foraminifera-Nannofossil Ooze)

Sand	3%	Clay minerals	15%
Silt	12%	Foraminifers	15%
Clay	85%	Nannofossils	53%

GRAIN SIZE:
1-2 (2.7, 36.0, 61.2)
3-2 (9.9, 31.6, 58.6)

CARBONATE BOMB:
2-36 (54)

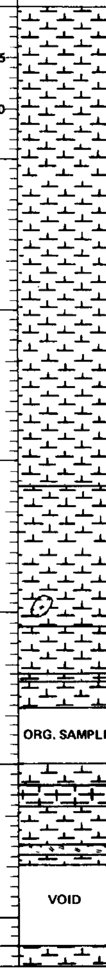
SITE 445 **HOLE** **CORE** 6 **CORED INTERVAL:** 46.5-56.0 m

TIME-ROCK UNIT: Upper Pliocene/Lower Pleistocene

BIOSTRAT ZONE: *Discoaster pentaradiatus* Subzone or *C. macintyre* Subzone/*Crenalithus doronicoides* Zone (N); *Globorotalia tosaensis* (N.21)

Section	Meters	Forams	Nannos	Rads	Color
1	0.5, 1.0	AM	AG		
2		AG	AG		10YR 8/2, 10YR 6/3
3		AM	AG		10YR 6/3
4			AG		10YR 8/2, 10YR 6/3; 10YR 8/2
5			AG		10YR 6/2, 10YR 7/3; 10YR 5/2
6			AG		10YR 8/3
7					
CC		AG	AG	B	10YR 7/4

GRAPHIC LITHOLOGY:



LITHOLOGIC DESCRIPTION

Dominant Lithology: Nannofossil Ooze partly passing to grayish brown **Clayey Nannofossil Ooze** in Sections 5 and 6. Pale brown to white; pelagic clay generally <10% volcanic glass 0-5%. Sediments are very soft to firm in Sections 5, 6, and 7.

Minor Lithology: Ash, 1 bed noted at Section 6, 84 cm.

Sedimentary structures: biotrubation mild to intense, color mottling. Relics of parallel bedding.

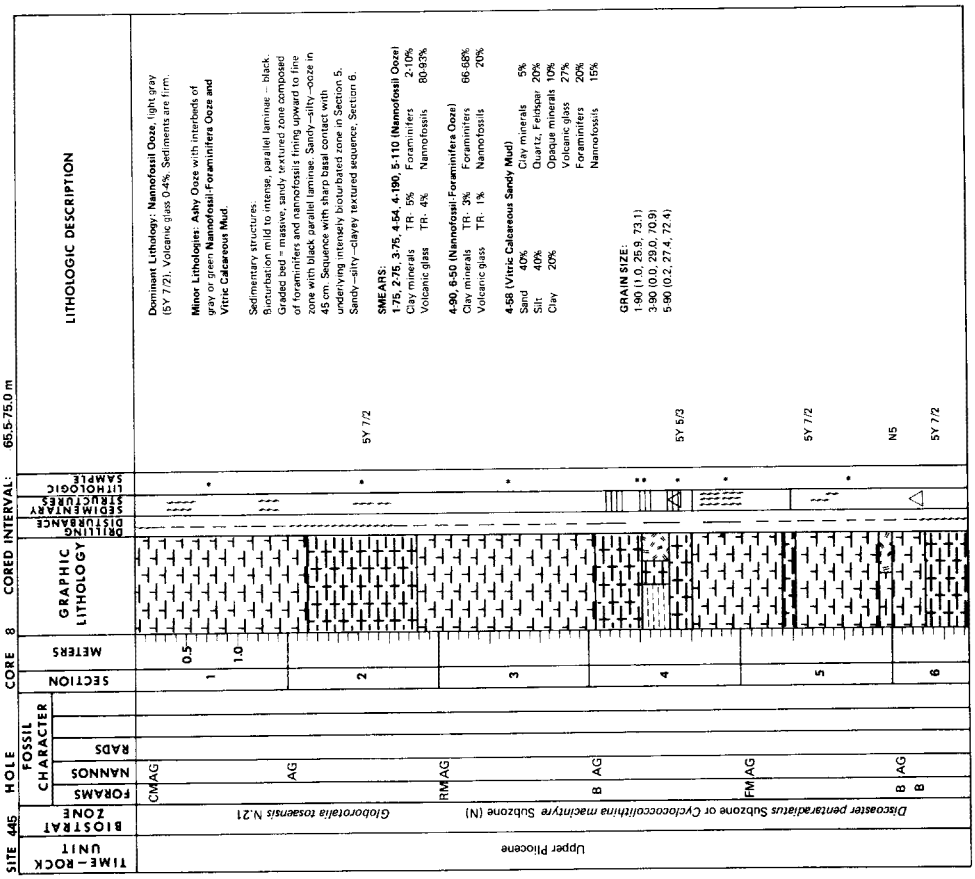
SMEARS:
1-50, 1-105, 2-85, 3-110, 4-75, 4-130, 5-60, 5-90, 6-65, CC (Nannofossil Ooze)

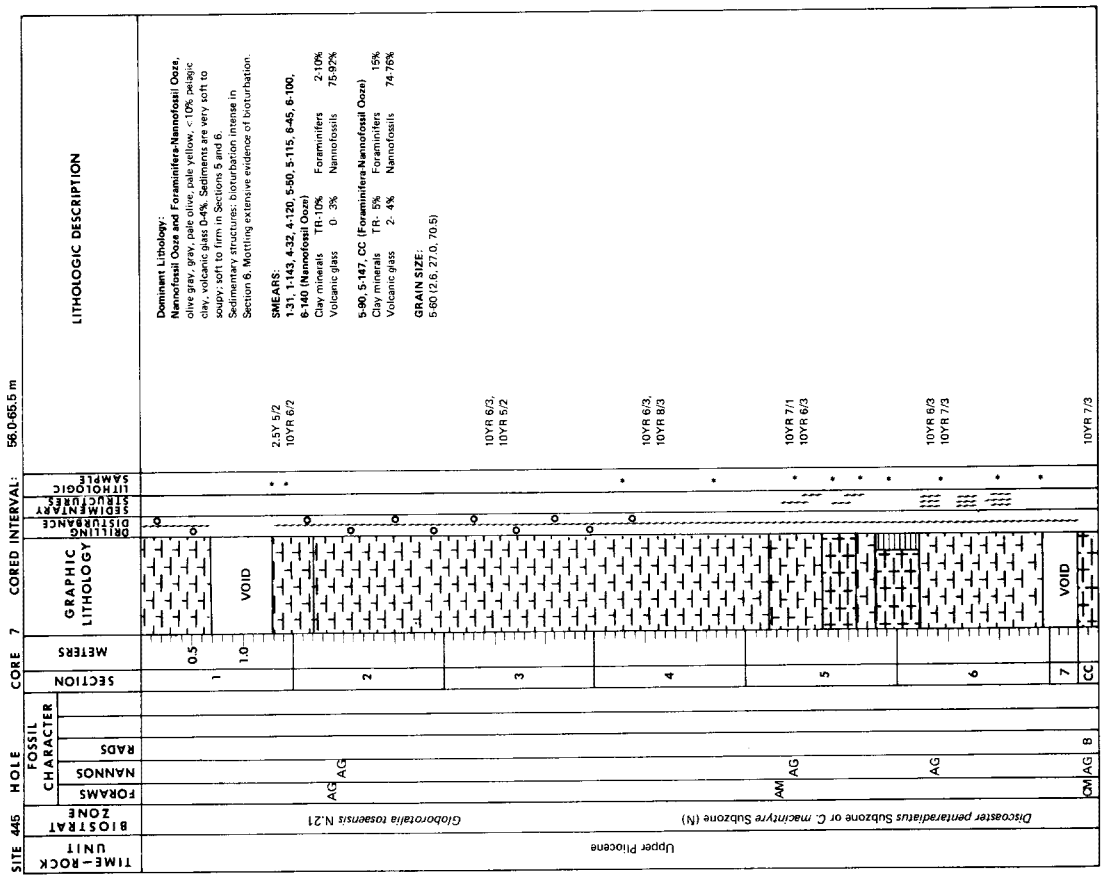
Clay minerals	2- 5%	Nannofossils	71-90%
Volcanic glass	0- 5%	Sponge spicules	0-TR%
Foraminifers	1- 9%		

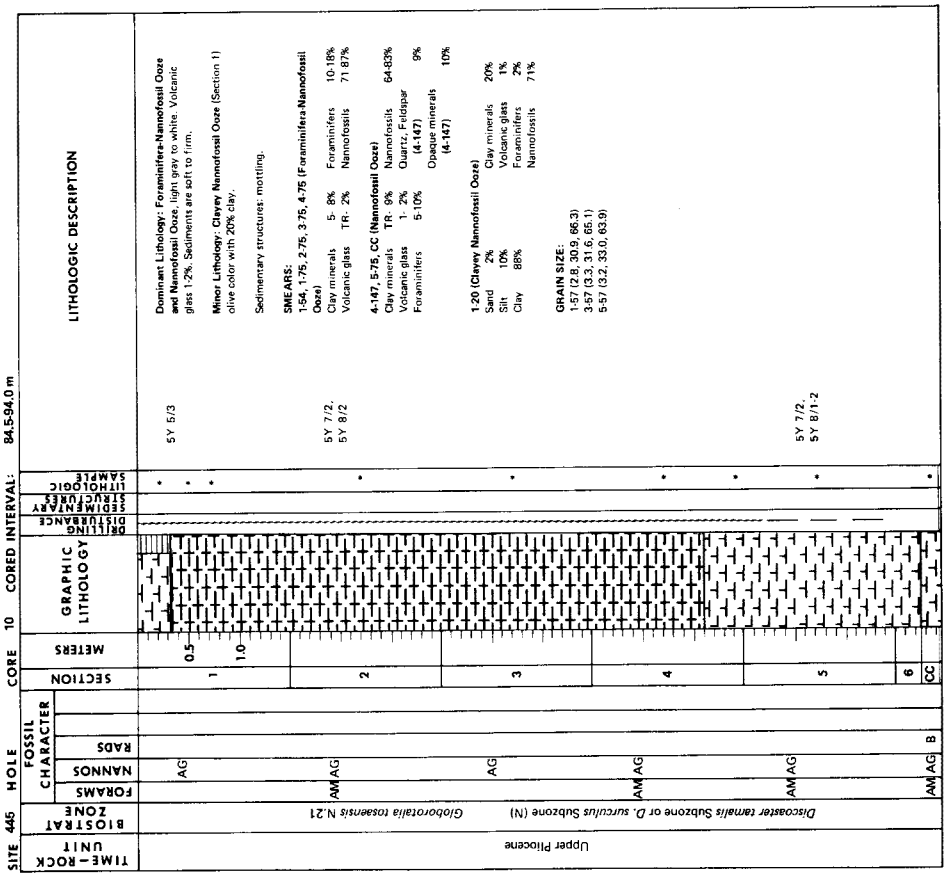
5-66 (Clayey Nannofossil Ooze)

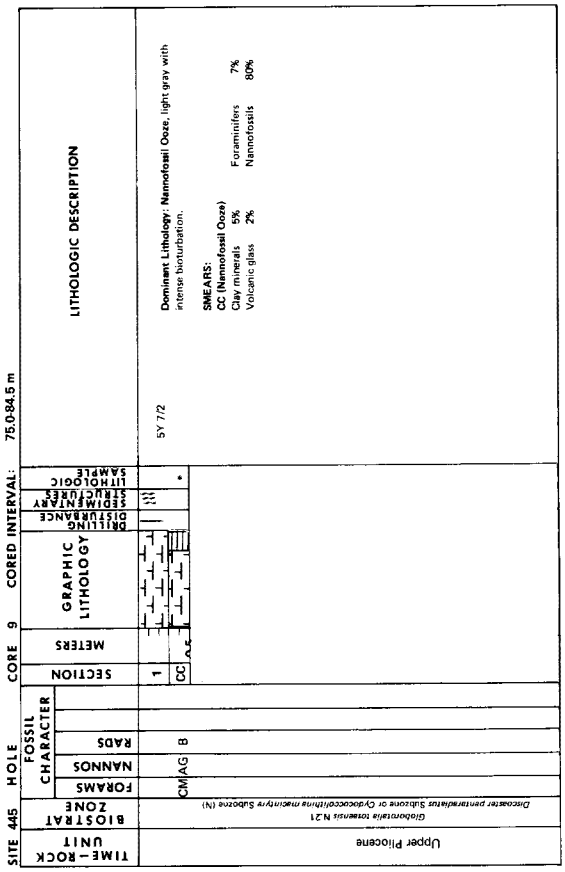
Sand	9%	Clay minerals	30%
Silt	18%	Volcanic glass	1%
Clay	73%	Foraminifers	4%
		Nannofossils	56%

GRAIN SIZE:
1-25 (3.9, 33.4, 62.7)
3-25 (3.6, 25.3, 71.1)
5-25 (5.1, 31.1, 63.9)

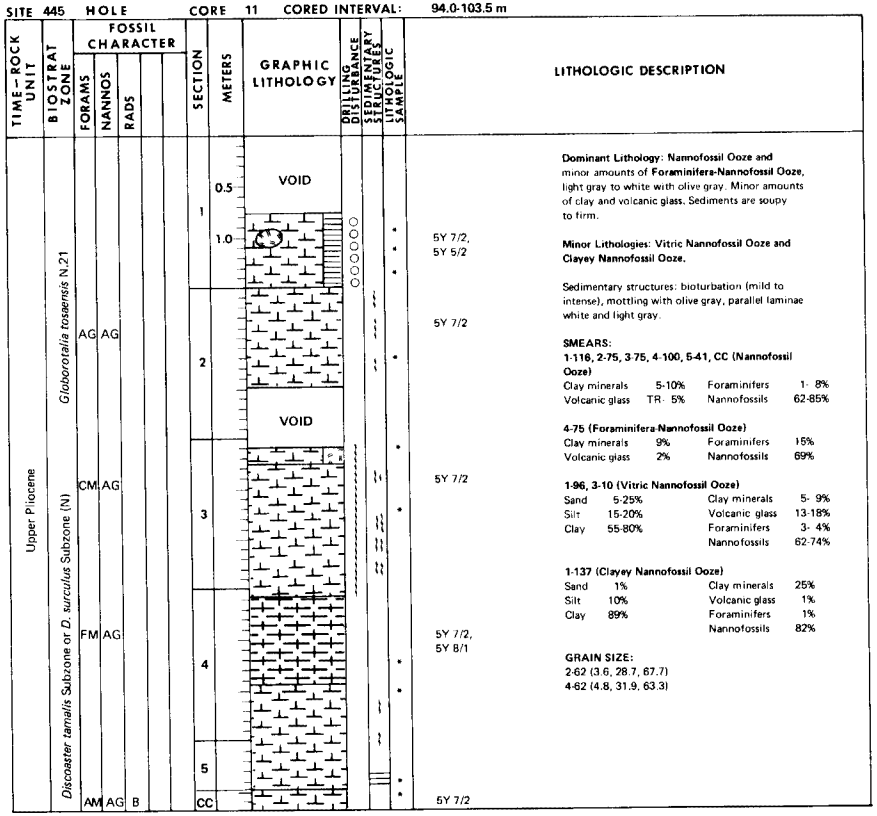

SITE 445
HOLE
CORE 8
CORED INTERVAL: 65.5-75.0 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Upper Pliocene
Globorotalia tosaensis N.21
Discoaster pentaradiatus Subzone or Cyclococcolithina macintyre Subzone (N)
Dominant Lithology: Nannofossil Ooze, light gray (5Y 7/2), Volcanic glass 0-4%, Sediments are firm.
Minor Lithologies: Ashy Ooze with interbeds of gray or green Nannofossil-Foraminifera Ooze and Vitric Calcareous Mud.
Sedimentary structures: Bioturbation mild to intense, parallel laminae – black. Bioturbation mild to intense, parallel laminae – black. Graded bed + massive, sandy textured zone composed of foraminifers and nannofossils fining upward to fine zone with black parallel laminae. Sandy–silty–ooze in 45 cm. Sequence with sharp basal contact with underlying intensely bioturbated zone in Section 5. Sandy–silty–clayey textured sequence, Section 6.
SMEARS:
1-75, 2-75, 3-75, 4-54, 4-130, 5-110 (Nannofossil Ooze)
Clay minerals TR- 5% Foraminifers 2-10%
Volcanic glass TR- 4% Nannofossils 80-93%
4-90, 6-50 (Nannofossil-Foraminifera Ooze)
Clay minerals TR- 3% Foraminifers 66-68%
Volcanic glass TR- 1% Nannofossils 20%
4-58 (Vitric Calcareous Sandy Mud)
Sand 40% Clay minerals 5%
Silt 40% Quartz, Feldspar 20%
Clay 20% Opaque minerals 10%
Volcanic glass 27%
Foraminifers 20%
Nannofossils 15%
GRAIN SIZE:
1-90 (1.0, 25.9, 73.1)
3-90 (0.0, 29.0, 70.9)
5-90 (0.2, 27.4, 72.4)
5Y 7/2
5Y 5/3
5Y 7/2
N5
5Y 7/2


SITE 445
HOLE
CORE 7
CORED INTERVAL: 56.0-65.5 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Upper Pliocene
Globorotalia tosaensis N.21
Discoaster pentaradiatus Subzone or C. macintyre Subzone (N)
VOID
VOID
Dominant Lithology:
Nannofossil Ooze and Foraminifera-Nannofossil Ooze, olive gray, gray, pale olive, pale yellow, <10% pelagic clay, volcanic glass 0-4%. Sediments are very soft to soupy; soft to firm in Sections 5 and 6.
Sedimentary structures: bioturbation intense in Section 6. Mottling extensive evidence of bioturbation.
SMEARS:
1-31, 1-143, 4-32, 4-120, 5-50, 5-115, 6-45, 6-100, 6-140 (Nannofossil Ooze)
Clay minerals TR-10% Foraminifers 2-10%
Volcanic glass 0- 3% Nannofossils 75-92%
5-90, 5-147, CC (Foraminifera-Nannofossil Ooze)
Clay minerals TR- 5% Foraminifers 15%
Volcanic glass 2- 4% Nannofossils 74-76%
GRAIN SIZE:
5-60 (2.6, 27.0, 70.5)
2.5Y 5/2
10YR 6/2
10YR 6/3,
10YR 5/2
10YR 6/3,
10YR 8/3
10YR 7/1
10YR 6/3
10YR 6/3
10YR 7/3
10YR 7/3





SITE 445 HOLE CORE 11 CORED INTERVAL: 94.0-103.5 m



Dominant Lithology: Nannofossil Ooze and minor amounts of **Foraminifera-Nannofossil Ooze,** light gray to white with olive gray. Minor amounts of clay and volcanic glass. Sediments are soupy to firm.

Minor Lithologies: Vitric Nannofossil Ooze and Clayey Nannofossil Ooze.

Sedimentary structures: bioturbation (mild to intense), mottling with olive gray, parallel laminae white and light gray.

SMEARS:

1-116, 2-75, 3-75, 4-100, 5-41, CC (Nannofossil Ooze)

Clay minerals	5-10%	Foraminifers	1- 8%
Volcanic glass	TR- 5%	Nannofossils	62-85%

4-75 (Foraminifera-Nannofossil Ooze)

Clay minerals	9%	Foraminifers	15%
Volcanic glass	2%	Nannofossils	69%

1-96, 3-10 (Vitric Nannofossil Ooze)

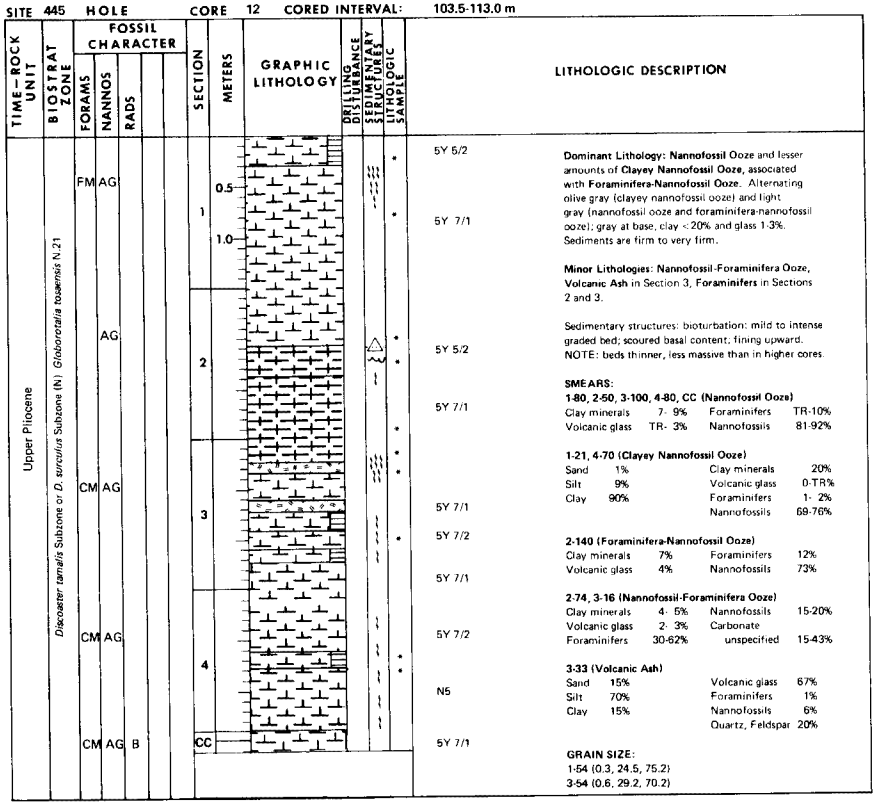
Sand	5-25%	Clay minerals	5- 9%
Silt	15-20%	Volcanic glass	13-18%
Clay	55-80%	Foraminifers	3- 4%
		Nannofossils	62-74%

1-137 (Clayey Nannofossil Ooze)

Sand	1%	Clay minerals	25%
Silt	10%	Volcanic glass	1%
Clay	89%	Foraminifers	1%
		Nannofossils	82%

GRAIN SIZE:
2-62 (3.6, 28.7, 67.7)
4-62 (4.8, 31.9, 63.3)

SITE 445 HOLE CORE 12 CORED INTERVAL: 103.5-113.0 m



Dominant Lithology: Nannofossil Ooze and lesser amounts of **Clayey Nannofossil Ooze,** associated with **Foraminifera-Nannofossil Ooze.** Alternating olive gray (clayey nannofossil ooze) and light gray (nannofossil ooze and foraminifera-nannofossil ooze); gray at base, clay < 20% and glass 1-3%. Sediments are firm to very firm.

Minor Lithologies: Nannofossil-Foraminifera Ooze, Volcanic Ash in Section 3, **Foraminifers** in Sections 2 and 3.

Sedimentary structures: bioturbation: mild to intense graded bed; scoured basal content; fining upward. NOTE: beds thinner, less massive than in higher cores.

SMEARS:

1-80, 2-50, 3-100, 4-80, CC (Nannofossil Ooze)

Clay minerals	7- 9%	Foraminifers	TR-10%
Volcanic glass	TR- 3%	Nannofossils	81-92%

1-21, 4-70 (Clayey Nannofossil Ooze)

Sand	1%	Clay minerals	20%
Silt	9%	Volcanic glass	0-TR%
Clay	90%	Foraminifers	1- 2%
		Nannofossils	69-76%

2-140 (Foraminifera-Nannofossil Ooze)

Clay minerals	7%	Foraminifers	12%
Volcanic glass	4%	Nannofossils	73%

2-74, 3-16 (Nannofossil-Foraminifera Ooze)

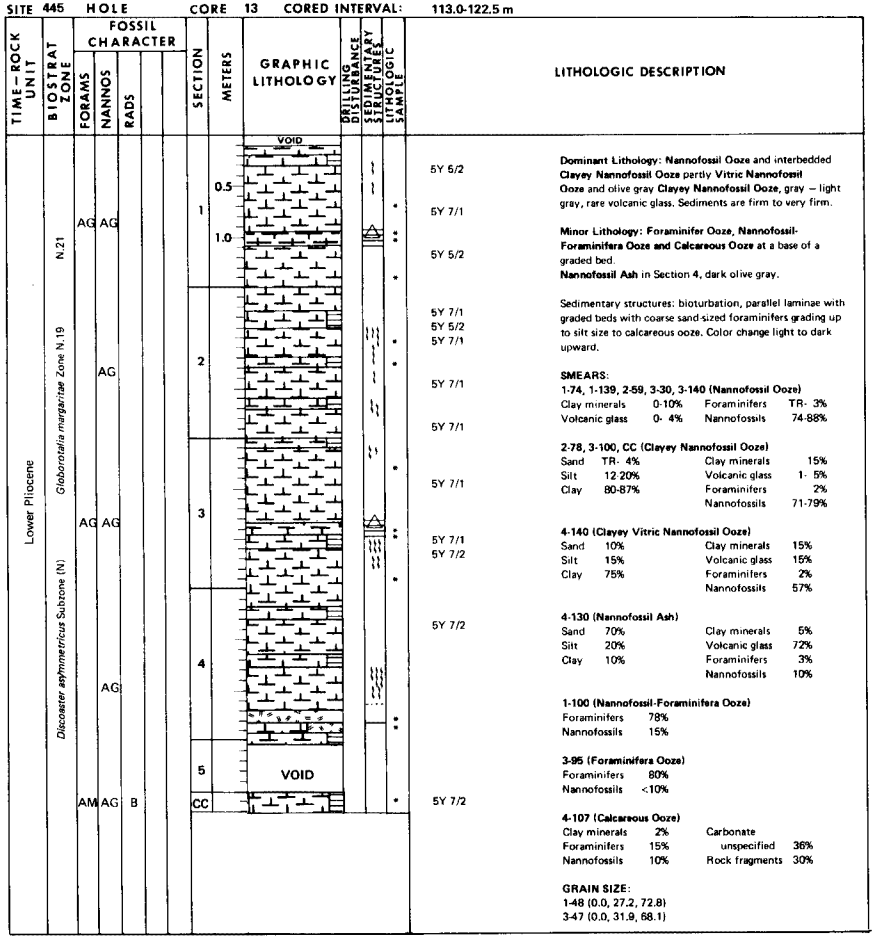
Clay minerals	4- 5%	Nannofossils	15-20%
Volcanic glass	2- 3%	Carbonate unspecified	15-43%
Foraminifers	30-62%		

3-33 (Volcanic Ash)

Sand	15%	Volcanic glass	67%
Silt	70%	Foraminifers	1%
Clay	15%	Nannofossils	6%
		Quartz, Feldspar	20%

GRAIN SIZE:
1-54 (0.3, 24.5, 75.2)
3-54 (0.6, 29.2, 70.2)

SITE 445 HOLE CORE 13 CORED INTERVAL: 113.0-122.5 m



Dominant Lithology: Nannofossil Ooze and interbedded **Clayey Nannofossil Ooze** partly **Vitric Nannofossil Ooze** and olive gray **Clayey Nannofossil Ooze**, gray – light gray, rare volcanic glass. Sediments are firm to very firm.

Minor Lithology: Foraminifer Ooze, Nannofossil-Foraminifera Ooze and Calcareous Ooze at a base of a graded bed.
Nannofossil Ash in Section 4, dark olive gray.

Sedimentary structures: bioturbation, parallel laminae with graded beds with coarse sand-sized foraminifers grading up to silt size to calcareous ooze. Color change light to dark upward.

SMEARS:
1-74, 1-139, 2-59, 3-30, 3-140 (Nannofossil Ooze)

Clay minerals	0-10%	Foraminifers	TR- 3%
Volcanic glass	0- 4%	Nannofossils	74-88%

2-78, 3-100, CC (Clayey Nannofossil Ooze)

Sand	TR- 4%	Clay minerals	15%
Silt	12-20%	Volcanic glass	1- 5%
Clay	80-87%	Foraminifers	2%
		Nannofossils	71-79%

4-140 (Clayey Vitric Nannofossil Ooze)

Sand	10%	Clay minerals	15%
Silt	15%	Volcanic glass	15%
Clay	75%	Foraminifers	2%
		Nannofossils	57%

4-130 (Nannofossil Ash)

Sand	70%	Clay minerals	5%
Silt	20%	Volcanic glass	72%
Clay	10%	Foraminifers	3%
		Nannofossils	10%

1-100 (Nannofossil-Foraminifera Ooze)

Foraminifers	78%
Nannofossils	15%

3-95 (Foraminifera Ooze)

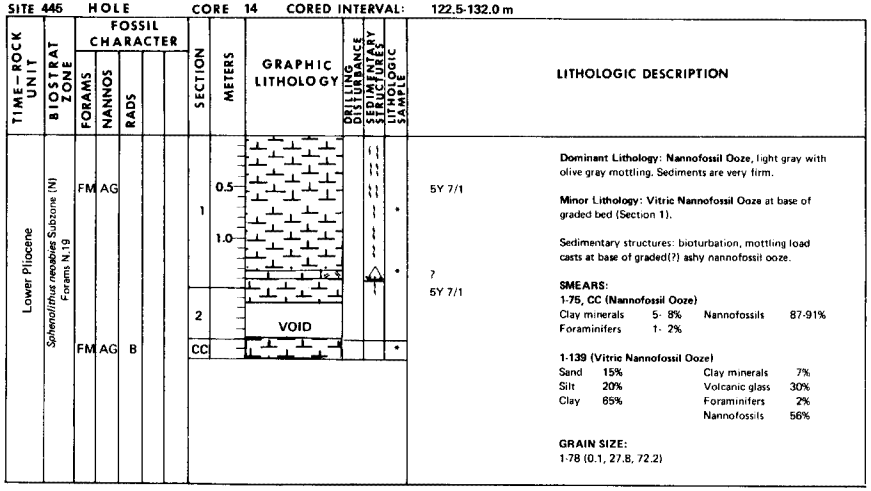
Foraminifers	80%
Nannofossils	<10%

4-107 (Calcareous Ooze)

Clay minerals	2%	Carbonate unspecified	36%
Foraminifers	15%	Rock fragments	30%
Nannofossils	10%		

GRAIN SIZE:
1-48 (0.0, 27.2, 72.8)
3-47 (0.0, 31.9, 68.1)

SITE 445 HOLE CORE 14 CORED INTERVAL: 122.5-132.0 m



Dominant Lithology: Nannofossil Ooze, light gray with olive gray mottling. Sediments are very firm.

Minor Lithology: Vitric Nannofossil Ooze at base of graded bed (Section 1).

Sedimentary structures: bioturbation, mottling load casts at base of graded(?) ashy nannofossil ooze.

SMEARS:
1-75, CC (Nannofossil Ooze)

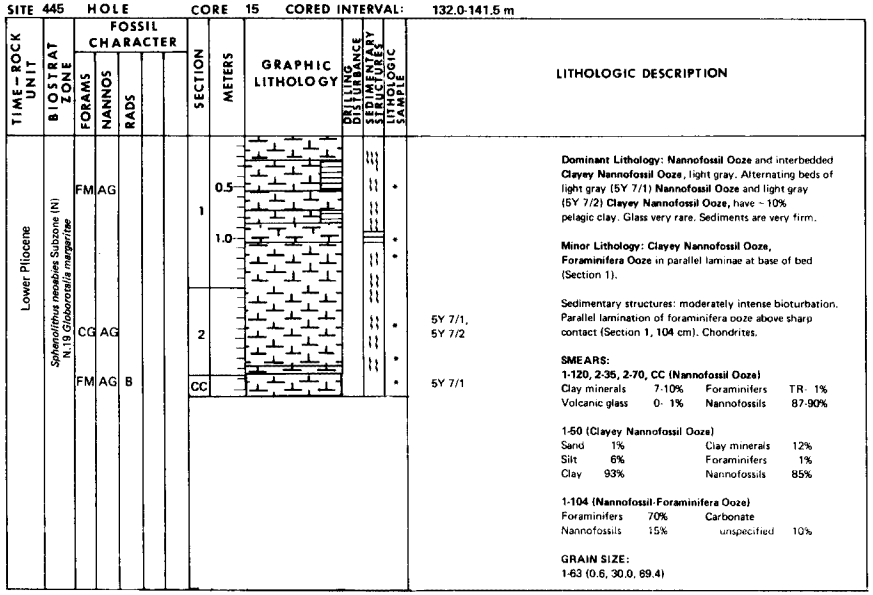
Clay minerals	5- 8%	Nannofossils	87-91%
Foraminifers	1- 2%		

1-139 (Vitric Nannofossil Ooze)

Sand	15%	Clay minerals	7%
Silt	20%	Volcanic glass	30%
Clay	85%	Foraminifers	2%
		Nannofossils	56%

GRAIN SIZE:
1-78 (0.1, 27.8, 72.2)

SITE 445 HOLE CORE 15 CORED INTERVAL: 132.0-141.5 m



Dominant Lithology: Nannofossil Ooze and interbedded **Clayey Nannofossil Ooze**, light gray. Alternating beds of light gray (5Y 7/1) **Nannofossil Ooze** and light gray (5Y 7/2) **Clayey Nannofossil Ooze**, have ~ 10% pelagic clay. Glass very rare. Sediments are very firm.

Minor Lithology: Clayey Nannofossil Ooze, Foraminifera Ooze in parallel laminae at base of bed (Section 1).

Sedimentary structures: moderately intense bioturbation. Parallel lamination of foraminifera ooze above sharp contact (Section 1, 104 cm). Chondrites.

SMEARS:
1-120, 2-35, 2-70, CC (Nannofossil Ooze)

Clay minerals	7-10%	Foraminifers	TR- 1%
Volcanic glass	0- 1%	Nannofossils	87-90%

1-50 (Clayey Nannofossil Ooze)

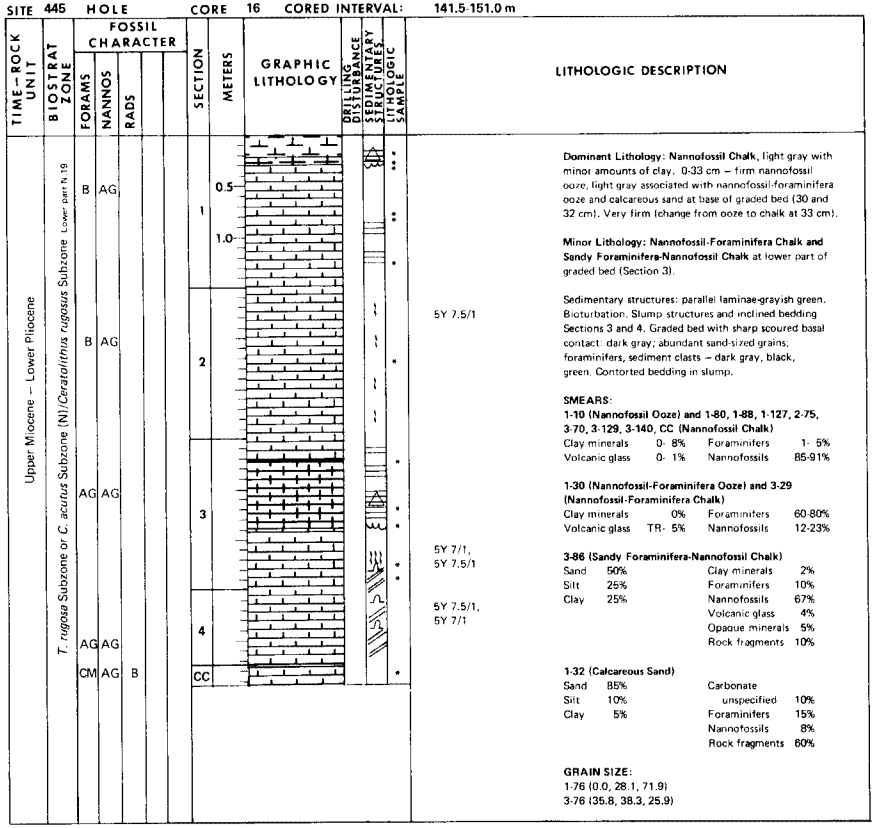
Sand	1%	Clay minerals	12%
Silt	6%	Foraminifers	1%
Clay	93%	Nannofossils	85%

1-104 (Nannofossil-Foraminifera Ooze)

Foraminifers	70%	Carbonate unspecified	10%
Nannofossils	15%		

GRAIN SIZE:
1-63 (0.6, 30.0, 69.4)

SITE 445 HOLE CORE 16 CORED INTERVAL: 141.5-151.0 m



LITHOLOGIC DESCRIPTION

Dominant Lithology: Nannofossil Chalk, light gray with minor amounts of clay. 0-33 cm – firm nannofossil ooze, light gray associated with nannofossil-foraminifera ooze and calcareous sand at base of graded bed (30 and 32 cm). Very firm (change from ooze to chalk at 33 cm).

Minor Lithology: Nannofossil-Foraminifera Chalk and Sandy Foraminifera-Nannofossil Chalk at lower part of graded bed (Section 3).

Sedimentary structures: parallel laminae-grayish green. Bioturbation. Slump structures and inclined bedding Sections 3 and 4. Graded bed with sharp scoured basal contact: dark gray; abundant sand-sized grains; foraminifers, sediment clasts – dark gray, black, green. Contorted bedding in slump.

SMEARS:

1-10 (Nannofossil Ooze) and 1-80, 1-88, 1-127, 2-75, 3-70, 3-129, 3-140, CC (Nannofossil Chalk)

Clay minerals	0- 8%	Foraminifers	1- 5%
Volcanic glass	0- 1%	Nannofossils	85-91%

1-30 (Nannofossil-Foraminifera Ooze) and 3-29 (Nannofossil-Foraminifera Chalk)

Clay minerals	0%	Foraminifers	60-80%
Volcanic glass	TR- 5%	Nannofossils	12-23%

3-86 (Sandy Foraminifera-Nannofossil Chalk)

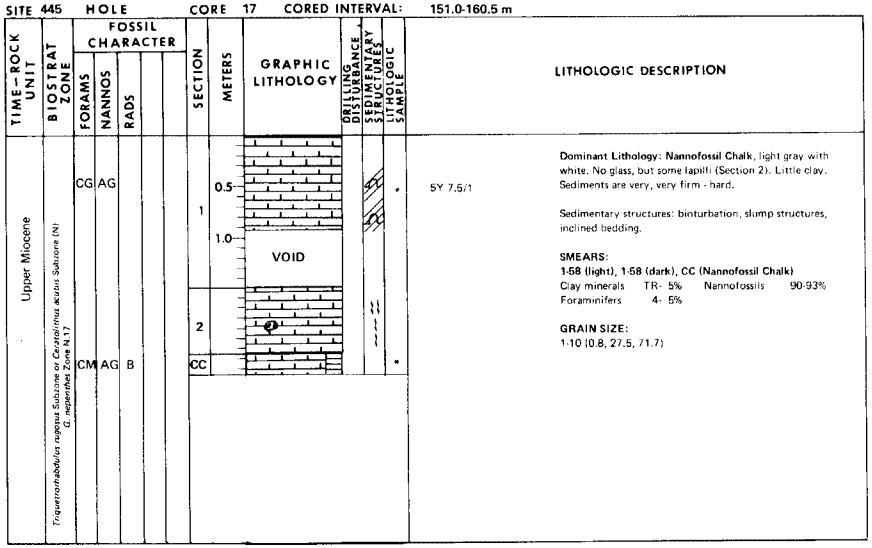
Sand	50%	Clay minerals	2%
Silt	25%	Foraminifers	10%
Clay	25%	Nannofossils	67%
		Volcanic glass	4%
		Opaque minerals	5%
		Rock fragments	10%

1-32 (Calcareous Sand)

Sand	85%	Carbonate unspecified	10%
Silt	10%	Foraminifers	15%
Clay	5%	Nannofossils	8%
		Rock fragments	60%

GRAIN SIZE:
1-76 (0.0, 28.1, 71.9)
3-76 (35.8, 38.3, 25.9)

SITE 445 HOLE CORE 17 CORED INTERVAL: 151.0-160.5 m



LITHOLOGIC DESCRIPTION

Dominant Lithology: Nannofossil Chalk, light gray with white. No glass, but some lapilli (Section 2). Little clay. Sediments are very, very firm - hard.

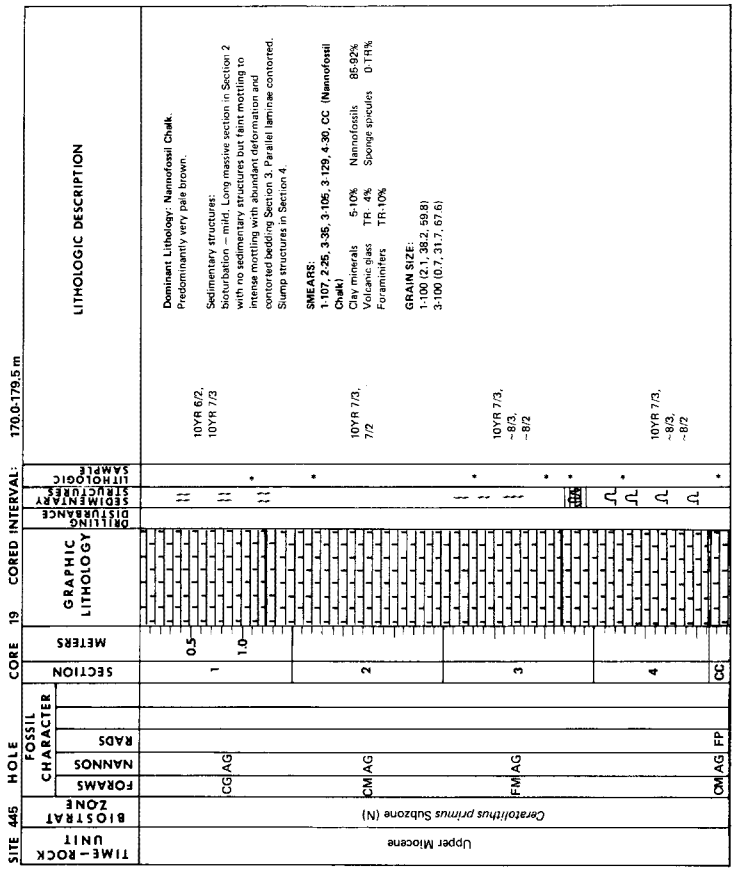
Sedimentary structures: bioturbation, slump structures, inclined bedding.

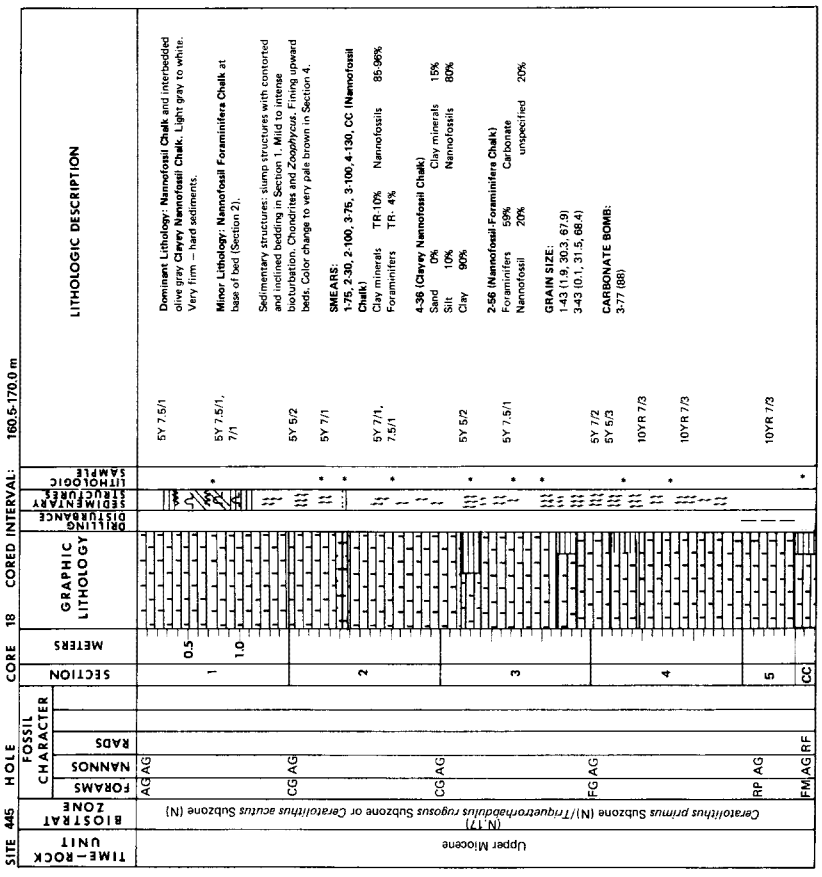
SMEARS:

1-58 (light), 1-58 (dark), CC (Nannofossil Chalk)

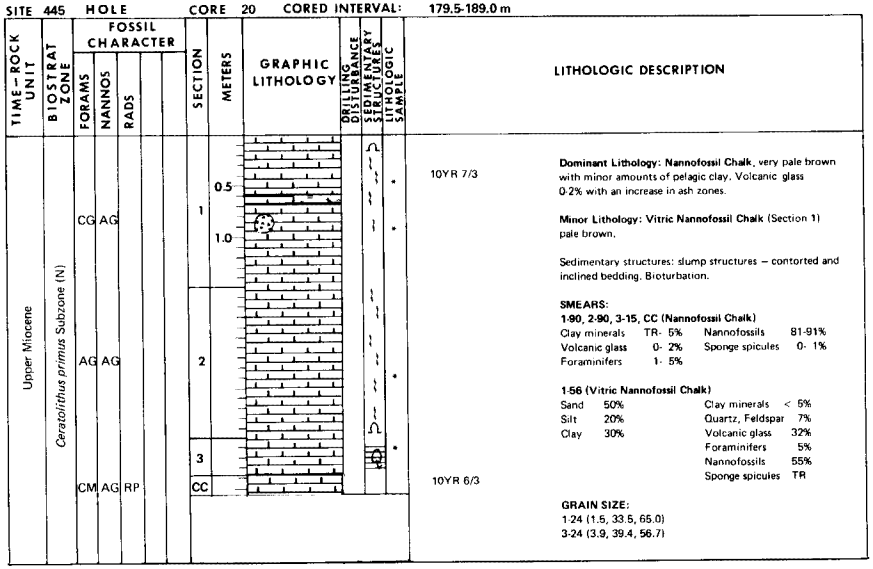
Clay minerals	TR- 5%	Nannofossils	90-93%
Foraminifers	4- 5%		

GRAIN SIZE:
1-10 (0.8, 27.5, 71.7)





SITE 445 HOLE CORE 20 CORED INTERVAL: 179.5-189.0 m



Dominant Lithology: Nannofossil Chalk, very pale brown with minor amounts of pelagic clay. Volcanic glass 0-2% with an increase in ash zones.

Minor Lithology: Vitric Nannofossil Chalk (Section 1) pale brown.

Sedimentary structures: slump structures – contorted and inclined bedding. Bioturbation.

SMEARS:

1-90, 2-90, 3-15, CC (Nannofossil Chalk)

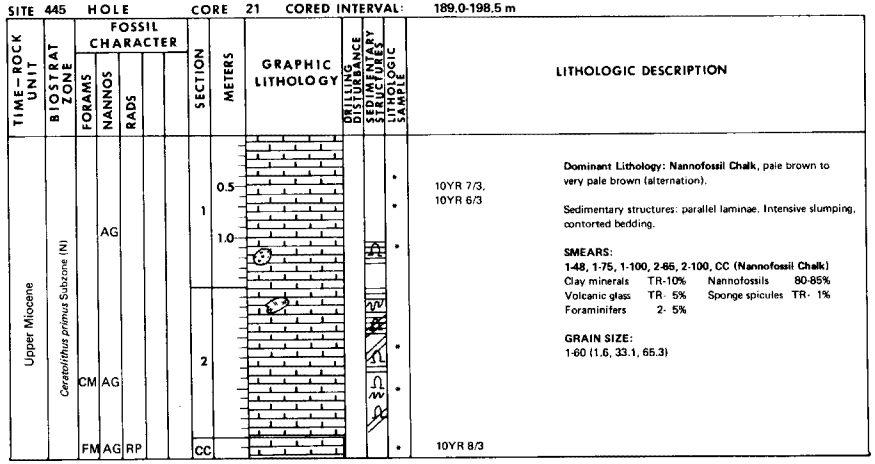
Clay minerals	TR- 5%	Nannofossils	81-91%
Volcanic glass	0- 2%	Sponge spicules	0- 1%
Foraminifers	1- 5%		

1-56 (Vitric Nannofossil Chalk)

Sand	50%	Clay minerals	< 5%
Silt	20%	Quartz, Feldspar	7%
Clay	30%	Volcanic glass	32%
		Foraminifers	5%
		Nannofossils	55%
		Sponge spicules	TR

GRAIN SIZE:
1-24 (1.5, 33.5, 65.0)
3-24 (3.9, 39.4, 56.7)

SITE 445 HOLE CORE 21 CORED INTERVAL: 189.0-198.5 m



Dominant Lithology: Nannofossil Chalk, pale brown to very pale brown (alternation).

Sedimentary structures: parallel laminae. Intensive slumping, contorted bedding.

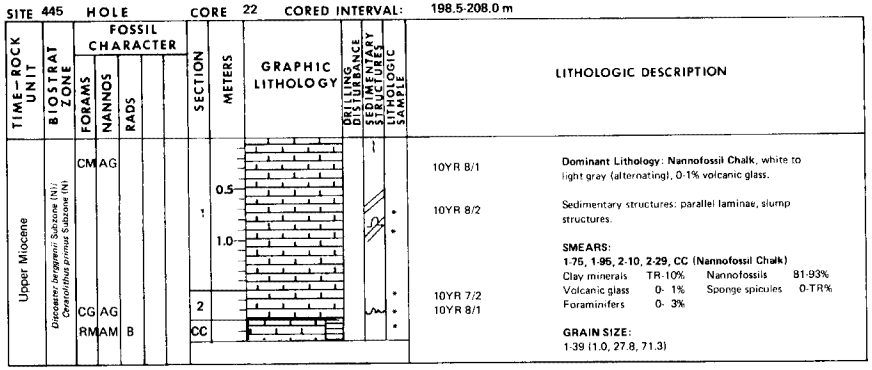
SMEARS:

1-48, 1-75, 1-100, 2-85, 2-100, CC (Nannofossil Chalk)

Clay minerals	TR-10%	Nannofossils	80-85%
Volcanic glass	TR- 5%	Sponge spicules	TR- 1%
Foraminifers	2- 5%		

GRAIN SIZE:
1-60 (1.6, 33.1, 65.3)

SITE 445 HOLE CORE 22 CORED INTERVAL: 198.5-208.0 m



Dominant Lithology: Nannofossil Chalk, white to light gray (alternating), 0-1% volcanic glass.

Sedimentary structures: parallel laminae, slump structures.

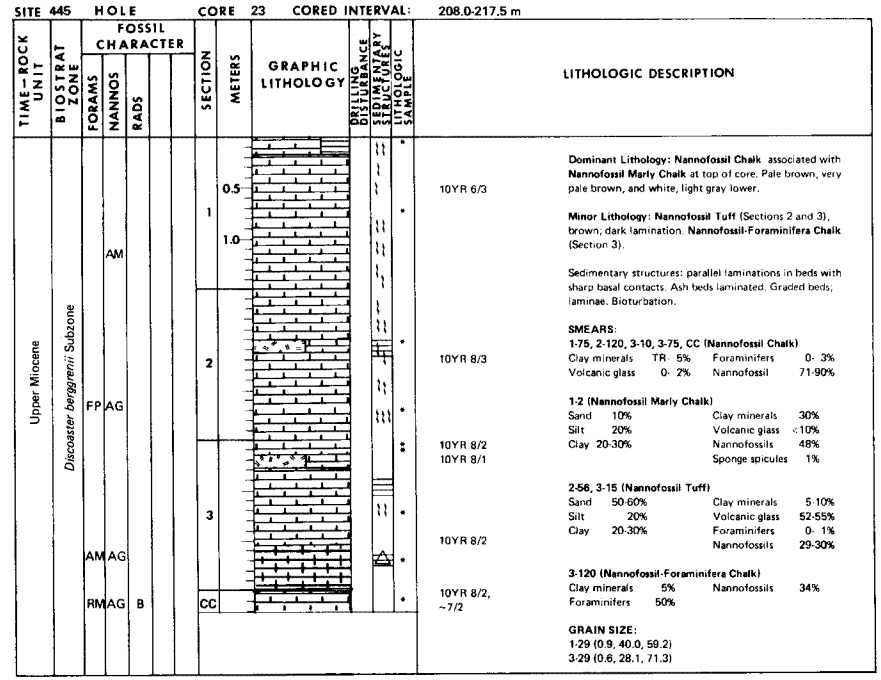
SMEARS:

1-75, 1-95, 2-10, 2-29, CC (Nannofossil Chalk)

Clay minerals	TR-10%	Nannofossils	81-93%
Volcanic glass	0- 1%	Sponge spicules	0-TR%
Foraminifers	0- 3%		

GRAIN SIZE:
1-39 (1.0, 27.8, 71.3)

SITE 445 HOLE CORE 23 CORED INTERVAL: 208.0-217.5 m



Dominant Lithology: Nannofossil Chalk associated with **Nannofossil Marly Chalk** at top of core. Pale brown, very pale brown, and white, light gray lower.

Minor Lithology: Nannofossil Tuff (Sections 2 and 3), brown; dark lamination. **Nannofossil-Foraminifera Chalk** (Section 3).

Sedimentary structures: parallel laminations in beds with sharp basal contacts. Ash beds laminated. Graded beds; laminae. Bioturbation.

SMEARS:

1-75, 2-120, 3-10, 3-75, CC (Nannofossil Chalk)

Clay minerals	TR- 5%	Foraminifers	0- 3%
Volcanic glass	0- 2%	Nannofossil	71-90%

1-2 (Nannofossil Marly Chalk)

Sand	10%	Clay minerals	30%
Silt	20%	Volcanic glass	<10%
Clay	20-30%	Nannofossils	48%
		Sponge spicules	1%

2-56, 3-15 (Nannofossil Tuff)

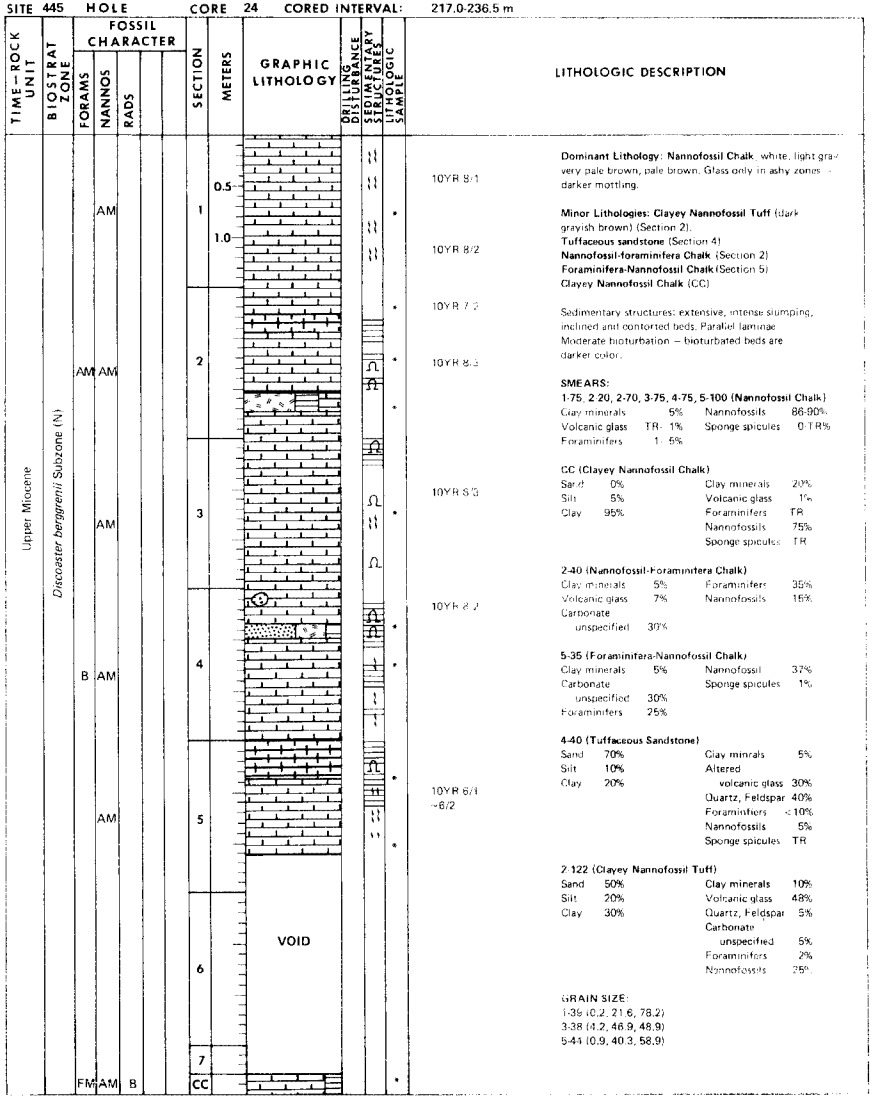
Sand	50-60%	Clay minerals	5-10%
Silt	20%	Volcanic glass	52-55%
Clay	20-30%	Foraminifers	0- 1%
		Nannofossils	29-30%

3-120 (Nannofossil-Foraminifera Chalk)

Clay minerals	5%	Nannofossils	34%
Foraminifers	50%		

GRAIN SIZE:
1-29 (0.9, 40.0, 59.2)
3-29 (0.6, 28.1, 71.3)

SITE 445 HOLE CORE 24 CORED INTERVAL: 217.0-236.5 m



Dominant Lithology: **Nannofossil Chalk**, white, light gray, very pale brown, pale brown. Glass only in ashy zones – darker mottling.

Minor Lithologies: **Clayey Nannofossil Tuff** (dark grayish brown) (Section 2).
Tuffaceous sandstone (Section 4).
Nannofossil-foraminifera Chalk (Section 2).
Foraminifera-Nannofossil Chalk (Section 5).
Clayey Nannofossil Chalk (CC).

Sedimentary structures: extensive, intense slumping, inclined and contorted beds. Parallel laminae. Moderate bioturbation – bioturbated beds are darker color.

SMEARS:

1-75, 2-20, 2-70, 3-75, 4-75, 5-100 (Nannofossil Chalk)

Clay minerals	5%	Nannofossils	86-90%
Volcanic glass	TR- 1%	Sponge spicules	0-TR%
Foraminifers	1- 5%		

CC (Clayey Nannofossil Chalk)

Sand	0%	Clay minerals	20%
Silt	5%	Volcanic glass	1%
Clay	95%	Foraminifers	TR
		Nannofossils	75%
		Sponge spicules	TR

2-40 (Nannofossil-Foraminifera Chalk)

Clay minerals	5%	Foraminifers	35%
Volcanic glass	7%	Nannofossils	16%
Carbonate unspecified	30%		

5-35 (Foraminifera-Nannofossil Chalk)

Clay minerals	5%	Nannofossil	37%
Carbonate unspecified	30%	Sponge spicules	1%
Foraminifers	25%		

4-40 (Tuffaceous Sandstone)

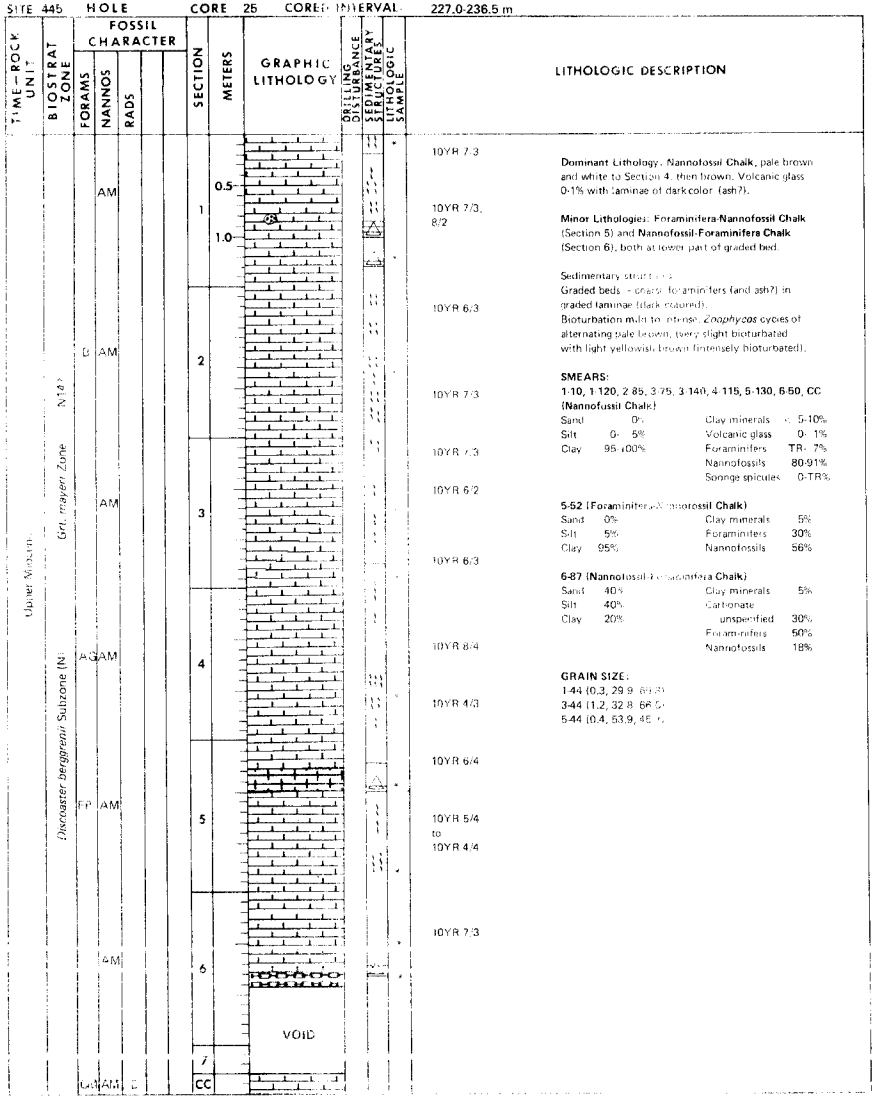
Sand	70%	Clay minrals	5%
Silt	10%	Altered volcanic glass	30%
Clay	20%	Quartz, Feldspar	40%
		Foraminifers	<10%
		Nannofossils	5%
		Sponge spicules	TR

2-122 (Clayey Nannofossil Tuff)

Sand	50%	Clay minerals	10%
Silt	20%	Volcanic glass	48%
Clay	30%	Quartz, Feldspar	5%
		Carbonate unspecified	5%
		Foraminifers	2%
		Nannofossils	25%

GRAIN SIZE:
1-39 (0.2, 21.6, 78.2)
3-38 (4.2, 46.9, 48.9)
5-44 (0.9, 40.3, 58.9)

SITE 445 HOLE CORE 25 CORED INTERVAL: 227.0-236.5 m



Dominant Lithology: **Nannofossil Chalk**, pale brown and white to Section 4, then brown. Volcanic glass 0-1% with laminae of dark color (ash?).

Minor Lithologies: **Foraminifera-Nannofossil Chalk** (Section 5) and **Nannofossil-Foraminifera Chalk** (Section 6), both at lower part of graded bed.

Sedimentary structures:
Graded beds – coarse foraminifers (and ash?) in graded laminae (dark colored).
Bioturbation mild to intense. *Zoophycos* cycles of alternating pale brown, (very slight bioturbated) with light yellowish brown (intensely bioturbated).

SMEARS:

1-10, 1-120, 2-85, 3-75, 3-140, 4-115, 5-130, 6-50, CC (Nannofossil Chalk)

Sand	0%	Clay minerals	5-10%
Silt	0- 5%	Volcanic glass	0- 1%
Clay	95-100%	Foraminifers	TR- 7%
		Nannofossils	80-91%
		Sponge spicules	0-TR%

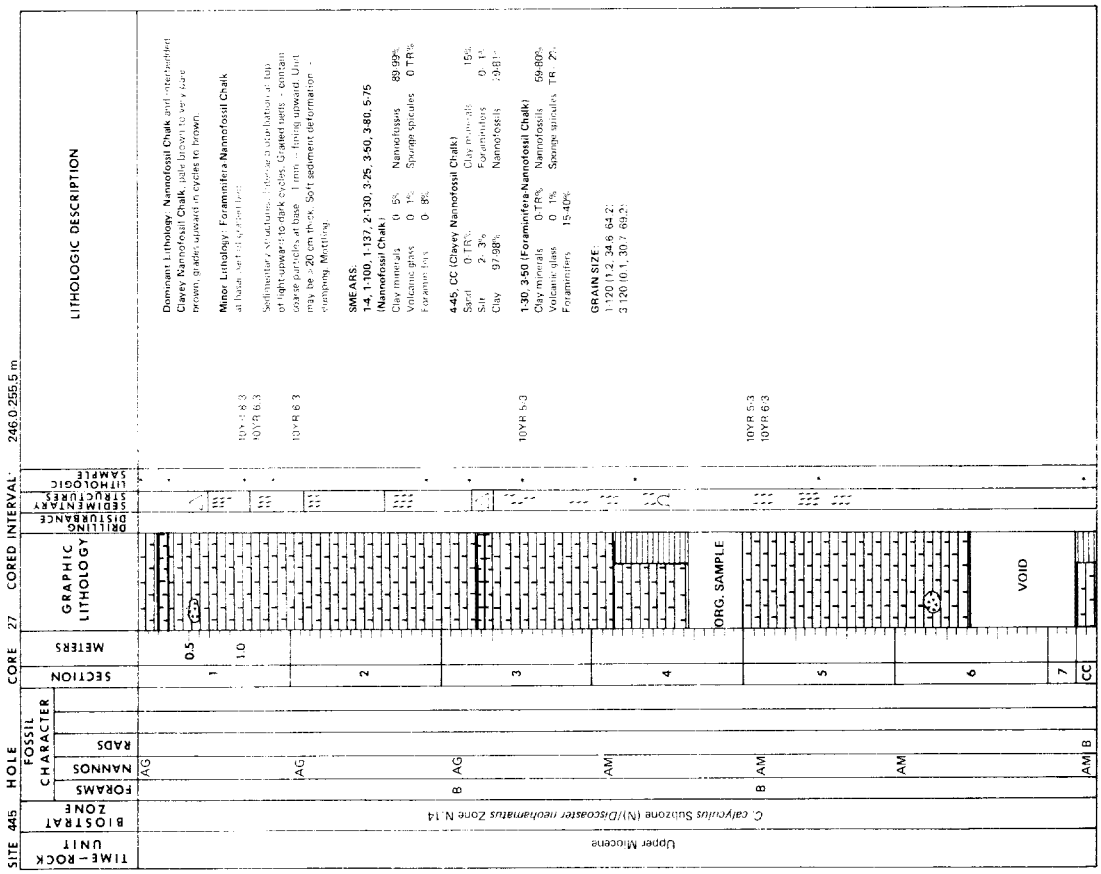
5-52 (Foraminifera-Nannofossil Chalk)

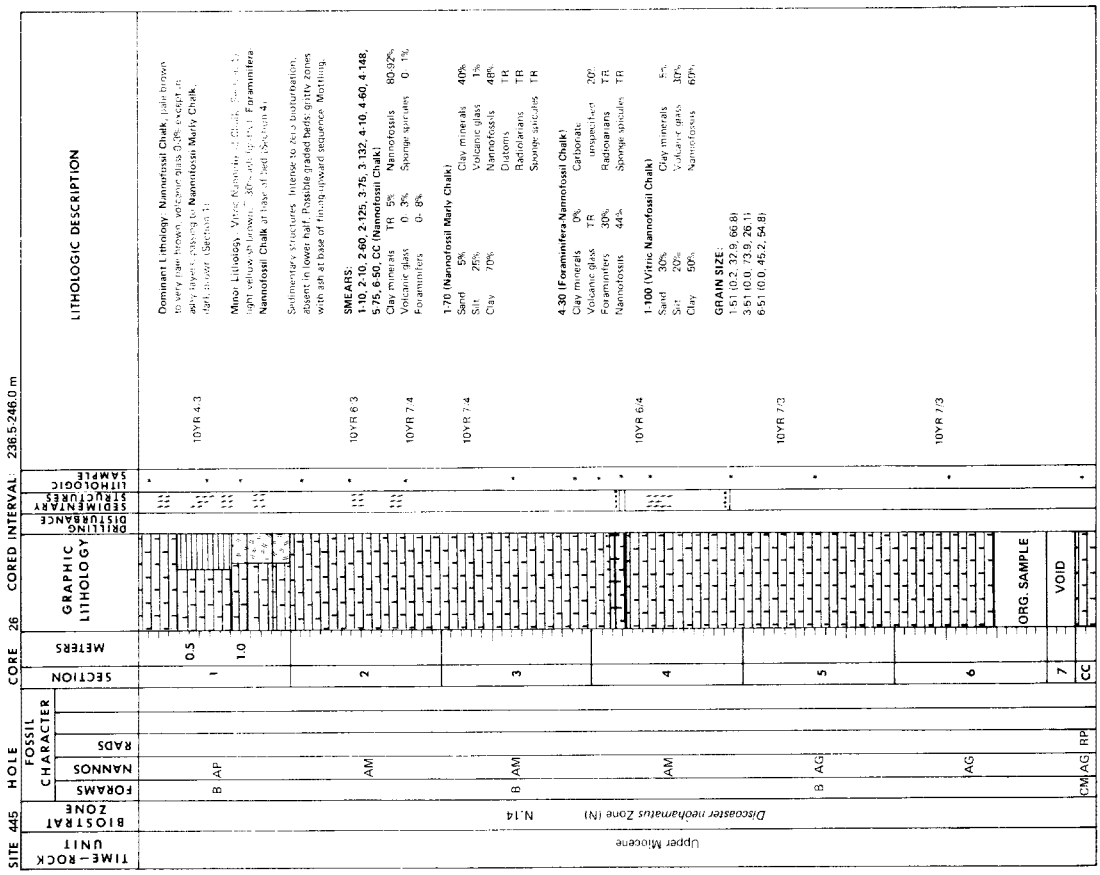
Sand	0%	Clay minerals	5%
Silt	5%	Foraminifers	30%
Clay	95%	Nannofossils	56%

6-87 (Nannofossil-Foraminifera Chalk)

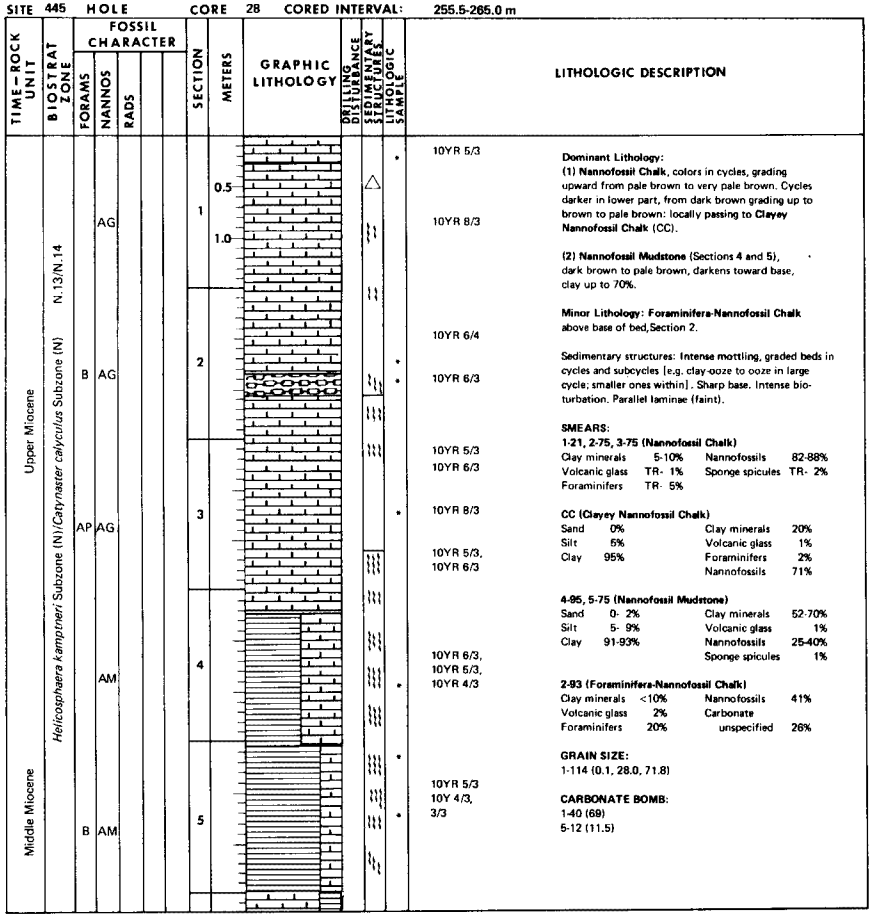
Sand	40%	Clay minerals	5%
Silt	40%	Carbonate unspecified	30%
Clay	20%	Foraminifers	50%
		Nannofossils	18%

GRAIN SIZE:
1-44 (0.3, 29.9, 69.8)
3-44 (1.2, 32.8, 66.0)
5-44 (0.4, 53.9, 45.7)





SITE 445 HOLE CORE 28 CORED INTERVAL: 255.5-265.0 m



10YR 5/3
10YR 8/3
10YR 6/4
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10YR 6/3
10YR 6/3,
10YR 5/3,
10YR 4/3
10YR 5/3
10Y 4/3,
3/3

LITHOLOGIC DESCRIPTION

Dominant Lithology:
(1) Nannofossil Chalk, colors in cycles, grading upward from pale brown to very pale brown. Cycles darker in lower part, from dark brown grading up to brown to pale brown; locally passing to **Clayey Nannofossil Chalk** (CC).

(2) Nannofossil Mudstone (Sections 4 and 5), dark brown to pale brown, darkens toward base, clay up to 70%.

Minor Lithology: Foraminifera-Nannofossil Chalk above base of bed, Section 2.

Sedimentary structures: Intense mottling, graded beds in cycles and subcycles [e.g. clay-ooze to ooze in large cycle; smaller ones within]. Sharp base. Intense bioturbation. Parallel laminae (faint).

SMEARS:

1-21, 2-75, 3-75 (Nannofossil Chalk)

Clay minerals	5-10%	Nannofossils	82-88%
Volcanic glass	TR- 1%	Sponge spicules	TR- 2%
Foraminifers	TR- 5%		

CC (Clayey Nannofossil Chalk)

Sand	0%	Clay minerals	20%
Silt	5%	Volcanic glass	1%
Clay	95%	Foraminifers	2%
		Nannofossils	71%

4-95, 5-75 (Nannofossil Mudstone)

Sand	0- 2%	Clay minerals	52-70%
Silt	5- 9%	Volcanic glass	1%
Clay	91-93%	Nannofossils	25-40%
		Sponge spicules	1%

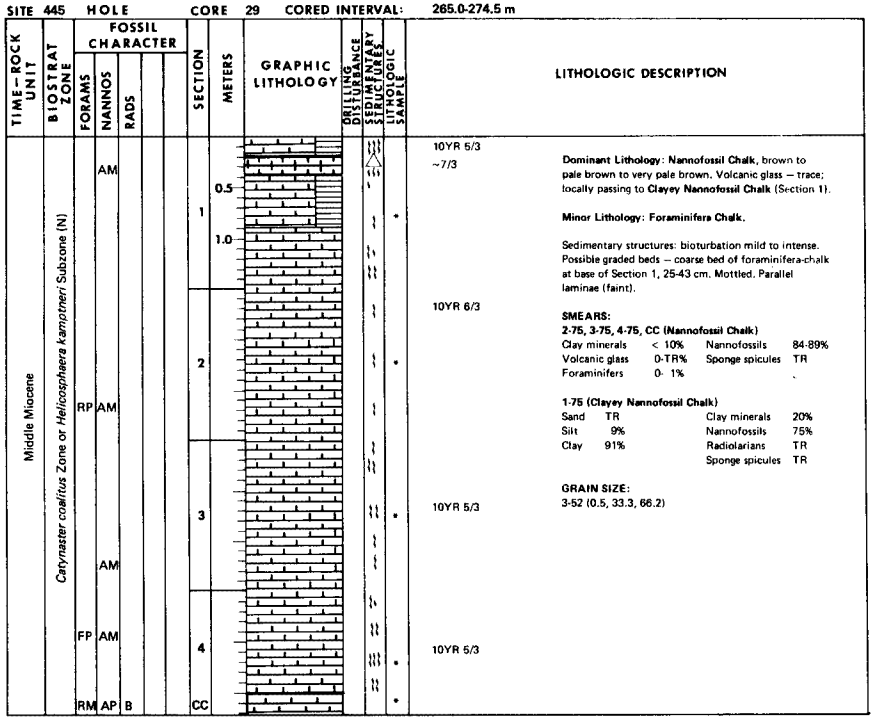
2-93 (Foraminifera-Nannofossil Chalk)

Clay minerals	<10%	Nannofossils	41%
Volcanic glass	2%	Carbonate unspecified	26%
Foraminifers	20%		

GRAIN SIZE:
1-114 (0.1, 28.0, 71.8)

CARBONATE BOMB:
1-40 (69)
5-12 (11.5)

SITE 445 HOLE CORE 29 CORED INTERVAL: 265.0-274.5 m



10YR 5/3
~7/3
10YR 6/3
10YR 5/3
10YR 5/3

Dominant Lithology: Nannofossil Chalk, brown to pale brown to very pale brown. Volcanic glass – trace; locally passing to **Clayey Nannofossil Chalk** (Section 1).

Minor Lithology: Foraminifera Chalk.

Sedimentary structures: bioturbation mild to intense. Possible graded beds – coarse bed of foraminifera-chalk at base of Section 1, 25-43 cm. Mottled. Parallel laminae (faint).

SMEARS:

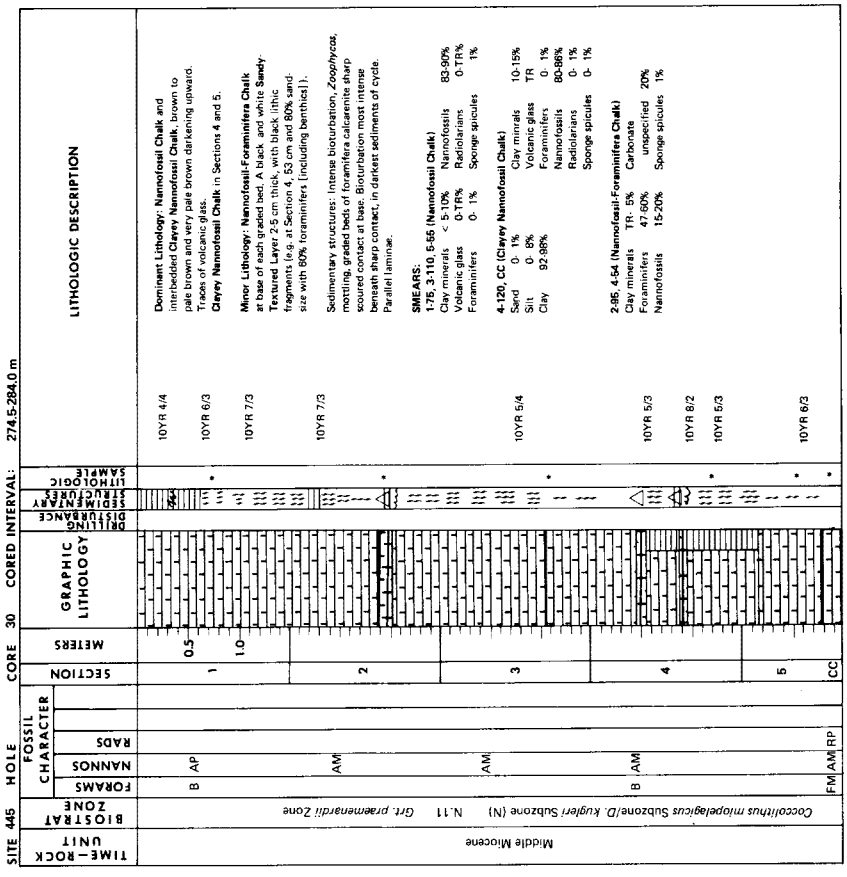
2-75, 3-75, 4-75, CC (Nannofossil Chalk)

Clay minerals	< 10%	Nannofossils	84-89%
Volcanic glass	0-TR%	Sponge spicules	TR
Foraminifers	0- 1%		

1-75 (Clayey Nannofossil Chalk)

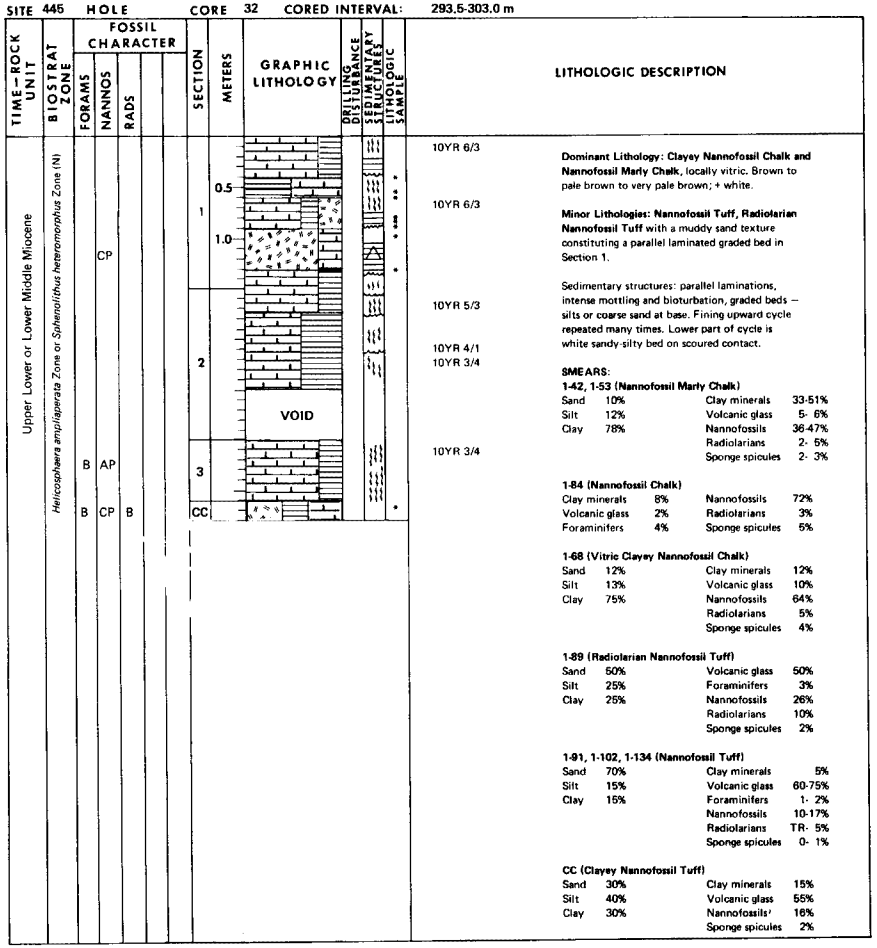
Sand	TR	Clay minerals	20%
Silt	9%	Nannofossils	75%
Clay	91%	Radiolarians	TR
		Sponge spicules	TR

GRAIN SIZE:
3-52 (0.5, 33.3, 66.2)


SITE 445 HOLE CORE 31 CORED INTERVAL: 184.0-293.5 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Middle Miocene
Helicosphaera ampliaperata Zone or Sphenaolithus heteromorphos Zone/Coccolithus miopelagicus Subzone (N)
FM AM CM AP FP
1 2 3 4 5 6 7 CC
0.5 1.0
10YR 5/3
10YR 7/3
10YR 8/2
10YR 6/3
10YR 3/4
Dominant Lithology: Clayey Nannofossil Chalk and lesser amounts of Nannofossil-Foraminifera Chalk, Calcareous Chalk and Vitric Foraminifera-Nannofossil Chalk. Brown to pale brown, to very pale brown, to white in downward sequence in each cycle with sharp basal contact. Minor glass, clay to 15%.
Minor Lithology: Clayey Nannofossil Chalk (Section 5) locally passing to lighter colored Nannofossil Chalk (Sections 1 and 4) or darker colored Nannofossil Mudstone, Siliceous Calcareous Mudstone (Sections 4 and 5) foraminifera-bearing chalks, occupying lower-basal parallel laminated part of each graded unit.
Sedimentary structures: bioturbation intense, parallel laminae, graded beds – white sand at base over sharp scoured contact, very pale brown to brown upward
SMEARS:
1-12, 1-121, 4-100, 6-128 (Nannofossil Chalk)
Clay minerals 5-10% Nannofossils 87-90%
Volcanic glass 0-TR% Sponge spicules 0- 1%
Foraminifers 2%
1-90, 2-70, 3-80, 6-98 (Clayey Nannofossil Chalk)
Sand 1- 8% Clay minerals 10-20%
Silt 9-15% Volcanic glass 0- 8%
Clay 80-90% Foraminifers 0- 2%
Nannofossils 61-80%
Radiolarians 0- 3%
Sponge spicules 0- 3%
1-28, 1-140 (Nannofossil-Foraminifera Chalk)
Clay minerals TR- 2% Nannofossils 13-25%
Volcanic glass 0- 2% Radiolarians 0- 1%
Foraminifers 57-58% Sponge spicules 0- 1%
4-50, 5-28 (Siliceous Calcareous Mudstone)
Sand 8% Clay minerals 50-68%
Silt 16-20% Volcanic glass 5-10%
Clay 72-76% Nannofossils 8- 9%
Radiolarians 5- 8%
Sponge spicules 5- 9%
5-2 (Calcareous Chalk)
Clay minerals 8% Nannofossils 25%
Volcanic glass 3% Diatoms 1%
Carbonate unspecified 30% Radiolarians 3%
Foraminifers 23% Sponge spicules 3%
5-22 (Nannofossil Mudstone)
Sand 10% Clay minerals 37%
Silt 10% Volcanic glass 3%
Clay 80% Foraminifers 2%
Nannofossil 15%
Radiolarians 3%
Sponge spicules 3%
6-112 (Vitric Foraminifera-Nannofossil Chalk)
Sand 4% Clay minerals 7%
Silt 10% Volcanic glass 20%
Clay 36% Foraminifers 16%
Nannofossils 35%
Radiolarians 3%
Sponge spicules 1%

SITE 445 HOLE CORE 30 CORED INTERVAL: 274.5-284.0 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Middle Miocene
Coccolithus miopelagicus Subzone/D. kugleri Subzone (N) N.11 Grt. praemenardii Zone
B AP AM B AM FM AM RP
1 2 3 4 5 CC
0.5 1.0
10YR 4/4
10YR 6/3
10YR 7/3
10YR 5/4
10YR 5/3
10YR 8/2
Dominant Lithology: Nannofossil Chalk and interbedded Clayey Nannofossil Chalk, brown to pale brown and very pale brown darkening upward. Traces of volcanic glass.
Clayey Nannofossil Chalk in Sections 4 and 5.
Minor Lithology: Nannofossil-Foraminifera Chalk at base of each graded bed. A black and white Sandy Textured Layer 2.5 cm thick, with black lithic fragments, (e.g. at Section 4, 53 cm) and 80% sand size with 80% foraminifers (including benthics)).
Sedimentary structures: Intense bioturbation, Zoophycos, mottling, graded beds of foraminifera calcarenite sharp scoured contact at base. Bioturbation most intense beneath sharp contact, in darkest sediments of cycle. Parallel laminae.
SMEARS:
1-75, 3-110, 5-55 (Nannofossil Chalk)
Clay minerals < 5-10% Nannofossils 83-90%
Volcanic glass 0-TR% Radiolarians 0-TR%
Foraminifers 0- 1% Sponge spicules 1%
4-120, CC (Clayey Nannofossil Chalk)
Sand 0- 1% Clay minrals 10-15%
Silt 0- 8% Volcanic glass TR
Clay 92-98% Foraminifers 0- 1%
Nannofossils 80-88%
Radiolarians 0- 1%
Sponge spicules 0- 1%
2-95, 4-54 (Nannofossil-Foraminifera Chalk)
Clay minerals TR- 5% Carbonate
Foraminifers 47-60% unspecified 20%
Nannofossils 15-20% Sponge spicules 1%

SITE 445 HOLE CORE 32 CORED INTERVAL: 293.5-303.0 m



10YR 6/3
10YR 6/3
10YR 5/3
10YR 4/1
10YR 3/4
10YR 3/4

Dominant Lithology: Clayey Nannofossil Chalk and Nannofossil Marly Chalk, locally vitric. Brown to pale brown to very pale brown; + white.

Minor Lithologies: Nannofossil Tuff, Radiolarian Nannofossil Tuff with a muddy sand texture constituting a parallel laminated graded bed in Section 1.

Sedimentary structures: parallel laminations, intense mottling and bioturbation, graded beds – silts or coarse sand at base. Fining upward cycle repeated many times. Lower part of cycle is white sandy-silty bed on scoured contact.

SMEARS:

1-42, 1-53 (Nannofossil Marly Chalk)

Sand	10%	Clay minerals	33-51%
Silt	12%	Volcanic glass	5- 6%
Clay	78%	Nannofossils	36-47%
		Radiolarians	2- 5%
		Sponge spicules	2- 3%

1-84 (Nannofossil Chalk)

Clay minerals	8%	Nannofossils	72%
Volcanic glass	2%	Radiolarians	3%
Foraminifers	4%	Sponge spicules	5%

1-68 (Vitric Clayey Nannofossil Chalk)

Sand	12%	Clay minerals	12%
Silt	13%	Volcanic glass	10%
Clay	75%	Nannofossils	64%
		Radiolarians	5%
		Sponge spicules	4%

1-89 (Radiolarian Nannofossil Tuff)

Sand	50%	Volcanic glass	50%
Silt	25%	Foraminifers	3%
Clay	25%	Nannofossils	26%
		Radiolarians	10%
		Sponge spicules	2%

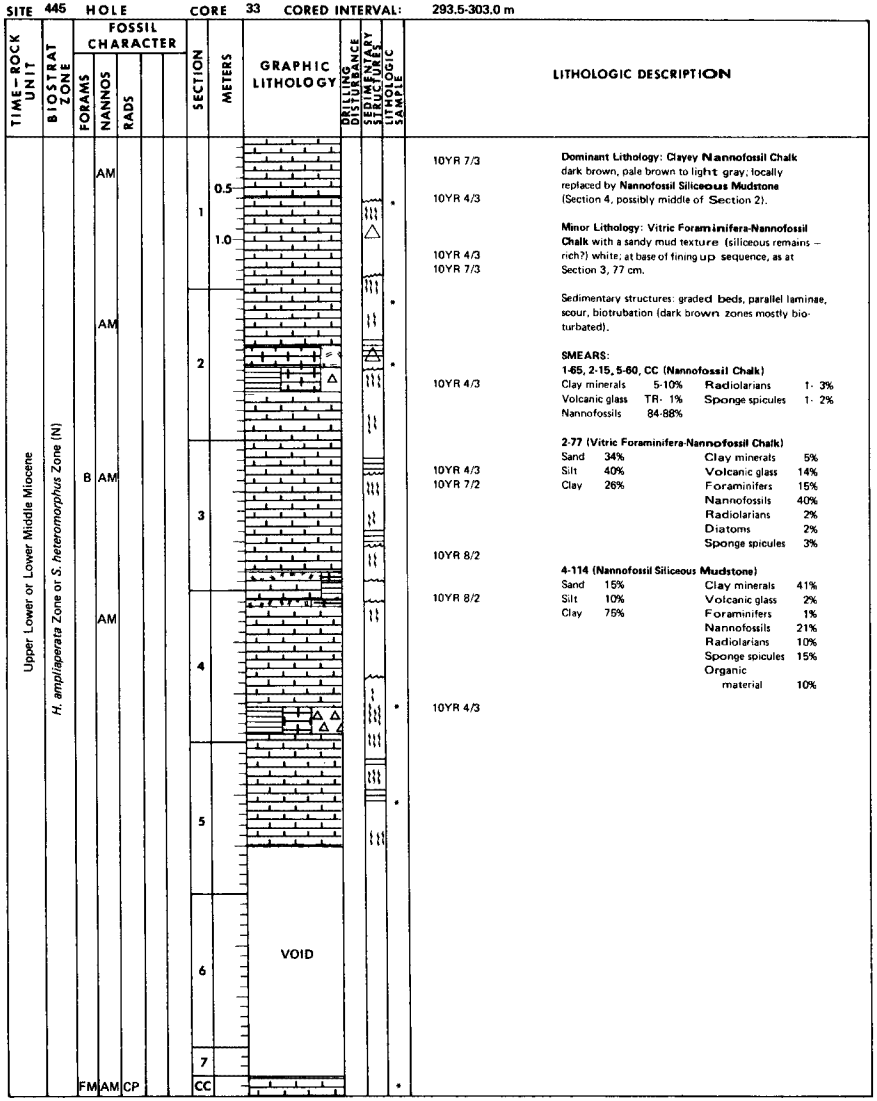
1-91, 1-102, 1-134 (Nannofossil Tuff)

Sand	70%	Clay minerals	5%
Silt	15%	Volcanic glass	60-75%
Clay	15%	Foraminifers	1- 2%
		Nannofossils	10-17%
		Radiolarians	TR- 5%
		Sponge spicules	0- 1%

CC (Clayey Nannofossil Tuff)

Sand	30%	Clay minerals	15%
Silt	40%	Volcanic glass	55%
Clay	30%	Nannofossils	16%
		Sponge spicules	2%

SITE 445 HOLE CORE 33 CORED INTERVAL: 293.5-303.0 m



10YR 7/3
10YR 4/3
10YR 4/3
10YR 7/3
10YR 4/3
10YR 4/3
10YR 7/2
10YR 8/2
10YR 8/2
10YR 4/3

Dominant Lithology: Clayey Nannofossil Chalk dark brown, pale brown to light gray; locally replaced by **Nannofossil Siliceous Mudstone** (Section 4, possibly middle of Section 2).

Minor Lithology: Vitric Foraminifera-Nannofossil Chalk with a sandy mud texture (siliceous remains – rich?) white; at base of fining up sequence, as at Section 3, 77 cm.

Sedimentary structures: graded beds, parallel laminae, scour, biotrubation (dark brown zones mostly bioturbated).

SMEARS:

1-65, 2-15, 5-60, CC (Nannofossil Chalk)

Clay minerals	5-10%	Radiolarians	1- 3%
Volcanic glass	TR- 1%	Sponge spicules	1- 2%
Nannofossils	84-88%		

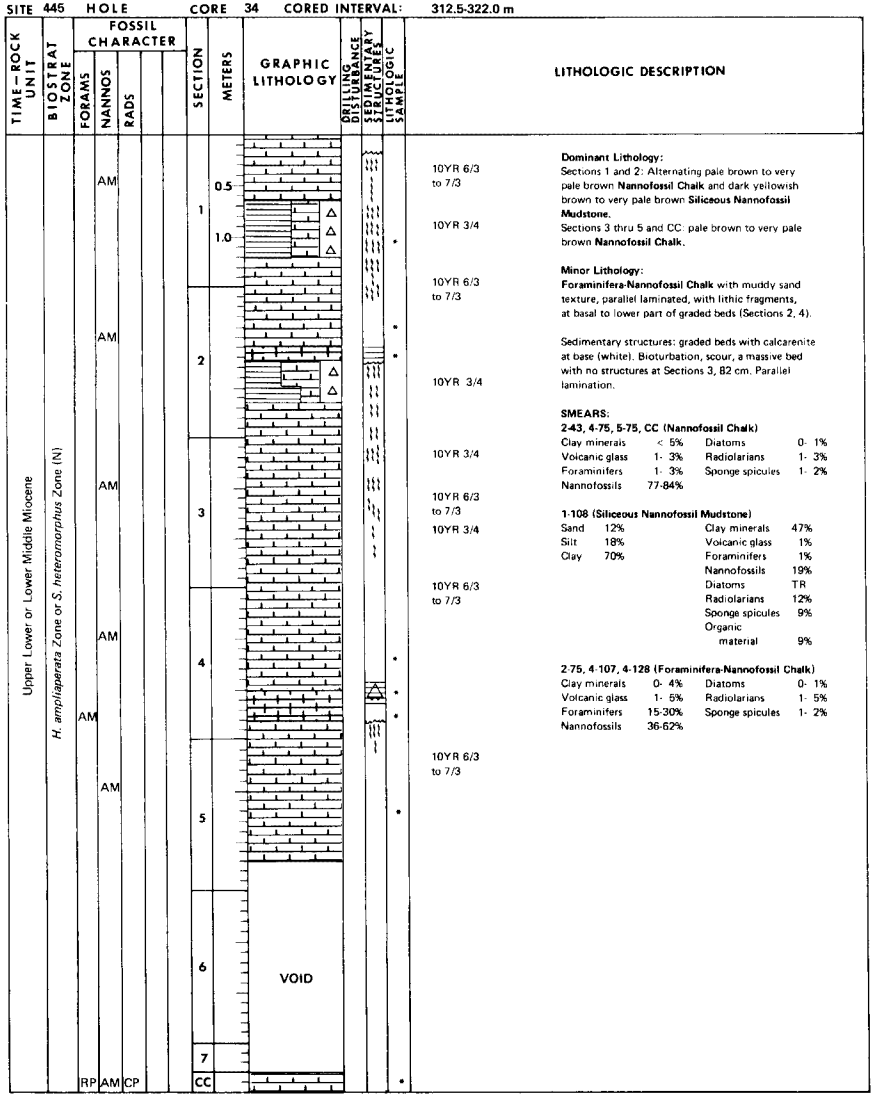
2-77 (Vitric Foraminifera-Nannofossil Chalk)

Sand	34%	Clay minerals	5%
Silt	40%	Volcanic glass	14%
Clay	26%	Foraminifers	15%
		Nannofossils	40%
		Radiolarians	2%
		Diatoms	2%
		Sponge spicules	3%

4-114 (Nannofossil Siliceous Mudstone)

Sand	15%	Clay minerals	41%
Silt	10%	Volcanic glass	2%
Clay	75%	Foraminifers	1%
		Nannofossils	21%
		Radiolarians	10%
		Sponge spicules	15%
		Organic material	10%

SITE 445 HOLE CORE 34 CORED INTERVAL: 312.5-322.0 m



Dominant Lithology:
Sections 1 and 2: Alternating pale brown to very pale brown **Nannofossil Chalk** and dark yellowish brown to very pale brown **Siliceous Nannofossil Mudstone.**
Sections 3 thru 5 and CC: pale brown to very pale brown **Nannofossil Chalk.**

Minor Lithology:
Foraminifera-Nannofossil Chalk with muddy sand texture, parallel laminated, with lithic fragments, at basal to lower part of graded beds (Sections 2, 4).

Sedimentary structures: graded beds with calcarenite at base (white). Bioturbation, scour, a massive bed with no structures at Sections 3, 82 cm. Parallel lamination.

SMEARS:

2-43, 4-75, 5-75, CC (Nannofossil Chalk)

Clay minerals	< 5%	Diatoms	0- 1%
Volcanic glass	1- 3%	Radiolarians	1- 3%
Foraminifers	1- 3%	Sponge spicules	1- 2%
Nannofossils	77-84%		

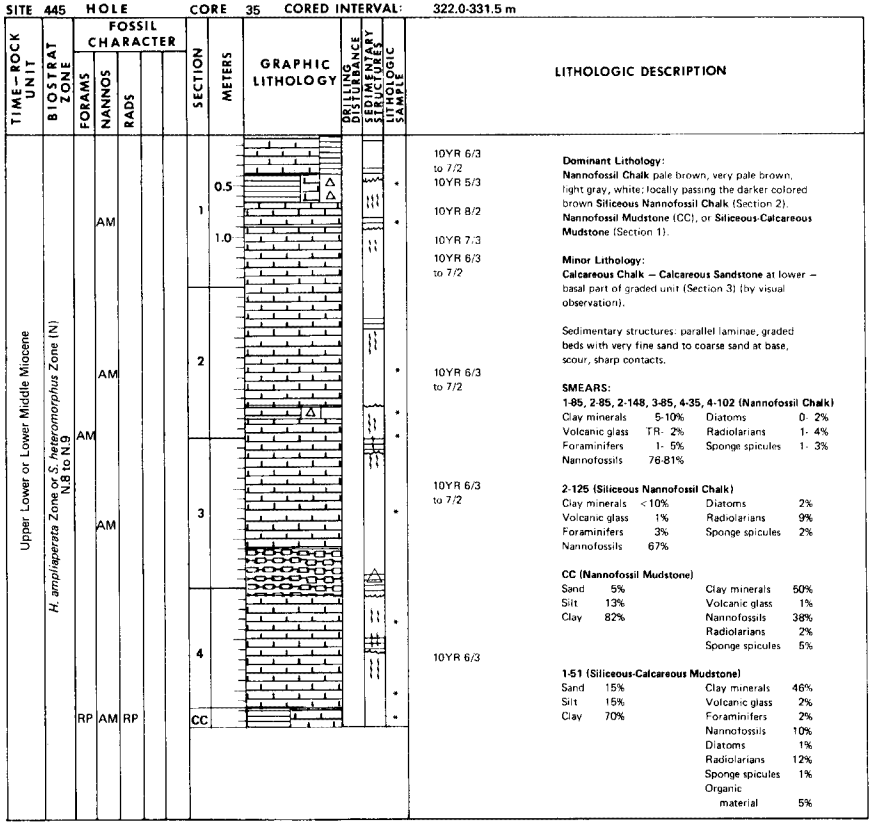
1-108 (Siliceous Nannofossil Mudstone)

Sand	12%	Clay minerals	47%
Silt	18%	Volcanic glass	1%
Clay	70%	Foraminifers	1%
		Nannofossils	19%
		Diatoms	TR
		Radiolarians	12%
		Sponge spicules	9%
		Organic material	9%

2-75, 4-107, 4-128 (Foraminifera-Nannofossil Chalk)

Clay minerals	0- 4%	Diatoms	0- 1%
Volcanic glass	1- 5%	Radiolarians	1- 5%
Foraminifers	15-30%	Sponge spicules	1- 2%
Nannofossils	36-62%		

SITE 445 HOLE CORE 35 CORED INTERVAL: 322.0-331.5 m



Dominant Lithology:
Nannofossil Chalk pale brown, very pale brown, light gray, white; locally passing the darker colored brown **Siliceous Nannofossil Chalk** (Section 2). **Nannofossil Mudstone** (CC), or **Siliceous-Calcareous Mudstone** (Section 1).

Minor Lithology:
Calcareous Chalk – Calcareous Sandstone at lower – basal part of graded unit (Section 3) (by visual observation).

Sedimentary structures: parallel laminae, graded beds with very fine sand to coarse sand at base, scour, sharp contacts.

SMEARS:

1-85, 2-85, 2-148, 3-85, 4-35, 4-102 (Nannofossil Chalk)

Clay minerals	5-10%	Diatoms	0- 2%
Volcanic glass	TR- 2%	Radiolarians	1- 4%
Foraminifers	1- 5%	Sponge spicules	1- 3%
Nannofossils	76-81%		

2-125 (Siliceous Nannofossil Chalk)

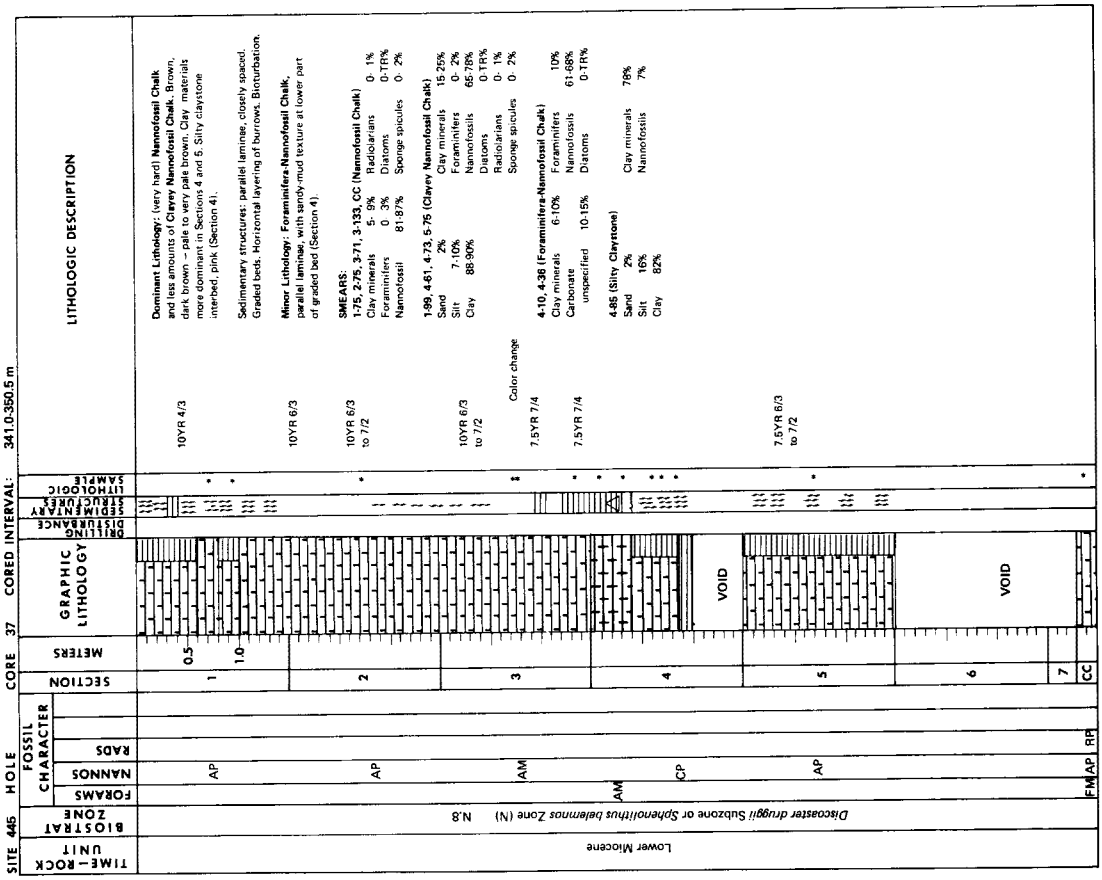
Clay minerals	<10%	Diatoms	2%
Volcanic glass	1%	Radiolarians	9%
Foraminifers	3%	Sponge spicules	2%
Nannofossils	67%		

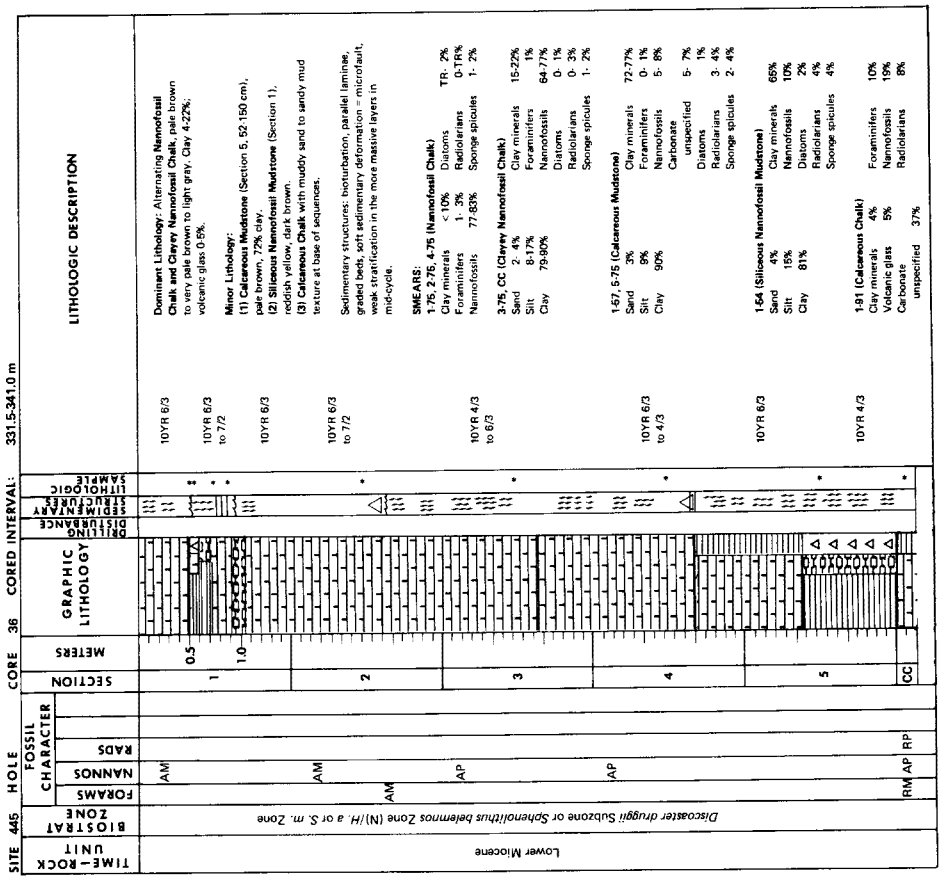
CC (Nannofossil Mudstone)

Sand	5%	Clay minerals	50%
Silt	13%	Volcanic glass	1%
Clay	82%	Nannofossils	38%
		Radiolarians	2%
		Sponge spicules	5%

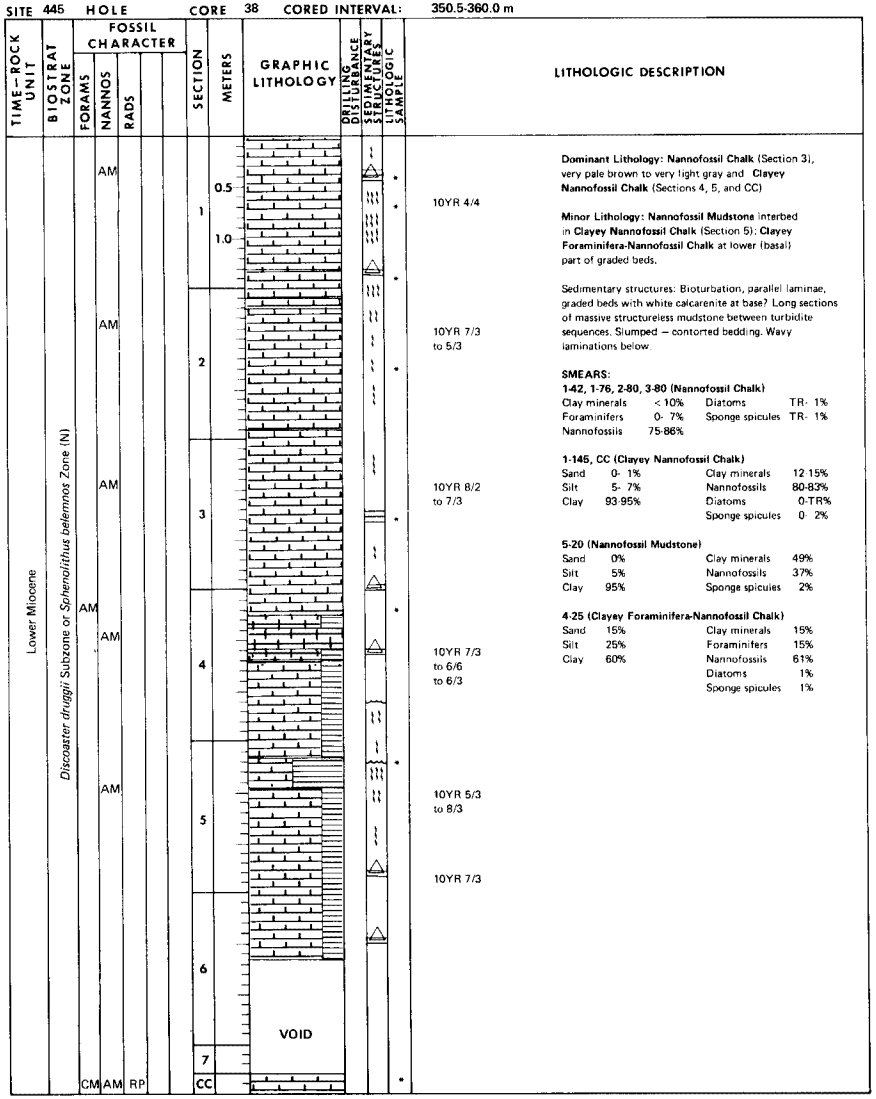
1-51 (Siliceous-Calcareous Mudstone)

Sand	15%	Clay minerals	46%
Silt	15%	Volcanic glass	2%
Clay	70%	Foraminifers	2%
		Nannofossils	10%
		Diatoms	1%
		Radiolarians	12%
		Sponge spicules	1%
		Organic material	5%





SITE 445 HOLE CORE 38 CORED INTERVAL: 350.5-360.0 m



Dominant Lithology: Nannofossil Chalk (Section 3), very pale brown to very light gray and **Clayey Nannofossil Chalk** (Sections 4, 5, and CC)

Minor Lithology: Nannofossil Mudstone interbed in **Clayey Nannofossil Chalk** (Section 5); **Clayey Foraminifera-Nannofossil Chalk** at lower (basal) part of graded beds.

Sedimentary structures: Bioturbation, parallel laminae, graded beds with white calcarenite at base? Long sections of massive structureless mudstone between turbidite sequences. Slumped – contorted bedding. Wavy laminations below.

SMEARS:

1-42, 1-76, 2-80, 3-80 (Nannofossil Chalk)

Clay minerals	< 10%	Diatoms	TR- 1%
Foraminifers	0- 7%	Sponge spicules	TR- 1%
Nannofossils	75-86%		

1-145, CC (Clayey Nannofossil Chalk)

Sand	0- 1%	Clay minerals	12-15%
Silt	5- 7%	Nannofossils	80-83%
Clay	93-95%	Diatoms	0-TR%
		Sponge spicules	0- 2%

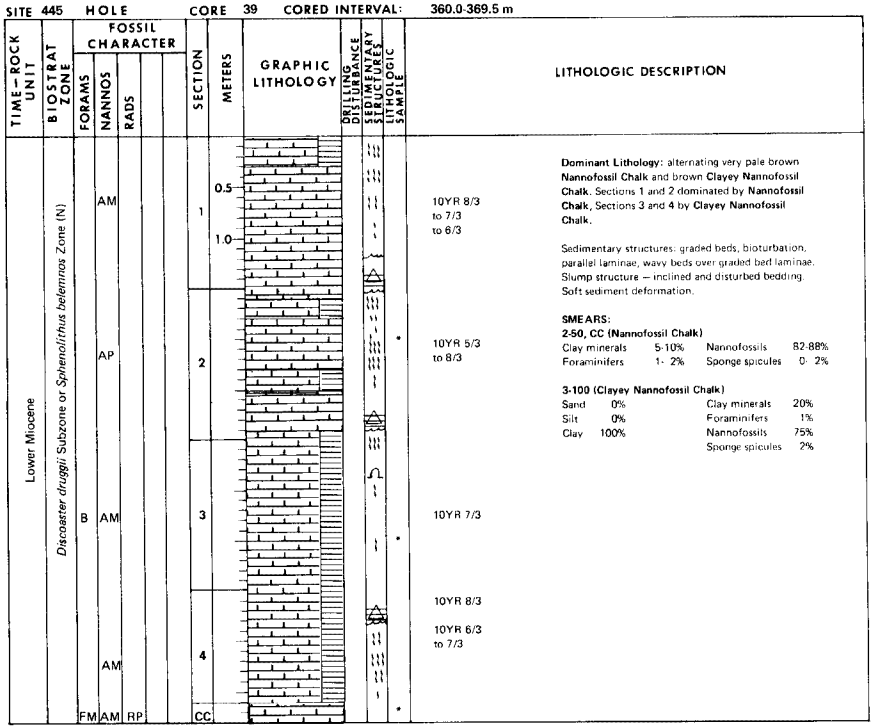
5-20 (Nannofossil Mudstone)

Sand	0%	Clay minerals	49%
Silt	5%	Nannofossils	37%
Clay	95%	Sponge spicules	2%

4-25 (Clayey Foraminifera-Nannofossil Chalk)

Sand	15%	Clay minerals	15%
Silt	25%	Foraminifers	15%
Clay	60%	Nannofossils	61%
		Diatoms	1%
		Sponge spicules	1%

SITE 445 HOLE CORE 39 CORED INTERVAL: 360.0-369.5 m



Dominant Lithology: alternating very pale brown **Nannofossil Chalk** and brown **Clayey Nannofossil Chalk**. Sections 1 and 2 dominated by **Nannofossil Chalk**, Sections 3 and 4 by **Clayey Nannofossil Chalk**.

Sedimentary structures: graded beds, bioturbation, parallel laminae, wavy beds over graded bed laminae. Slump structure – inclined and disturbed bedding. Soft sediment deformation.

SMEARS:

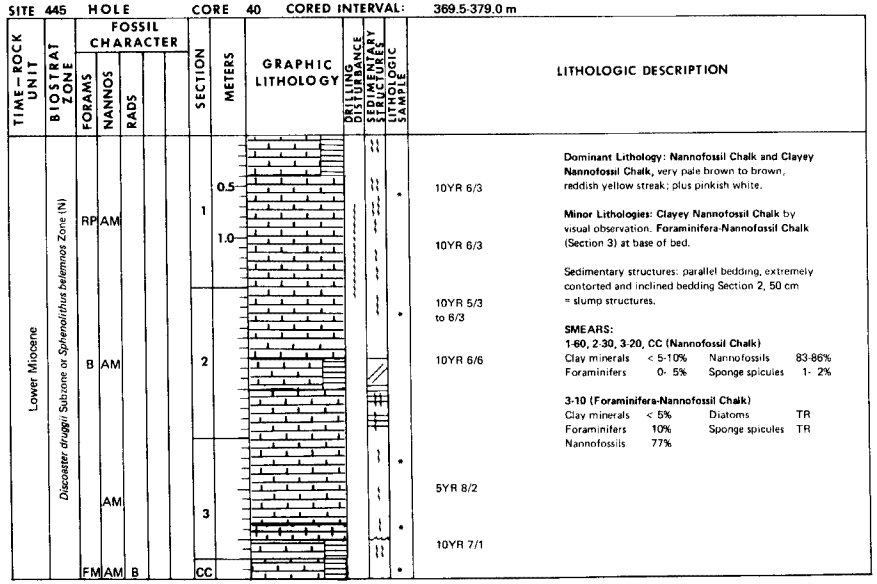
2-50, CC (Nannofossil Chalk)

Clay minerals	5-10%	Nannofossils	82-88%
Foraminifers	1- 2%	Sponge spicules	0- 2%

3-100 (Clayey Nannofossil Chalk)

Sand	0%	Clay minerals	20%
Silt	0%	Foraminifers	1%
Clay	100%	Nannofossils	75%
		Sponge spicules	2%

SITE 445 HOLE CORE 40 CORED INTERVAL: 369.5-379.0 m



Dominant Lithology: Nannofossil Chalk and Clayey Nannofossil Chalk, very pale brown to brown, reddish yellow streak; plus pinkish white.

Minor Lithologies: Clayey Nannofossil Chalk by visual observation. **Foraminifera-Nannofossil Chalk** (Section 3) at base of bed.

Sedimentary structures: parallel bedding, extremely contorted and inclined bedding Section 2, 50 cm = slump structures.

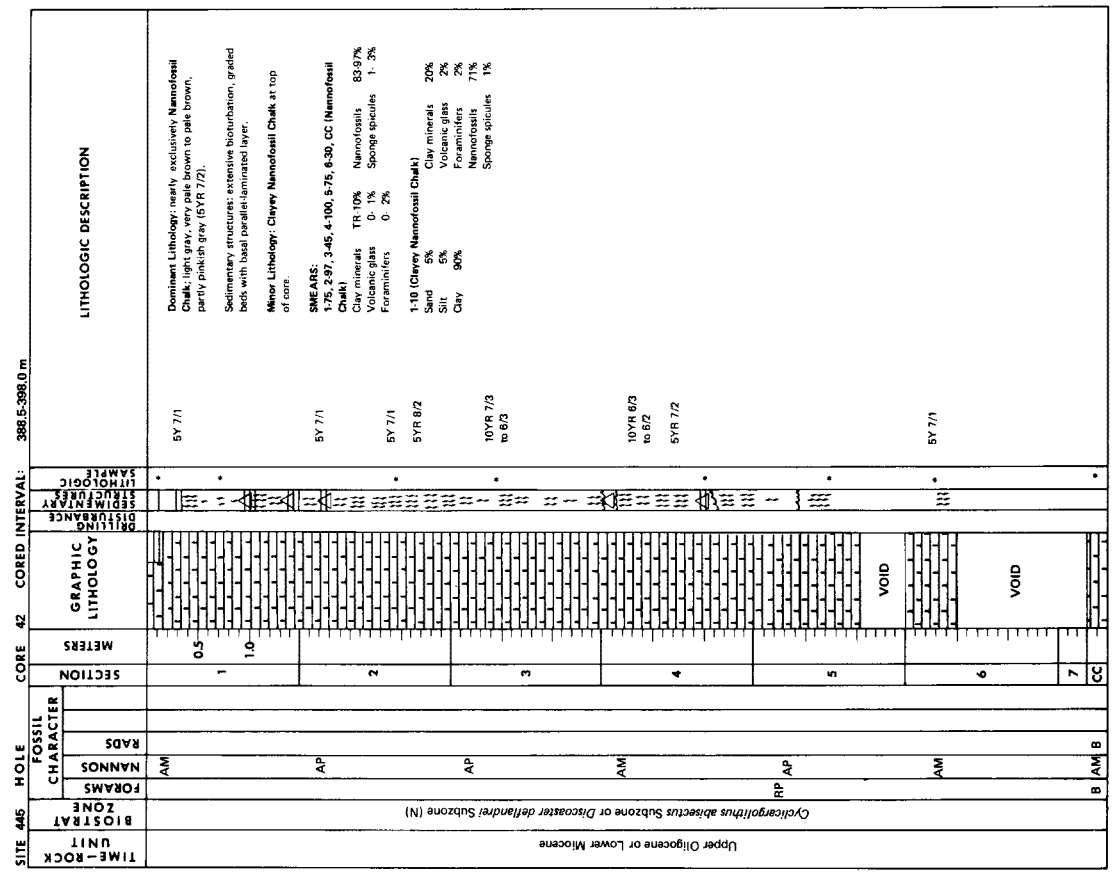
SMEARS:

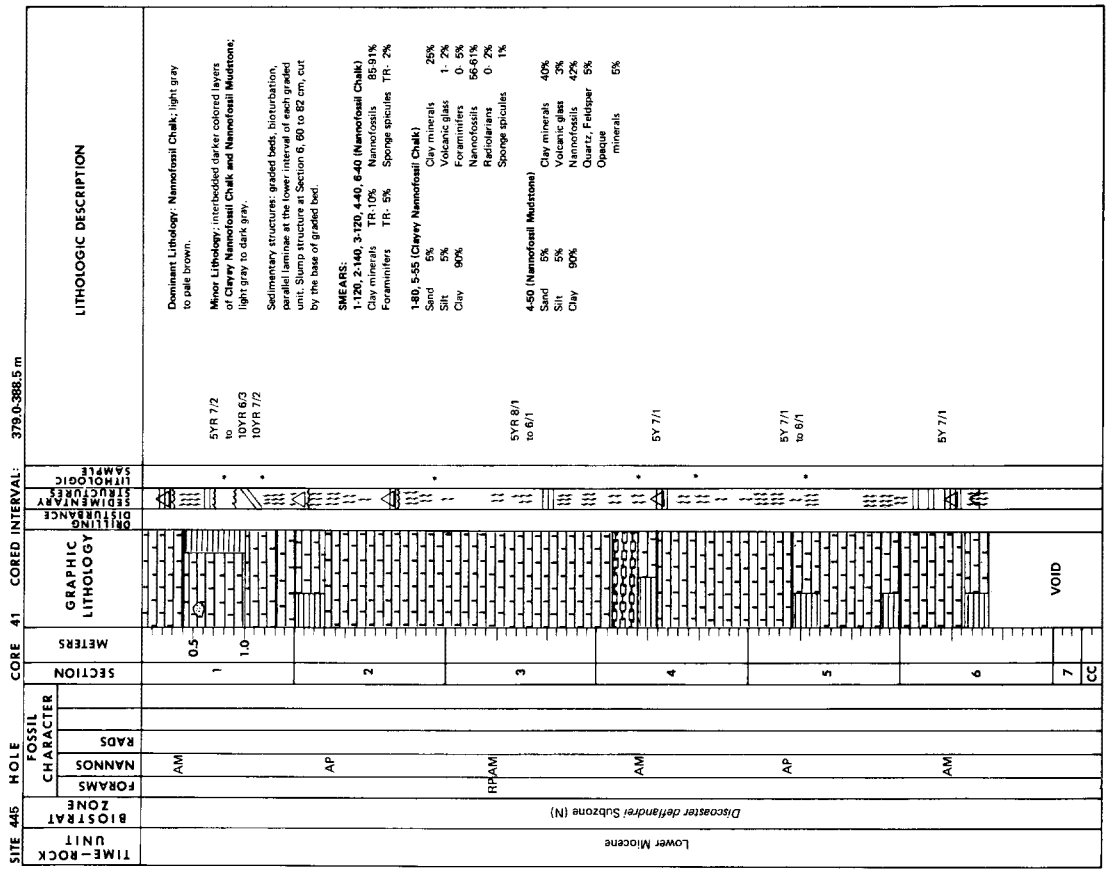
1-60, 2-30, 3-20, CC (Nannofossil Chalk)

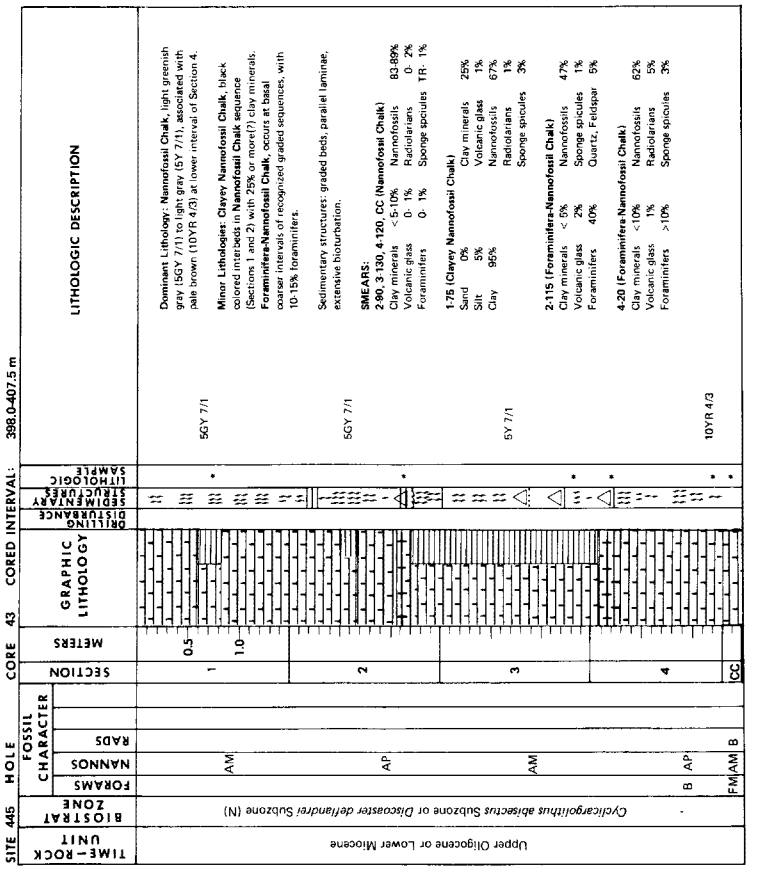
Clay minerals	< 5-10%	Nannofossils	83-86%
Foraminifers	0- 5%	Sponge spicules	1- 2%

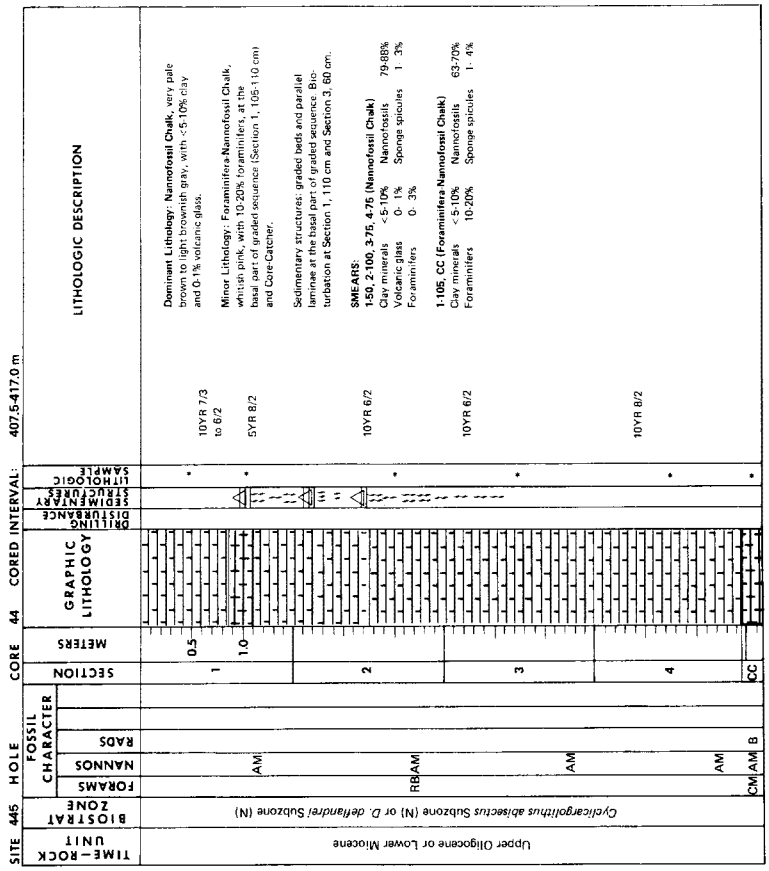
3-10 (Foraminifera-Nannofossil Chalk)

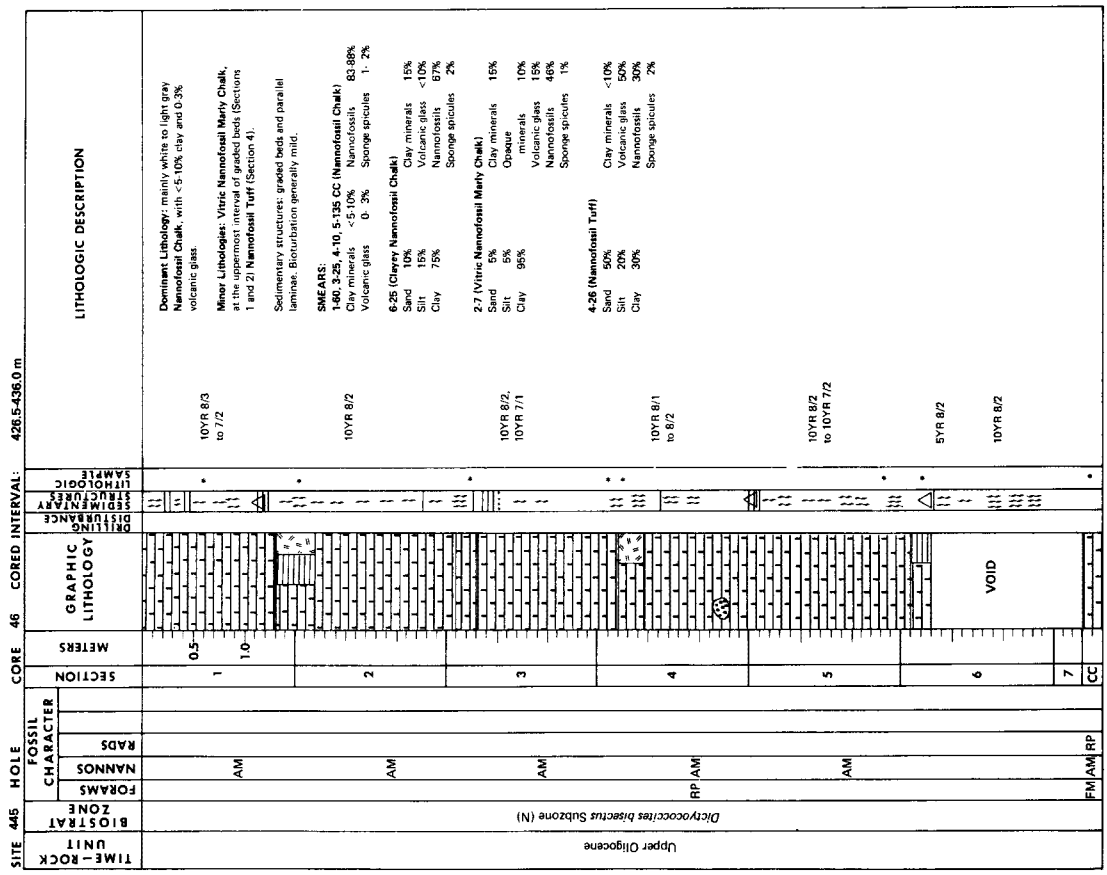
Clay minerals	< 5%	Diatoms	TR
Foraminifers	10%	Sponge spicules	TR
Nannofossils	77%		

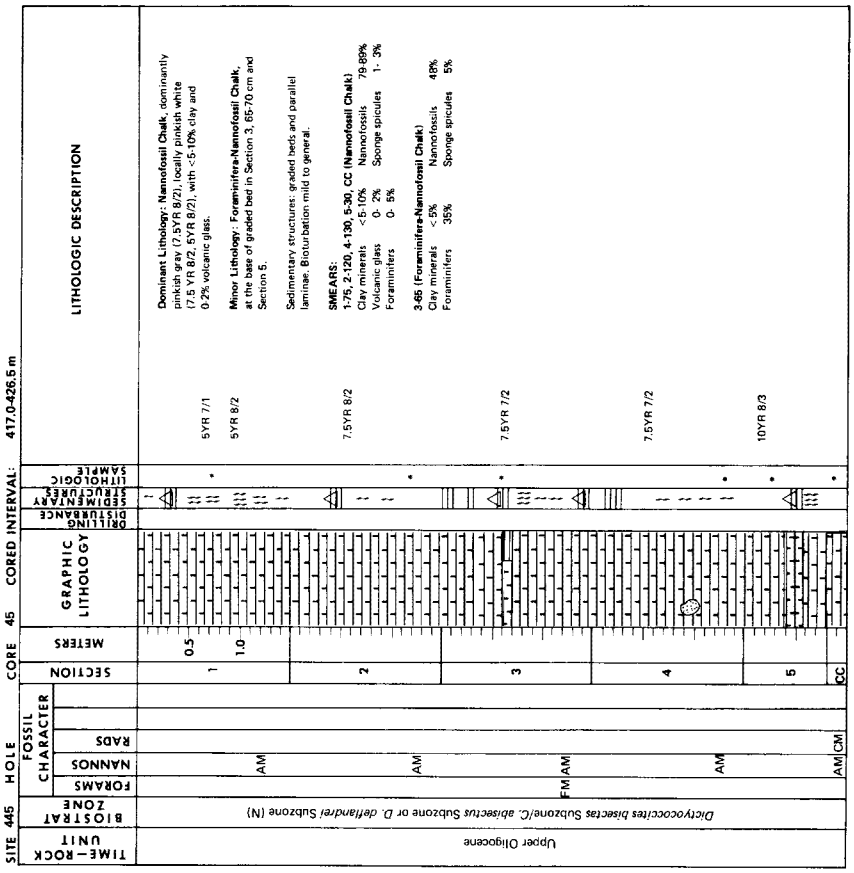










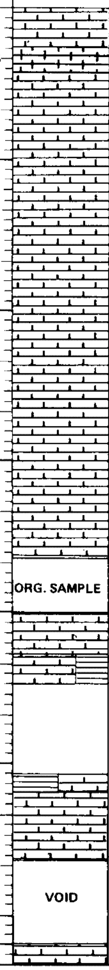


SITE 445 HOLE CORE 47 CORED INTERVAL: 436.0-445.5 m

Time-Rock Unit: Middle Oligocene/Upper Oligocene

Biostrat Zone: *Cyclicargolithus floridanus* Subzone/*Dictyococcites bisectus* Subzone (N)

Section	Forams	Nannos	Rads
1		AM	
2		AM	
3	B	AM	
4		AM	
5		AM	
6		AM	
7			
CC	FM	AM	FP



10YR 8/2
10YR 4/1
10YR 8/2
10YR 8/2

LITHOLOGIC DESCRIPTION

Dominant Lithology: Nannofossil Chalk, with white (10YR 8/2), no structures except for bioturbation.
Clayey Nannofossil Chalk, as interbeds in **Nannofossil Chalk** (Section 5).

Minor Lithologies: Foraminifera-Nannofossil Chalk (Section 1) and **Nannofossil Mudstone** (Section 6).

Sedimentary structures: generally massive, with extensive bioturbation.

SMEARS:
2-35, 3-75, 4-45, CC (Nannofossil Chalk)

Clay minerals	< 5- 8%	Radiolarians	0- 5%
Foraminifers	2- 5%	Sponge spicules	1- 2%
Nannofossils	85-88%		

1-60 (Foraminifera-Nannofossil Chalk)

Clay minerals	<5%	Nannofossils	61%
Volcanic glass	3%	Sponge spicules	1%
Foraminifers	15%		

5-55 (Clayey Nannofossil Chalk)

Sand	7%	Clay minerals	15%
Silt	7%	Volcanic glass	2%
Clay	86%	Foraminifers	2%
		Nannofossils	71%
		Radiolarians	TR
		Sponge spicules	2%

6-17 (Nannofossil Mudstone)

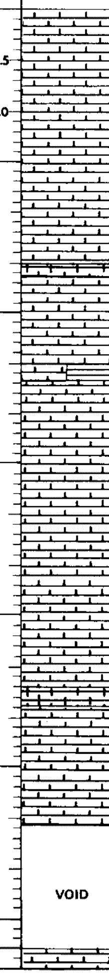
Sand	13%	Clay minerals	37%
Silt	30%	Opaque minerals	15%
Clay	60%	Volcanic glass	5%
		Foraminifers	5%
		Nannofossils	17%
		Diatoms	1%
		Radiolarians	2%
		Sponge spicules	1%

SITE 445 HOLE CORE 48 CORED INTERVAL: 445.5-455.0 m

Time-Rock Unit: Middle Oligocene

Biostrat Zone: *Cyclicargolithus floridanus* Subzone (N)

Section	Forams	Nannos	Rads
1	B	AM	
2		AM	
3		AM	
4		AM	
5		AM	
6			
7			
CC	B	AM	RP



10YR 8/2
10YR 8/2
10YR 8/1
5Y 7/1
10YR 8/1
10YR 8/1

LITHOLOGIC DESCRIPTION

Dominant Lithology: Nannofossil Chalk, white, faintly laminated.

Minor Lithologies: Interbeded **Nannofossil Marly Chalk**, layer (Section 3), **Foraminifera-Nannofossil Chalk** (Section 2) and **Nannofossil-Foraminifera Chalk** (Section 5).

Sedimentary structures: graded beds; faint lamination; bioturbation rather mild.

SMEARS:
1-75, 2-70, 3-100, 4-10, CC (Nannofossil Chalk)

Clay minerals	TR- 7%	Nannofossils	83-94%
Volcanic glass	0- 1%	Sponge spicules	1- 3%
Foraminifers	1- 5%		

2-107 (Foraminifera-Nannofossil Chalk)

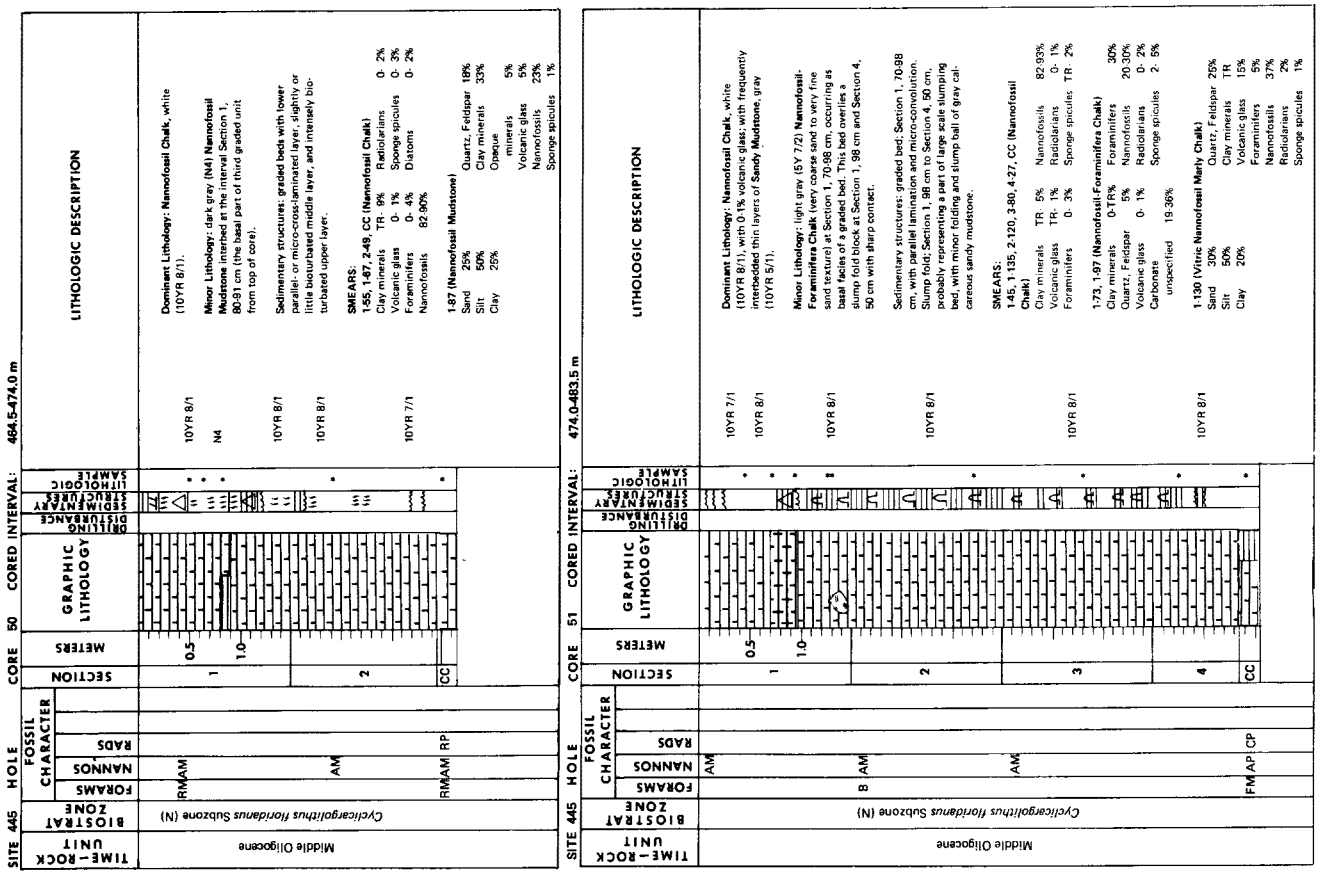
Clay minerals	TR	Nannofossils	62%
Volcanic glass	4%	Sponge spicules	1%
Foraminifers	15%		

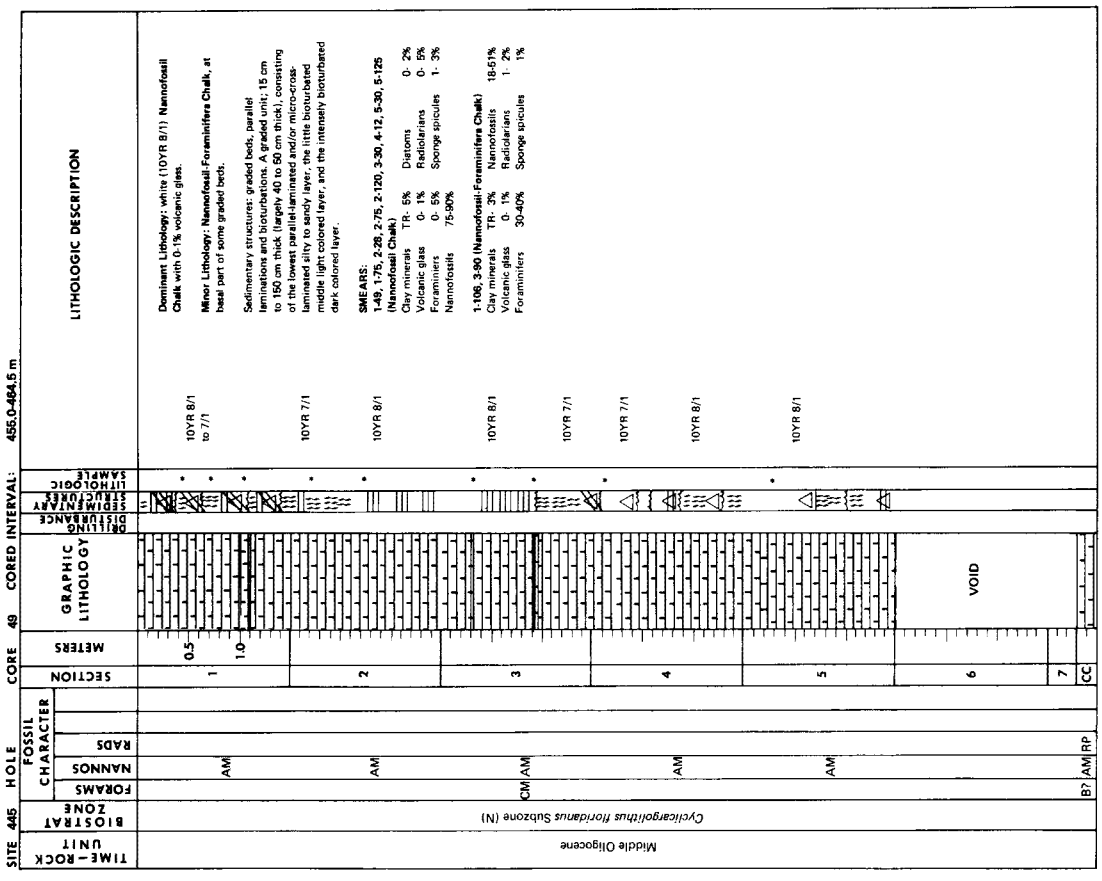
3-52 (Nannofossil Mudstone)

Sand	5%	Clay minerals	50%
Silt	10%	Opaque minerals	5%
Clay	85%	Voclanic glass	1%
		Foraminifers	2%
		Nannofossils	27%
		Radiolarians	1%
		Sponge spicules	4%

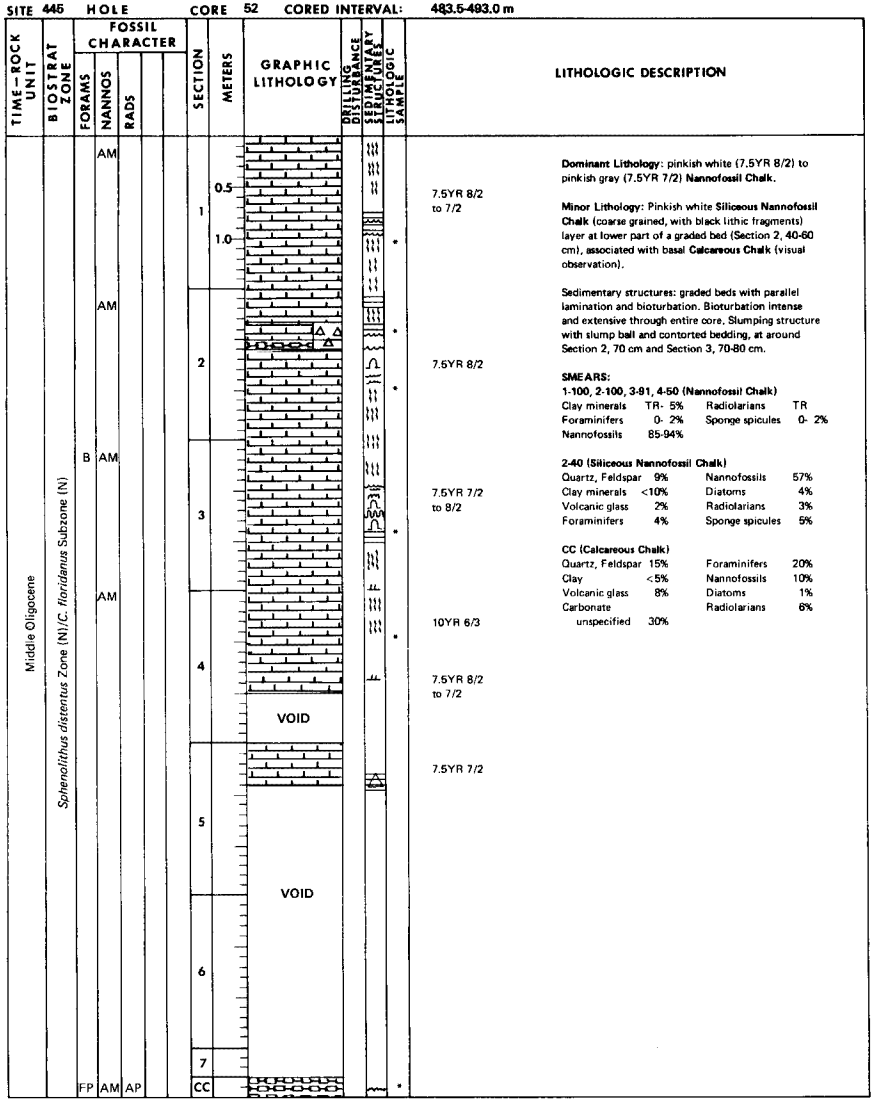
5-73 (Nannofossil-Foraminifera Chalk)

Clay minerals	8%	Nannofossils	25%
Foraminifers	51%	Sponge spicules	2%


SITE 445
HOLE
CORED INTERVAL: 464.5-474.0 m
TIME–ROCK UNIT: Middle Oligocene
BIOSTRAT ZONE: Cyclicargolithus floridanus Subzone (N)
FOSSIL CHARACTER: FORAMS, NANNOS, RADS
CORE 50
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Dominant Lithology: Nannofossil Chalk, white (10YR 8/1).
Minor Lithology: dark gray (N4) Nannofossil Mudstone interbed at the interval Section 1, 80-91 cm (the basal part of third graded unit from top of core).
Sedimentary structures: graded beds with lower parallel- or micro-cross-laminated layer, slightly or little bioturbated middle layer, and intensely bioturbated upper layer.
SMEARS:
1-55, 1-87, 2-49, CC (Nannofossil Chalk)
1-87 (Nannofossil Mudstone)
CORE 51
474.0-483.5 m
Dominant Lithology: Nannofossil Chalk, white (10YR 8/1), with 0.1% volcanic glass; with frequently interbedded thin layers of Sandy Mudstone, gray (10YR 5/1).
Minor Lithology: light gray (5Y 7/2) Nannofossil-Foraminifera Chalk (very coarse sand to very fine sand texture) at Section 1, 70-98 cm, occurring as basal facies of a graded bed. This bed overlies a slump fold block at Section 1, 98 cm and Section 4, 50 cm with sharp contact.
Sedimentary structures: graded bed; Section 1, 70-98 cm, with parallel lamination and micro-convolution. Slump fold; Section 1, 98 cm to Section 4, 50 cm, probably representing a part of large scale slumping bed, with minor folding and slump ball of gray calcareous sandy mudstone.
SMEARS:
1-45, 1-135, 2-120, 3-80, 4-27, CC (Nannofossil Chalk)
1-73, 1-97 (Nannofossil-Foraminifera Chalk)
1-130 (Vitric Nannofossil Marly Chalk)


SITE 445
HOLE
CORED INTERVAL: 455.0-464.5 m
TIME–ROCK UNIT: Middle Oligocene
BIOSTRAT ZONE: Cyclicargolithus floridanus Subzone (N)
FOSSIL CHARACTER: FORAMS, NANNOS, RADS
CORE 49
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Dominant Lithology: white (10YR 8/1) Nannofossil Chalk with 0-1% volcanic glass.
Minor Lithology: Nannofossil-Foraminifera Chalk, at basal part of some graded beds.
Sedimentary structures: graded beds, parallel laminations and bioturbations. A graded unit; 15 cm to 150 cm thick (largely 40 to 50 cm thick), consisting of the lowest parallel-laminated and/or micro-cross-laminated silty to sandy layer, the little bioturbated middle light colored layer, and the intensely bioturbated dark colored layer.
SMEARS:
1-49, 1-75, 2-28, 2-75, 2-120, 3-30, 4-12, 5-30, 5-125 (Nannofossil Chalk)
1-106, 3-90 (Nannofossil-Foraminifera Chalk)
VOID

SITE 445 HOLE CORE 52 CORED INTERVAL: 483.5-493.0 m



7.5YR 8/2 to 7/2

7.5YR 8/2

7.5YR 7/2 to 8/2

10YR 6/3

7.5YR 8/2 to 7/2

7.5YR 7/2

Dominant Lithology: pinkish white (7.5YR 8/2) to pinkish gray (7.5YR 7/2) **Nannofossil Chalk.**

Minor Lithology: Pinkish white **Siliceous Nannofossil Chalk** (coarse grained, with black lithic fragments) layer at lower part of a graded bed (Section 2, 40-60 cm), associated with basal **Calcareous Chalk** (visual observation).

Sedimentary structures: graded beds with parallel lamination and bioturbation. Bioturbation intense and extensive through entire core. Slumping structure with slump ball and contorted bedding, at around Section 2, 70 cm and Section 3, 70-80 cm.

SMEARS:

1-100, 2-100, 3-91, 4-50 (Nannofossil Chalk)

Clay minerals	TR- 5%	Radiolarians	TR
Foraminifers	0- 2%	Sponge spicules	0- 2%
Nannofossils	85-94%		

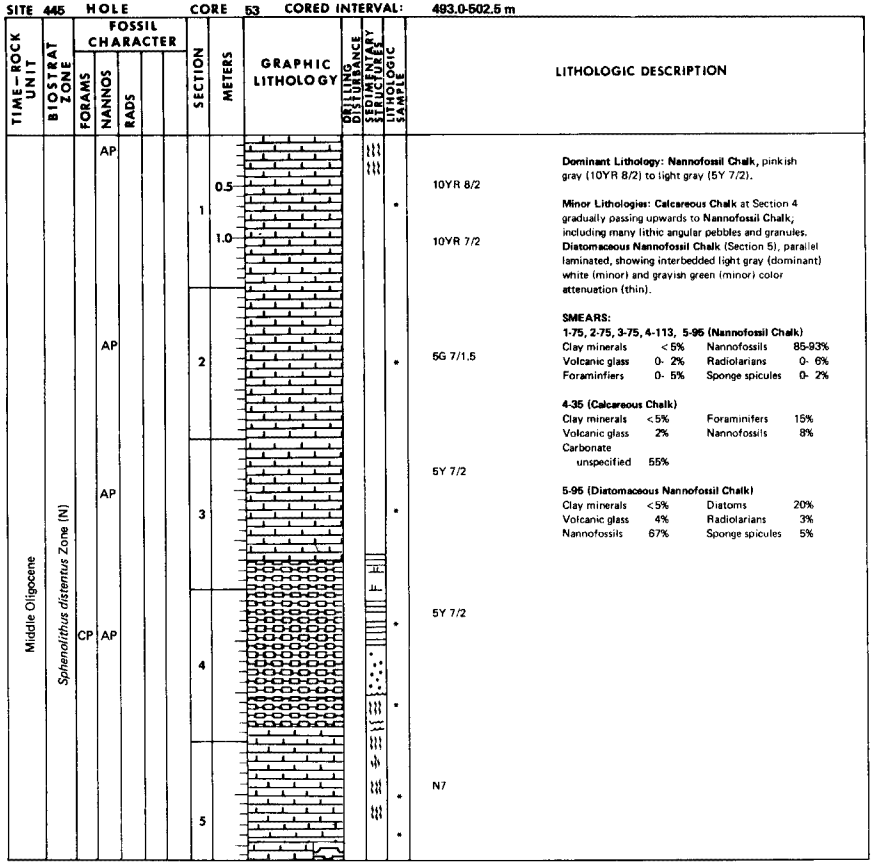
2-40 (Siliceous Nannofossil Chalk)

Quartz, Feldspar	9%	Nannofossils	57%
Clay minerals	<10%	Diatoms	4%
Volcanic glass	2%	Radiolarians	3%
Foraminifers	4%	Sponge spicules	5%

CC (Calcareous Chalk)

Quartz, Feldspar	15%	Foraminifers	20%
Clay	<5%	Nannofossils	10%
Volcanic glass	8%	Diatoms	1%
Carbonate unspecified	30%	Radiolarians	6%

SITE 445 HOLE CORE 53 CORED INTERVAL: 493.0-502.5 m



10YR 8/2

10YR 7/2

5G 7/1.5

5Y 7/2

5Y 7/2

N7

Dominant Lithology: Nannofossil Chalk, pinkish gray (10YR 8/2) to light gray (5Y 7/2).

Minor Lithologies: Calcareous Chalk at Section 4 gradually passing upwards to **Nannofossil Chalk,** including many lithic angular pebbles and granules. **Diatomaceous Nannofossil Chalk** (Section 5), parallel laminated, showing interbedded light gray (dominant) white (minor) and grayish green (minor) color attenuation (thin).

SMEARS:

1-75, 2-75, 3-75, 4-113, 5-95 (Nannofossil Chalk)

Clay minerals	< 5%	Nannofossils	85-93%
Volcanic glass	0- 2%	Radiolarians	0- 6%
Foraminifers	0- 5%	Sponge spicules	0- 2%

4-35 (Calcareous Chalk)

Clay minerals	<5%	Foraminifers	15%
Volcanic glass	2%	Nannofossils	8%
Carbonate unspecified	55%		

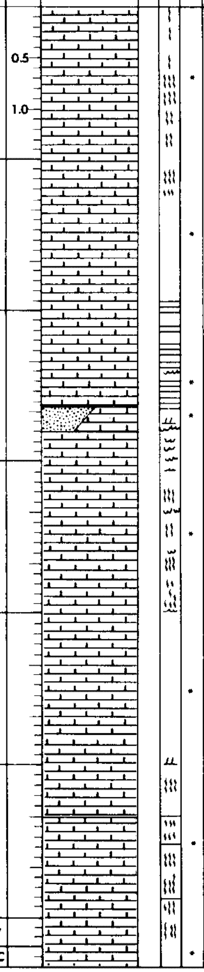
5-95 (Diatomaceous Nannofossil Chalk)

Clay minerals	<5%	Diatoms	20%
Volcanic glass	4%	Radiolarians	3%
Nannofossils	67%	Sponge spicules	5%

SITE 445 HOLE CORE 54 CORED INTERVAL: 502.5-512.0 m

TIME-ROCK UNIT: Middle Oligocene
BIOSTRAT ZONE: *Sphenolithus distentus* Zone (N)

SECTION	FORAMS	NANNOS	RADS	COLOR
1	B	AP		5Y 7/1; 10R 8/1
2		AM		7.5YR 8/3
3		AM		7.5YR 7/2; 7.5YR 8/2
4		AP		5Y 8/2 to 7/2
5		AM		5Y 7/2 to 8/2
6		AM		7.5Y 8/2; 7.5Y 8/2, 7/2
7				7.5Y 8/2
CC	FP	AM	CP	



LITHOLOGIC DESCRIPTION

Dominant Lithology: Nannofossil Chalk, with dominant color of pinkish white (7.5YR 8/2) to pinkish gray (7.5YR 7/2) and white (5Y 8/2) to light gray (5Y 7/2).

Minor Lithologies: Calcareous Silty Sandstone, at base of parallel-laminated and micro-cross-laminated **Nannofossil Chalk** sequence (Section 3, 103-118 cm).

Sedimentary structures: No definite graded beds; parallel laminations, wavy laminations, and micro-cross-laminations; bioturbation locally intense.

SMEARS:
1-70, 2-75, 3-75, 4-75, 5-75, 6-75, CC (Nannofossil Chalk)

Clay minerals	TR- 5%	Diatoms	0- 2%
Foraminifers	0- 5%	Sponge spicules	1- 5%
Nannofossils	78-96%		

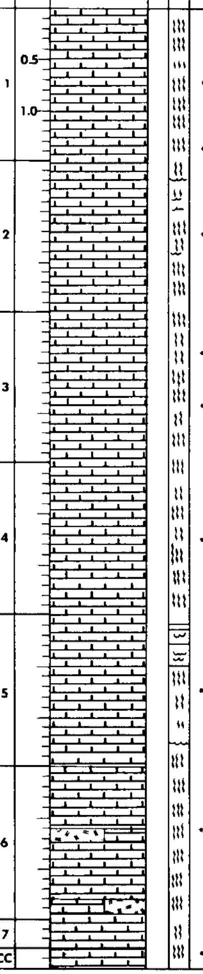
3-108 (Calcareous Silty Sandstone)

Sand	55%	Quartz, Feldspar	28%
Silt	40%	Clay minerals	4%
Clay	5%	Opaque minerals	15%
		Carbonate unspecified	20%
		Foraminifers	10%
		Nannofossils	5%

SITE 445 HOLE CORE 55 CORED INTERVAL: 512.0-521.5 m

TIME-ROCK UNIT: Middle Oligocene
BIOSTRAT ZONE: *Sphenolithus distentus* Zone (N)

SECTION	FORAMS	NANNOS	RADS	COLOR
1		AM		7.5YR 8/2; 7.5YR 7/2
2		AM		7.5YR 7/2
3	FP	AM		7.5Y 7/2; 7.5YR 8/2
4		AM		7.5YR 7/2; 7.5YR 8/2
5		AM		7.5YR 7/2; 7.5YR 8/2
6		AM		
7				
CC	FM	AM	CP	



LITHOLOGIC DESCRIPTION

Dominant Lithology: intensely and extensely bioturbated **Nannofossil Chalk**; pinkish white (7.5YR 8/2) to pinkish gray (7.5YR 7/2); generally rich in siliceous remains.

Minor Lithologies: Vitric Nannofossil Chalk at Section 6 and **Nannofossil Tuff** at Section 6. Nannofossil tuff occurs as dark gray (10YR 5/1) thin, several layers of 1-10 cm thickness with definite bottom boundary throughout the section.

Sedimentary structures: except for some parts, it is very difficult to discriminate original stratification from nearly horizontal structure (wavy lamination-like); possibly resulting from intense bioturbation.

SMEARS:
1-75, 1-140, 2-75, 3-41, 3-95, 4-75, 5-75, CC (Nannofossil Chalk)

Clay minerals	TR- 5%	Diatoms	2- 8%
Volcanic glass	0- 1%	Radiolarians	0- 5%
Foraminifers	0- 1%	Sponge spicules	1- 5%
Nannofossils	70-95%		

6-134 (Vitric Nannofossil Chalk)

Sand	5%	Volcanic glass	<10%
Silt	60%	Nannofossils	60%
Clay	35%	Diatoms	2%
		Opaque minerals	8%

6-63 (Nannofossil Tuff)

Sand	5%	Clay minerals	3%
Silt	65%	Opaque minerals	5%
Clay	30%	Volcanic glass	54%
		Nannofossils	25%
		Diatoms	2%

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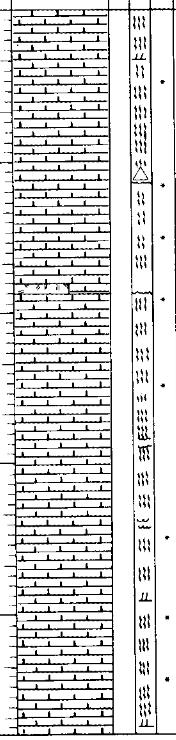
SITE 445 HOLE CORE 56 CORED INTERVAL: 521.5-531.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	COLOR
Middle Oligocene	*Sphenolithus distentus* Zone (N)	RP	AP		1	7.5YR 8/2 to 7/2
			AM		2	7.5YR 7/2; 7.5YR N4
			AP		3	7.5YR 7/2
			AM		4	7.5YR 7/2-8/2
			AM		5	10YR 7/1

GRAPHIC LITHOLOGY



LITHOLOGIC DESCRIPTION

Dominant Lithology: pinkish white (7.5YR 8/2) to pinkish gray (7.5YR 7/2) **Nannofossil Chalk.**

Minor Lithology: gray (7.5YR N6) **Nannofossil Tuff** interbed at Section 2, 122-132 cm.

Sedimentary structures: graded bed rarely occurs. Bioturbation* intensely developed, possibly resulting in destroying of original stratification.

*Including Chondrites, *Zoophycos*, rind burrows, and others.

SMEARS:

1-75, 2-25, 2-75, 3-75, 4-75, 5-9, 5-60 (Nannofossil Chalk)

Clay minerals	TR-5%	Nannofossils	61-92%
Opaque minerals	0-18%	Diatoms	2-6%
Volcanic glass	0-3%	Sponge spicules	1-3%
Foraminiers	0-2%	Radiolarians	0-1%

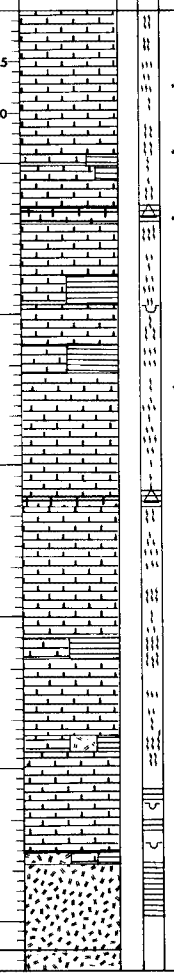
2-132 (Nannofossil Tuff)

Sand	6%	Clay minerals	2%
Silt	74%	Volcanic glass	60%
Clay	20%	Foraminifers	1%
		Nannofossils	20%
		Diatoms	2%
		Sponge spicules	1%

SITE 445 HOLE CORE 57 CORED INTERVAL: 531.0-540.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	COLOR
Middle Oligocene	*Sphenolithus distentus* Zone (N)		AM		1	5Y 7/1, 5Y 6/1
			AM		2	5Y 7/1, 5Y 5/1
			AM		3	5Y 7/1 to 5Y 6/1 to 5Y 5/1
			AM		4	5Y 5/1 to 4/1
		FP	AM		5	5Y 7/1 to 5Y 5/1
			CM		6	5Y 7/1 to 5Y 4/1
					7	
		CP	AG	B	CC	

GRAPHIC LITHOLOGY



LITHOLOGIC DESCRIPTION

Dominant Lithology: alternating light gray (5Y 7/1) **Nannofossil Chalk** and less amount of darker colored gray (5Y 5/1, N5) layers consisting of **Nannofossil Mudstone, Clayey Vitric Nannofossil Chalk, Nannofossil Tuff, etc.**

Tuffaceous layers are concentrated in Sections 5, 6, and CC.

Minor Lithology: Nannofossil-Foraminifera Chalk occurs at basal part of graded beds.

Sedimentary structures: bioturbation; intensity is episodic from mild to intense, but extensive. Graded beds occur at interval of about 3 meters.

SMEARS:

1-25, 3-75, 4-75 (Nannofossil Chalk)

Clay minerals	TR-5%	Nannofossils	85-90%
Foraminifers	1-5%	Sponge spicules	1%

1-140 (Vitric Nannofossil Chalk)

Sand	40%	Clay minerals	<5%
Silt	20%	Volcanic glass	25%
Clay	40%	Nannofossils	60%
		Sponge spicules	1%

2-55 (Nannofossil-Foraminifera Chalk)

Clay minerals	<5%	Nannofossils	35%
Foraminifers	40%	Sponge spicules	1%

5-20 (Nannofossil Mudstone)

Sand	15%	Quartz, Feldspar	10%
Silt	5%	Clay minerals	25%
Clay	80%	Opaque minerals	10%
		Volcanic glass	3%
		Nannofossils	39%

5-125 (Clayey Vitric Nannofossil Chalk)

Sand	40%	Clay minerals	15%
Silt	20%	Volcanic glass	30%
Clay	40%	Nannofossils	49%
		Diatoms	1%
		Sponge spicules	2%

6-85 (Clayey Nannofossil Tuff)

Sand	60%	Clay minerals	15%	Nannofossils	3%
Silt	20%	Volcanic glass	50%	Foraminifers	24%
Clay	20%				

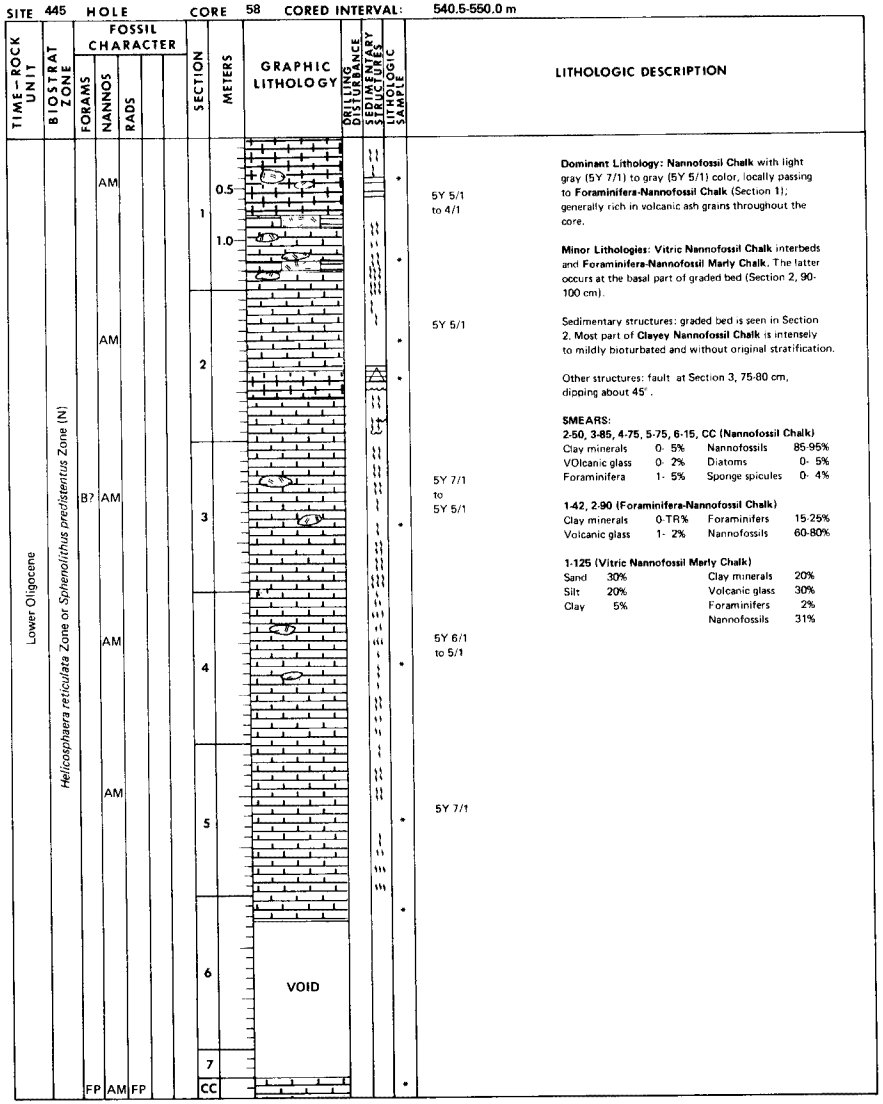
6-135, 7-20 (Nannofossil Tuff)

Sand	40-70%	Clay minerals	<5%	Foraminifers	3%
Silt	10-20%	Volcanic glass	64-65%	Nannofossils	20%
Clay	20-40%				

CC (Tuff)

Sand	93%	Volcanic glass	93%
Silt	3%	Foraminifers	3%
Clay	4%	Nannofossils	4%

SITE 445 HOLE CORE 58 CORED INTERVAL: 540.5-550.0 m



LITHOLOGIC DESCRIPTION

Dominant Lithology: Nannofossil Chalk with light gray (5Y 7/1) to gray (5Y 5/1) color, locally passing to **Foraminifera-Nannofossil Chalk** (Section 1); generally rich in volcanic ash grains throughout the core.

5Y 5/1 to 4/1

Minor Lithologies: Vitric Nannofossil Chalk interbeds and **Foraminifera-Nannofossil Marly Chalk**. The latter occurs at the basal part of graded bed (Section 2, 90-100 cm).

5Y 5/1

Sedimentary structures: graded bed is seen in Section 2. Most part of **Clayey Nannofossil Chalk** is intensely to mildly bioturbated and without original stratification.

Other structures: fault at Section 3, 75-80 cm, dipping about 45°.

5Y 7/1 to 5Y 5/1

SMEARS:

2-50, 3-85, 4-75, 5-75, 6-15, CC (Nannofossil Chalk)

Clay minerals	0- 5%	Nannofossils	85-95%
VOlcanic glass	0- 2%	Diatoms	0- 5%
Foraminifera	1- 5%	Sponge spicules	0- 4%

1-42, 2-90 (Foraminifera-Nannofossil Chalk)

Clay minerals	0-TR%	Foraminifers	15-25%
Volcanic glass	1- 2%	Nannofossils	60-80%

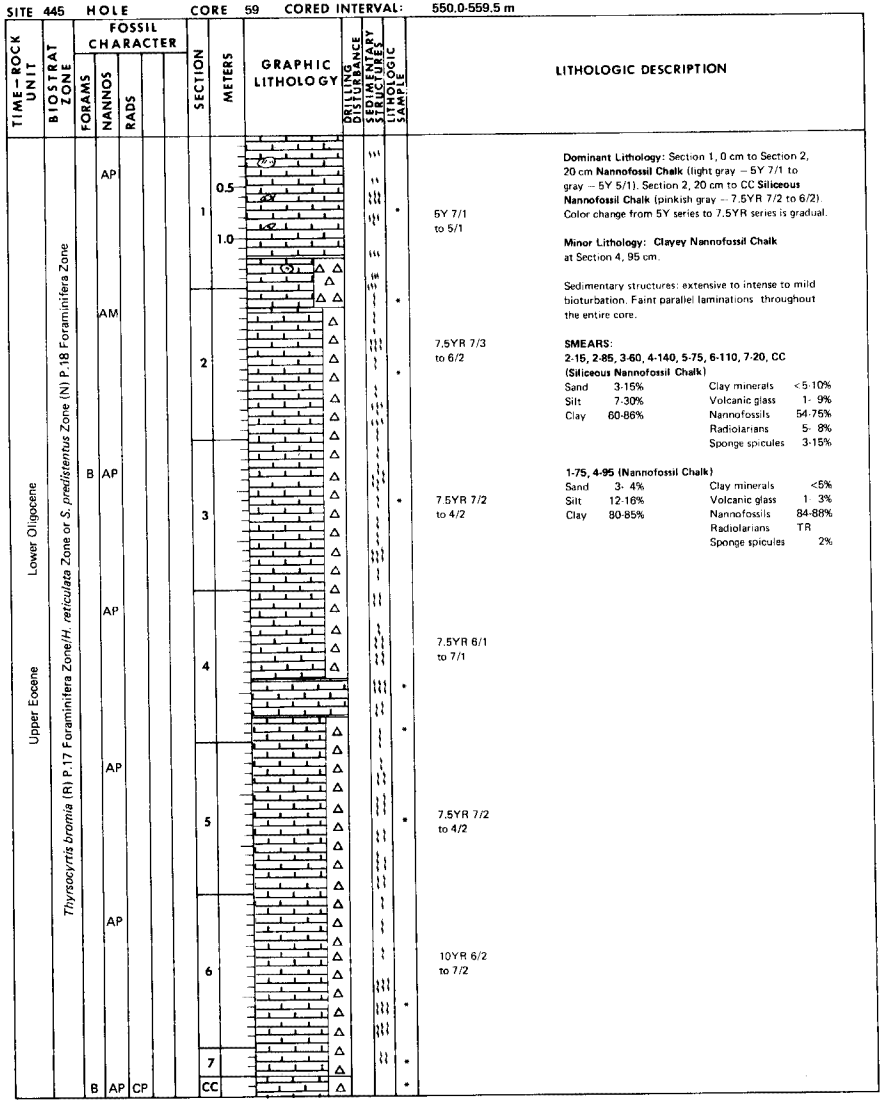
1-125 (Vitric Nannofossil Marly Chalk)

Sand	30%	Clay minerals	20%
Silt	20%	Volcanic glass	30%
Clay	5%	Foraminifers	2%
		Nannofossils	31%

5Y 6/1 to 5/1

5Y 7/1

SITE 445 HOLE CORE 59 CORED INTERVAL: 550.0-559.5 m



LITHOLOGIC DESCRIPTION

Dominant Lithology: Section 1, 0 cm to Section 2, 20 cm **Nannofossil Chalk** (light gray – 5Y 7/1 to gray – 5Y 5/1). Section 2, 20 cm to CC **Siliceous Nannofossil Chalk** (pinkish gray – 7.5YR 7/2 to 6/2). Color change from 5Y series to 7.5YR series is gradual.

5Y 7/1 to 5/1

Minor Lithology: Clayey Nannofossil Chalk at Section 4, 95 cm.

Sedimentary structures: extensive to intense to mild bioturbation. Faint parallel laminations throughout the entire core.

7.5YR 7/3 to 6/2

SMEARS:

2-15, 2-85, 3-60, 4-140, 5-75, 6-110, 7-20, CC (Siliceous Nannofossil Chalk)

Sand	3-15%	Clay minerals	<5-10%
Silt	7-30%	Volcanic glass	1- 9%
Clay	60-86%	Nannofossils	54-75%
		Radiolarians	5- 8%
		Sponge spicules	3-15%

1-75, 4-95 (Nannofossil Chalk)

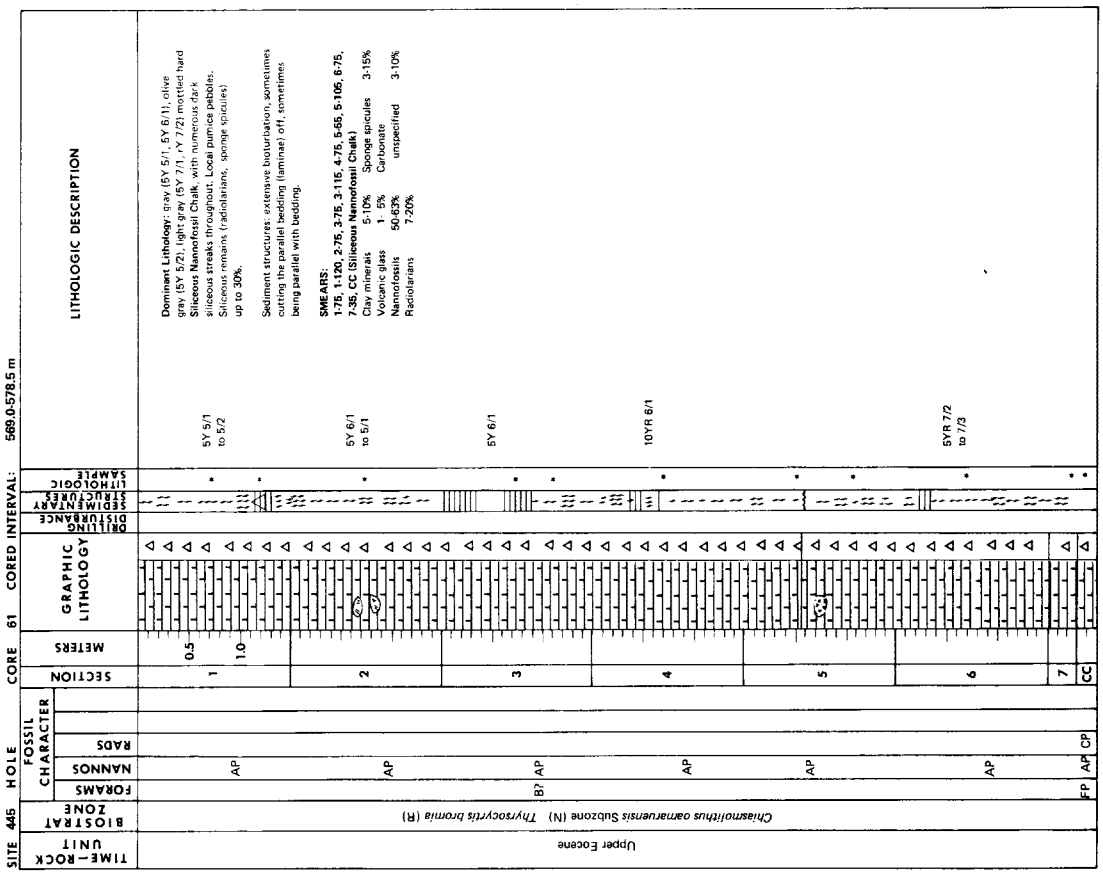
Sand	3- 4%	Clay minerals	<5%
Silt	12-16%	Volcanic glass	1- 3%
Clay	80-85%	Nannofossils	84-88%
		Radiolarians	TR
		Sponge spicules	2%

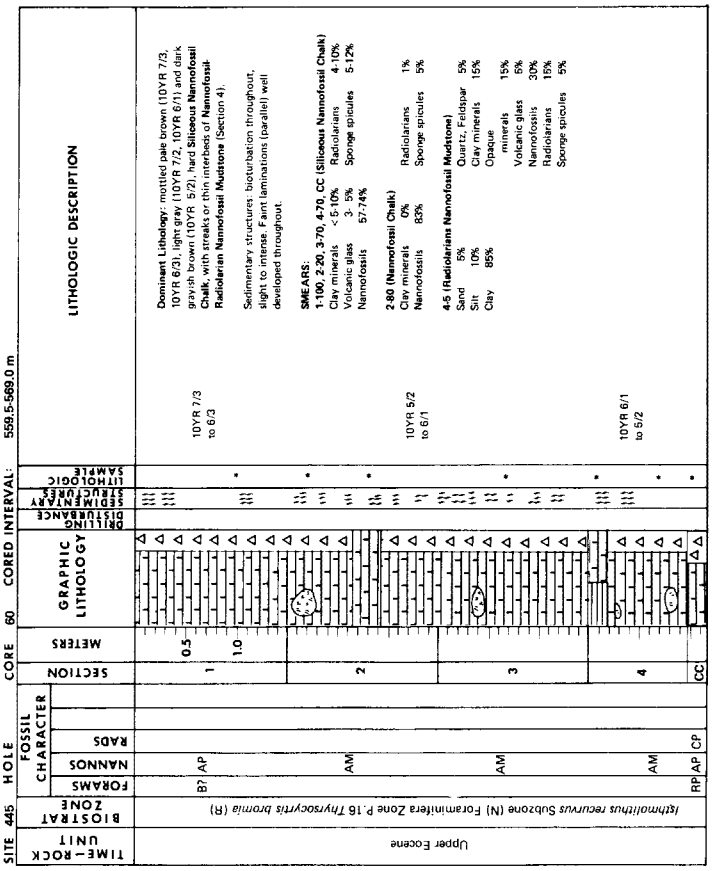
7.5YR 7/2 to 4/2

7.5YR 6/1 to 7/1

7.5YR 7/2 to 4/2

10YR 6/2 to 7/2


SITE 445 HOLE CORE 61 CORED INTERVAL: 569.0-578.5 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Upper Eocene
Chiasmolithus oamaruensis Subzone (N) Thyrsocyrtis bromia (R)
Dominant Lithology: gray (5Y 5/1, 5Y 6/1), olive gray (5Y 5/2), light gray (5Y 7/1, rY 7/2) mottled hard Siliceous Nannofossil Chalk, with numerous dark siliceous streaks throughout. Local pumice pebbles. Siliceous remains (radiolarians, sponge spicules) up to 30%.
Sediment structures: extensive bioturbation, sometimes cutting the parallel bedding (laminae) off, sometimes being parallel with bedding.
SMEARS:
1-75, 1-120, 2-75, 3-75, 3-115, 4-75, 5-65, 5-105, 6-75, 7-35, CC (Siliceous Nannofossil Chalk)
Clay minerals 5-10%
Volcanic glass 1 - 5%
Nannofossils 50-63%
Radiolarians 7-20%
Sponge spicules 3-15%
Carbonate unspecified 3-10%
5Y 5/1 to 5/2
5Y 6/1 to 5/1
5Y 6/1
10YR 6/1
5YR 7/2 to 7/3


SITE 445 HOLE CORE 60 CORED INTERVAL: 569.5-669.0 m
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Upper Eocene
Isthmolithus recurvus Subzone (N) Foraminifera Zone P.16 Thyrsocyrtis bromia (R)
Dominant Lithology: mottled pale brown (10YR 7/3, 10YR 6/3), light gray (10YR 7/2, 10YR 6/1) and dark grayish brown (10YR 5/2), hard Siliceous Nannofossil Chalk, with streaks or thin interbeds of Nannofossil-Radiolarian Nannofossil Mudstone (Section 4).
Sedimentary structures: bioturbation throughout, slight to intense. Faint laminations (parallel) well developed throughout.
SMEARS:
1-100, 2-20, 3-70, 4-70, CC (Siliceous Nannofossil Chalk)
Clay minerals < 5-10%
Volcanic glass 3- 5%
Nannofossils 57-74%
Radiolarians 4-10%
Sponge spicules 5-12%
2-80 (Nannofossil Chalk)
Clay minerals 0%
Nannofossils 83%
Radiolarians 1%
Sponge spicules 5%
4-5 (Radiolarians Nannofossil Mudstone)
Sand 5%
Silt 10%
Clay 85%
Quartz, Feldspar 5%
Clay minerals 15%
Opaque minerals 15%
Volcanic glass 5%
Nannofossils 30%
Radiolarians 15%
Sponge spicules 5%
10YR 7/3 to 6/3
10YR 5/2 to 6/1
10YR 6/1 to 5/2

SITE 445 HOLE CORE 62 CORED INTERVAL: 578.5-588.0 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FORAMS	NANNOS	RADS		SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Upper Eocene	*Chiasmolithus oamaruensis* Subzone (N) / *Thyrsocyrtis bromia* (R)	B	AP				1	0.5				*	10YR 6/2 to 5/2
								1.0				*	2.5Y 7/1
			AP				2					*	5Y 6/1 to 5/2
												*	
			AP				3						5Y 4/2 to 5/2
												*	
			AP				4					*	
			AM				5					*	5Y 4/2 to 4/1 to 5/3
				RM			6						5Y 4/2
							7					*	
		B	AP	CP			CC					*	

Dominant Lithology: Olive gray (5Y 4/2, 5Y 5/2) to gray (5Y 6/1) **Siliceous Nannofossil Marly Chalk and Siliceous Nannofossil Chalk** (Sections 1 to 5), olive gray (5Y 4/2) to dark olive gray (5Y 3/2) **Radiolarian Mudstone** (Section 6).

Minor Lithologies: light gray **Nannofossil Tuff** (hard volcanic ash) to **Nannofossil Tuff and Clayey Nannofossil Tuff**, in Section 1, 107-117 cm, Section 2, 80-98 cm, and Section 5, 35-65 cm. These beds are generally graded-bedded, and show a sharp contact at the bottom, a gradational contact at the top.

Sedimentary structures: extensive bioturbation throughout, generally moderate to intense, often parallel with bedding. Internal deformation (Section 5, 75 cm), siliceous streaks (Section 7, 5-20 cm). Some graded beds.

SMEARS:

1-75 (Siliceous Nannofossil Marly Chalk)

Sand	30%	Clay minerals	<10%
Silt	20%	Volcanic glass	2%
Clay	50%	Nannofossils	49%
		Radiolarians	20%
		Sponge spicules	7%

2-75, 2-90, 4-50, 5-85, 7-25 (Siliceous Nannofossil Chalk)

Clay minerals	< 5%	Radiolarians	10-25%
Volcanic glass	2- 5%	Sponge spicules	2- 5%
Nannofossils	50-73%		

1-110 (Nannofossil Tuff)

Sand	70%	Clay minerals	5%
Silt	10%	Volcanic glass	73%
Clay	20%	Nannofossils	20%
		Sponge spicules	TR

5-40 (Vitric Nannofossil Marly Chalk)

Sand	40%	Clay minerals	<10%
Silt	20%	Opaque minerals	15%
Clay	40%	Volcanic glass	30%
		Nannofossils	49%
		Sponge spicules	1%

6-85, 6-90, 6-95 (Radiolarian Mudstone)

Sand	20%	Quartz, Feldspar	15-20%
Silt	10-20%	Clay minrals	20-45%
Clay	60-70%	Opaque minerals	15-20%
		Volcanic glass	3- 5%
		Nannofossils	1- 2%
		Radiolarians	10-40%
		Sponge spicules	5%

CC (Clayey Vitric Siliceous Nannofossil Marly Chalk)

Sand	25%	Clay minrals	15%
Silt	5%	Volcanic glass	20%
Clay	70%	Nannofossils	32%
		Radiolarians	10%
		Sponge spicules	10%

SITE 445 HOLE CORE 63 CORED INTERVAL: 588.0-597.5 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FORAMS	NANNOS	RADS		SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Upper Eocene	*D. seljaensis* Subzone/*C. oamaruensis* Subzone / *Thyrsocyrtis bromia* (R)			AP			1	0.5				*	5GY 5/1
								1.0				*	5Y 4/2 to 5/2
												*	5GY 5/1
				AP			2					*	5GY 5/2
				AP									
		B		AM			3					*	5GY 4/2 to 5/2
												*	
				AM			4					*	5GY 4/2 to 5/2
		B		AM	AM		CC					*	

Lithology: Section 1, 0-90 cm: olive gray (5Y 4/2 to 5Y 5/2) hard **Clayey Vitric Nannofossil Marly Chalk and Radiolarians Nannofossil Chalk.** Section 1, 90 cm -- Section 4, 63 cm and CC: olive gray (5Y 4/2 to 5Y 5/2) hard **Nannofossil Radiolarite**, with **Clayey Vitric Siliceous Nannofossil Marly Chalk** in Core-Catcher.

Sedimentary structures: frequent parallel laminae, especially where graded-bed occurs. Graded-beds show normal grain size decrease upwards, sharp contact at bottom, gradational contact at top.

SMEARS:

1-135, 2-50, 3-75, 3-85, 4-105 (Nannofossil Radiolarite)

Clay minerals	0- 5%	Radiolarians	40-50%
Volcanic glass	1- 5%	Sponge spicules	5-15%
Nannofossils	18-29%		

1-87 (Radiolarian Nannofossil Chalk)

Clay minerals	5%	Radiolarians	20%
Nannofossils	58%	Sponge spicules	5%

1-30 (Clayey Vitric Nannofossil Marly Chalk)

Sand	25%	Clay minerals	20%
Silt	25%	Voclanic glass	30%
Clay	50%	Nannofossils	39%
		Radiolarians	3%
		Sponge spicules	3%

CC (Clayey Vitric Siliceous Nannofossil Marly Chalk)

Sand	6%	Clay minerals	15%
Silt	40%	Volcanic glass	15%
Clay	90%	Nannofossils	26%
		Foraminifers	5%
		Radiolarians	15%
		Sponge spicules	15%

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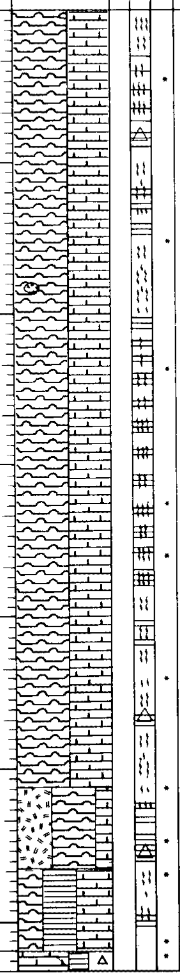
SITE 445 HOLE CORE 64 CORED INTERVAL: 597.5-607.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	COLOR
Upper Eocene	D. saipanensis Subzone / Thyrsocyrtis bromia (R)		AP	CM CM	1	0.5, 1.0		5Y 4/2 to 5/2
			AP	CM	2			5Y 10/2 to 5/2
		B	AP		3			5Y 5/2, 5Y 6/3, 10YR 8/3
			AM	AM	4			10YR 8/3
			AM		5			10YR 6/4
			AM		6			
					7			
		FM	AM	AM	CC			

LITHOLOGIC DESCRIPTION

Dominant Lithology: mottled olive gray (5Y 4/2, 5Y 5/2) to light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/4), very hard no deformed **Nannofossil Radiolarite,** locally **Vitric** (Section 6). Numerous minor color changes throughout, related to silt layers and bioturbation.

Minor Lithology: Radiolarian Nannofossil Chalk at Core-Catcher.

Sedimentary structures: parallel horizontal laminae and moderate to intense bioturbation throughout. Silt/ash layers show normal graded beds. Note one mud-crack in Section 4, 122-126 cm.

SMEARS:

1-70, 2-80, 3-60, 4-40, 4-90, 5-65, 6-105, 7-35 (Nannofossil Radiolarite)

Clay minerals	<5-10%	Diatoms	0- 5%
Volcanic glass	1-10%	Radiolarians	35-60%
Nannofossils	11-28%	Sponge spicules	10-15%

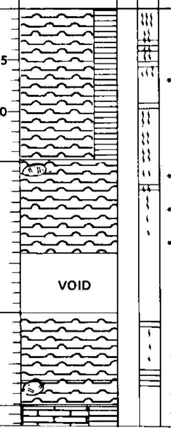
6-20, 6-75 (Vitric Nannofossil Radiolarite)

Sand	4-25%	Clay minerals	0- 5%
Silt	65-76%	Volcanic glass	37-40%
Clay	10-20%	Nannofossils	10-11%
		Diatoms	2- 5%
		Radiolarians	40%
		Sponge spicules	3- 5%

CC (Radiolarian Nannofossil Chalk)

Clay minerals	<5%	Nannofossils	65%
Volcanic glass	3%	Radiolarians	15%

SITE 445 HOLE CORE 65 CORED INTERVAL: 607.0-616.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	COLOR
Upper Eocene	D. saipanensis Subzone (N) / Thyrsocyrtis bromia (R)		CM	AM	1	0.5, 1.0		2.5Y 6/4
			B	AM	2		VOID	
			B	AM	3			5YR 4/4 to 7.5YR 3/2
		B						10YR 5/4-6
		B	RP	AM	CC			7.5YR 4/4

LITHOLOGIC DESCRIPTION

Dominant Lithology: light yellowish brown (2.5Y 6/4) very fine, locally laminated hard sediment, with minor to intense bioturbation – **Radiolarite** (with clay or ash). The color progressively changes downwards as follows:
Section 1 = light yellowish brown (2.5Y 6/4), with lightening in homogeneous areas: light gray (2.5Y 7/2) darkening in bioturbated areas: grayish brown (2.5Y 5/2).
Section 2 = 0.20 cm light brownish gray (2.5Y 6/2), 20-45 cm pale brown (10YR 6/3), 45-70 cm light yellowish brown (10YR 6/4), 70-90 cm brown (7.5Y 5/4).
Section 3 = 5-17 cm brown (7.5Y 5/4) and 11-56 cm reddish yellow (5YR 7/6).
Section 3, 56-67 cm shows alternating reddish brown (5YR 5/3) and very dark gray (5YR 3/1) laminations of radiolarite.

Minor Lithologies: Section 3, 67-90 cm as well as part of Core-Catcher, contain reddish brown (5YR 4/4) to dark brown (7.5YR 3/2) massive and very hard homogeneous **Chert and Siliceous Nannofossil Limestone.**

SMEARS:

2-50, 2-80, 3-50 (Radiolarite)

Clay minerals	< 5%	Radiolarians	69-71%
Volcanic glass	3- 5%	Sponge spicules	10-15%

1-85 (Clayey Radiolarite)

Sand	30%	Clay minerals	10%
Silt	50%	Volcanic glass	9%
Clay	20%	Radiolarians	60%
		Sponge spicules	15%

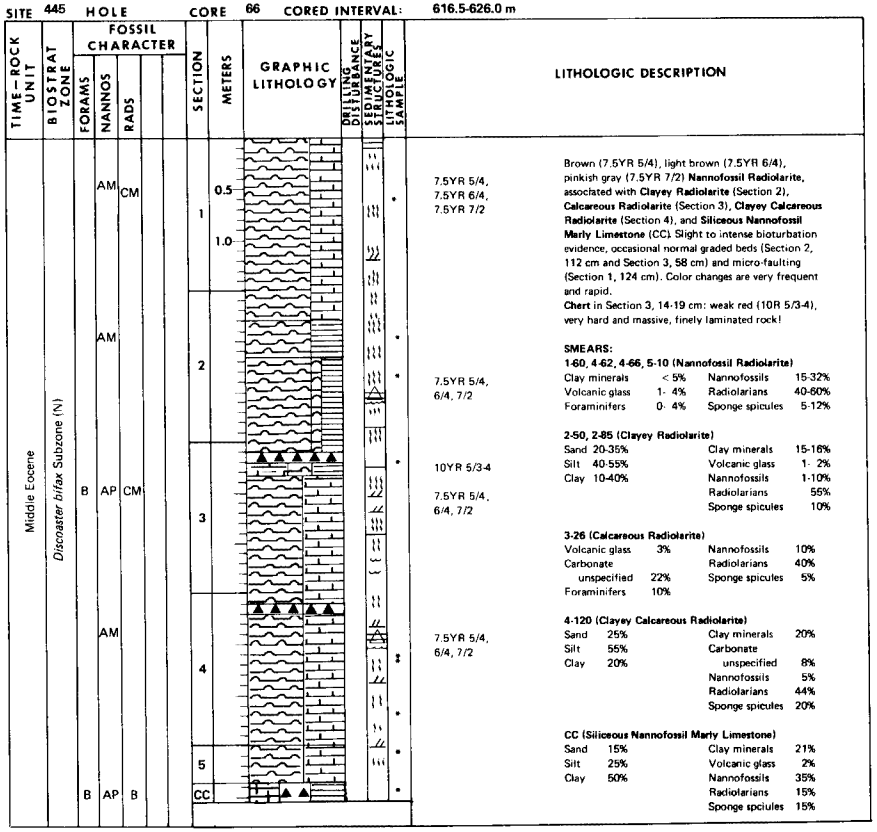
2-15, 3-83 (Vitric Radiolarite)

Sand	50%	Clay minerals	<5- 7%
Silt	40%	Volcanic glass	10-12%
Clay	10%	Radiolarians	60-64%
		Sponge spicules	15-20%

CC (Siliceous Nannofossil Limestone)

Sand	15%	Clay minerals	5%
Silt	25%	Volcanic glass	3%
Clay	60%	Nannofossils	60%
		Radiolarians	10%
		Sponge spicules	15%

SITE 445 HOLE CORE 66 CORED INTERVAL: 616.5-626.0 m



LITHOLOGIC DESCRIPTION

Brown (7.5YR 5/4), light brown (7.5YR 6/4), pinkish gray (7.5YR 7/2) **Nannofossil Radiolarite,** associated with **Clayey Radiolarite** (Section 2), **Calcareous Radiolarite** (Section 3), **Clayey Calcareous Radiolarite** (Section 4), and **Siliceous Nannofossil Marly Limestone** (CC). Slight to intense bioturbation evidence, occasional normal graded beds (Section 2, 112 cm and Section 3, 58 cm) and micro-faulting (Section 1, 124 cm). Color changes are very frequent and rapid.
Chert in Section 3, 14-19 cm: weak red (10R 5/3-4), very hard and massive, finely laminated rock!

SMEARS:

1-60, 4-62, 4-66, 5-10 (Nannofossil Radiolarite)

Clay minerals	< 5%	Nannofossils	15-32%
Volcanic glass	1- 4%	Radiolarians	40-60%
Foraminifers	0- 4%	Sponge spicules	5-12%

2-50, 2-85 (Clayey Radiolarite)

Sand	20-35%	Clay minerals	15-16%
Silt	40-55%	Volcanic glass	1- 2%
Clay	10-40%	Nannofossils	1-10%
		Radiolarians	55%
		Sponge spicules	10%

3-26 (Calcareous Radiolarite)

Volcanic glass	3%	Nannofossils	10%
Carbonate unspecified	22%	Radiolarians	40%
Foraminifers	10%	Sponge spicules	5%

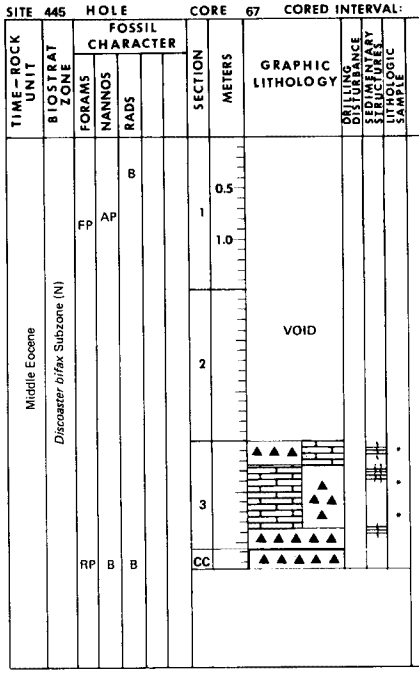
4-120 (Clayey Calcareous Radiolarite)

Sand	25%	Clay minerals	20%
Silt	55%	Carbonate unspecified	8%
Clay	20%	Nannofossils	5%
		Radiolarians	44%
		Sponge spicules	20%

CC (Siliceous Nannofossil Marly Limestone)

Sand	15%	Clay minerals	21%
Silt	25%	Volcanic glass	2%
Clay	50%	Nannofossils	35%
		Radiolarians	15%
		Sponge spicules	15%

SITE 445 HOLE CORE 67 CORED INTERVAL: 626.0-635.5 m



LITHOLOGIC DESCRIPTION

Dominant Lithology: Section 1, 0-84 cm light reddish brown (5YR 6/3) to locally lighter or darker, well-lithified to very hard **Foraminifera-Nannofossil Chert, Radiolarian Foraminifera Limestone and Radiolarian Nannofossil Limestone.** Generally laminated; slight and local bioturbation.
Section 1, 84-104 cm light reddish brown (5YR 6/3), very dark grayish brown (10YR 3/2), olive gray (5Y 5/2), to dark olive gray (5Y 5/3), massive, very hard and homogeneous **Chert.**
Core-Catcher: light brownish gray (2.5Y 6/2) to olive gray (5Y 4/2) **Chert.**

SMEARS:

1-13 (Foraminifera-Nannofossil Chert)

Clay minerals	<5%	Radiolarians	36%
Foraminifers	15%	Sponge spicules	20%
Nannofossils	17%		

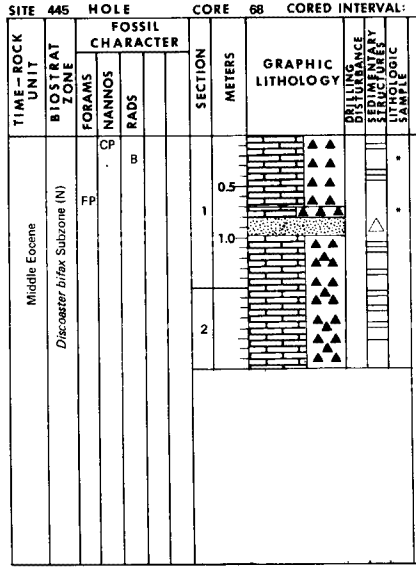
1-45 (Radiolarian Foraminifera Limestone

Sand	0%	Clay minerals	< 10%
Silt	5%	Foraminifers	51%
Clay	95%	Carbonate unspecified	20%
		Radiolarains	15%
		Sponge spicules	1%

1-75 (Radiolarian Nannofossil Limestone)

Sand	10%	Clay minerals	<10%
Silt	25%	Volcanic glass	2%
Clay	65%	Carbonate unspecified	20%
		Nannofossils	40%
		Radiolarians	20%
		Sponge spicules	3%

SITE 445 HOLE CORE 68 CORED INTERVAL: 635.5-645.0 m



LITHOLOGIC DESCRIPTION

Highly colored, massive well-lithified, very hard, finely laminated chert-like rocks probably represented by **Nannofossil Limestone** (Section 1, 25 and 27 cm) and **Radiolarian Nannofossil Marly Limestone** (Section 1, 75 cm).
Main colors of limestone sequence are as follows: Section 1, 0-20 cm yellowish brown (10YR 5/4), 20-25 cm pale red (2.5Y 6/2), 29-45 cm grayish brown (2.5Y 5/2), 45-62 cm olive (5Y 4/3), 95-150 cm chiefly greenish gray (5GY 5/1).
Section 2: same variations, added with dark greenish gray (5GY 4/1).

SMEARS:

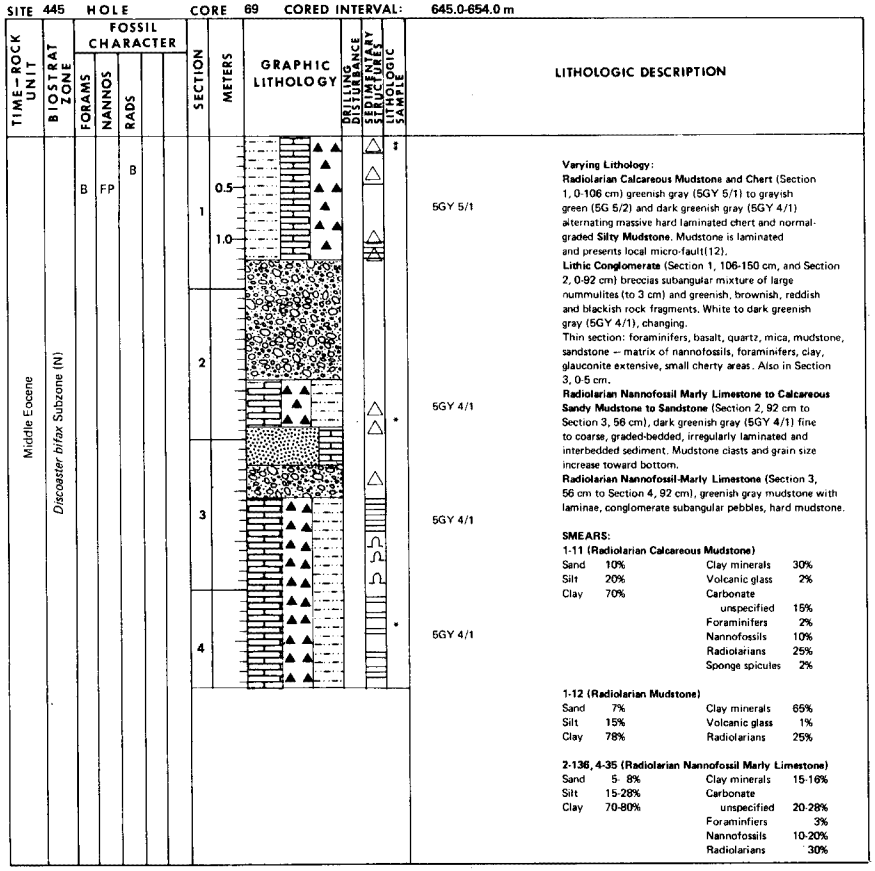
1-25, 1-27 (Nannofossil Limestone)

Quartz, Feldspar	4-10%	Nannofossils	41-72%
Clay minerals	< 10%	Radiolarians	0- 6%
Carbonate unspecified	5-25%		

1-75 (Radiolarian Nannofossil Marly Limestone)

Sand	30%	Quartz, Feldspar	<10%
Silt	50%	Clay minerals	<10%
Clay	20%	Carbonate unspecified	20%
		Foraminifers	5%
		Nannofossils	17%
		Radiolarians	25%

SITE 445 HOLE CORE 69 CORED INTERVAL: 645.0-654.0 m



Varying Lithology:

Radiolarian Calcareous Mudstone and Chert (Section 1, 0-106 cm) greenish gray (5GY 5/1) to grayish green (5G 5/2) and dark greenish gray (5GY 4/1) alternating massive hard laminated chert and normal-graded **Silty Mudstone**. Mudstone is laminated and presents local micro-fault(12).

Lithic Conglomerate (Section 1, 106-150 cm, and Section 2, 0-92 cm) breccias subangular mixture of large nummulites (to 3 cm) and greenish, brownish, reddish and blackish rock fragments. White to dark greenish gray (5GY 4/1), changing.

Thin section: foraminifers, basalt, quartz, mica, mudstone, sandstone -- matrix of nannofossils, foraminifers, clay, glauconite extensive, small cherty areas. Also in Section 3, 0-5 cm.

Radiolarian Nannofossil Marly Limestone to Calcareous Sandy Mudstone to Sandstone (Section 2, 92 cm to Section 3, 56 cm), dark greenish gray (5GY 4/1) fine to coarse, graded-bedded, irregularly laminated and interbedded sediment. Mudstone clasts and grain size increase toward bottom.

Radiolarian Nannofossil-Marly Limestone (Section 3, 56 cm to Section 4, 92 cm), greenish gray mudstone with laminae, conglomerate subangular pebbles, hard mudstone.

SMEARS:

1-11 (Radiolarian Calcareous Mudstone)

Sand	10%	Clay minerals	30%
Silt	20%	Volcanic glass	2%
Clay	70%	Carbonate unspecified	15%
		Foraminifers	2%
		Nannofossils	10%
		Radiolarians	25%
		Sponge spicules	2%

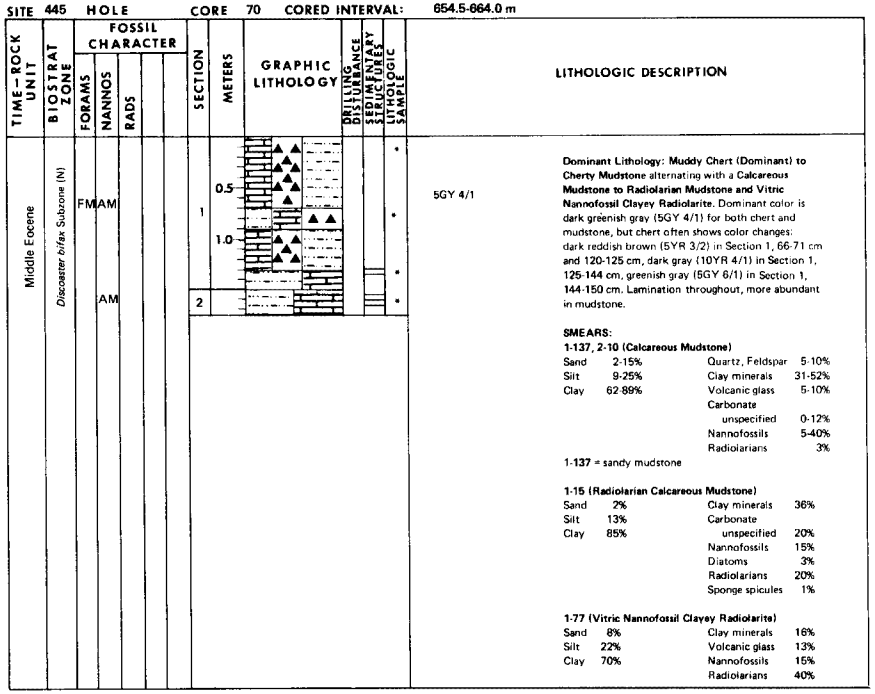
1-12 (Radiolarian Mudstone)

Sand	7%	Clay minerals	65%
Silt	15%	Volcanic glass	1%
Clay	78%	Radiolarians	25%

2-136, 4-35 (Radiolarian Nannofossil Marly Limestone)

Sand	5- 8%	Clay minerals	15-16%
Silt	15-28%	Carbonate unspecified	20-28%
Clay	70-80%	Foraminifers	3%
		Nannofossils	10-20%
		Radiolarians	30%

SITE 445 HOLE CORE 70 CORED INTERVAL: 654.5-664.0 m



Dominant Lithology: Muddy Chert (Dominant) to Cherty Mudstone alternating with a **Calcareous Mudstone to Radiolarian Mudstone and Vitric Nannofossil Clayey Radiolarite**. Dominant color is dark greenish gray (5GY 4/1) for both chert and mudstone, but chert often shows color changes: dark reddish brown (5YR 3/2) in Section 1, 66-71 cm and 120-125 cm, dark gray (10YR 4/1) in Section 1, 125-144 cm, greenish gray (5GY 6/1) in Section 1, 144-150 cm. Lamination throughout, more abundant in mudstone.

SMEARS:

1-137, 2-10 (Calcareous Mudstone)

Sand	2-15%	Quartz, Feldspar	5-10%
Silt	9-25%	Clay minerals	31-52%
Clay	62-89%	Volcanic glass	5-10%
		Carbonate unspecified	0-12%
		Nannofossils	5-40%
		Radiolarians	3%

1-137 = sandy mudstone

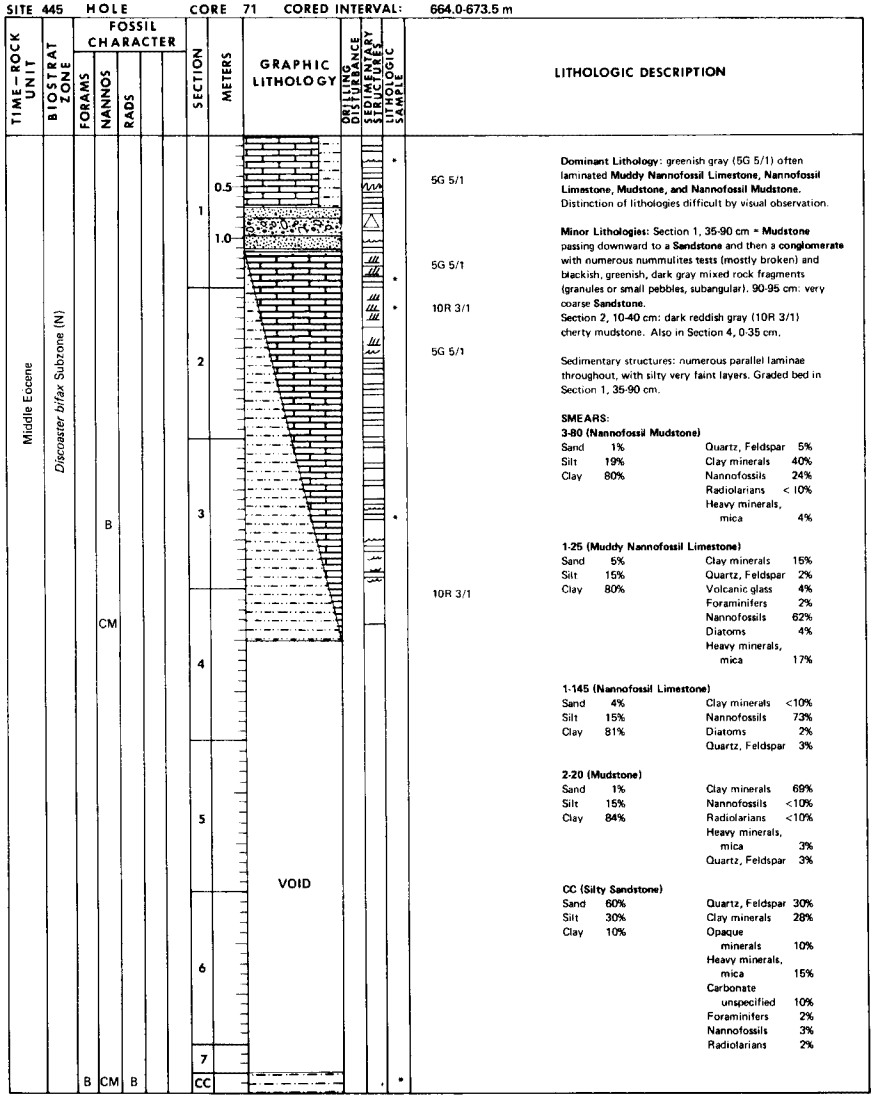
1-15 (Radiolarian Calcareous Mudstone)

Sand	2%	Clay minerals	36%
Silt	13%	Carbonate unspecified	20%
Clay	85%	Nannofossils	15%
		Diatoms	3%
		Radiolarians	20%
		Sponge spicules	1%

1-77 (Vitric Nannofossil Clayey Radiolarite)

Sand	8%	Clay minerals	16%
Silt	22%	Volcanic glass	13%
Clay	70%	Nannofossils	15%
		Radiolarians	40%

SITE 445 HOLE CORE 71 CORED INTERVAL: 664.0-673.5 m



5G 5/1

5G 5/1

10R 3/1

5G 5/1

10R 3/1

Dominant Lithology: greenish gray (5G 5/1) often laminated **Muddy Nannofossil Limestone, Nannofossil Limestone, Mudstone, and Nannofossil Mudstone.** Distinction of lithologies difficult by visual observation.

Minor Lithologies: Section 1, 35-90 cm = **Mudstone** passing downward to a **Sandstone** and then a **conglomerate** with numerous nummulites tests (mostly broken) and blackish, greenish, dark gray mixed rock fragments (granules or small pebbles, subangular). 90-95 cm: very coarse **Sandstone.**
Section 2, 10-40 cm: dark reddish gray (10R 3/1) cherty mudstone. Also in Section 4, 0-35 cm.

Sedimentary structures: numerous parallel laminae throughout, with silty very faint layers. Graded bed in Section 1, 35-90 cm.

SMEARS:

3-80 (Nannofossil Mudstone)

Sand	1%	Quartz, Feldspar	5%
Silt	19%	Clay minerals	40%
Clay	80%	Nannofossils	24%
		Radiolarians	< 10%
		Heavy minerals, mica	4%

1-25 (Muddy Nannofossil Limestone)

Sand	5%	Clay minerals	15%
Silt	15%	Quartz, Feldspar	2%
Clay	80%	Volcanic glass	4%
		Foraminifers	2%
		Nannofossils	62%
		Diatoms	4%
		Heavy minerals, mica	17%

1-145 (Nannofossil Limestone)

Sand	4%	Clay minerals	<10%
Silt	15%	Nannofossils	73%
Clay	81%	Diatoms	2%
		Quartz, Feldspar	3%

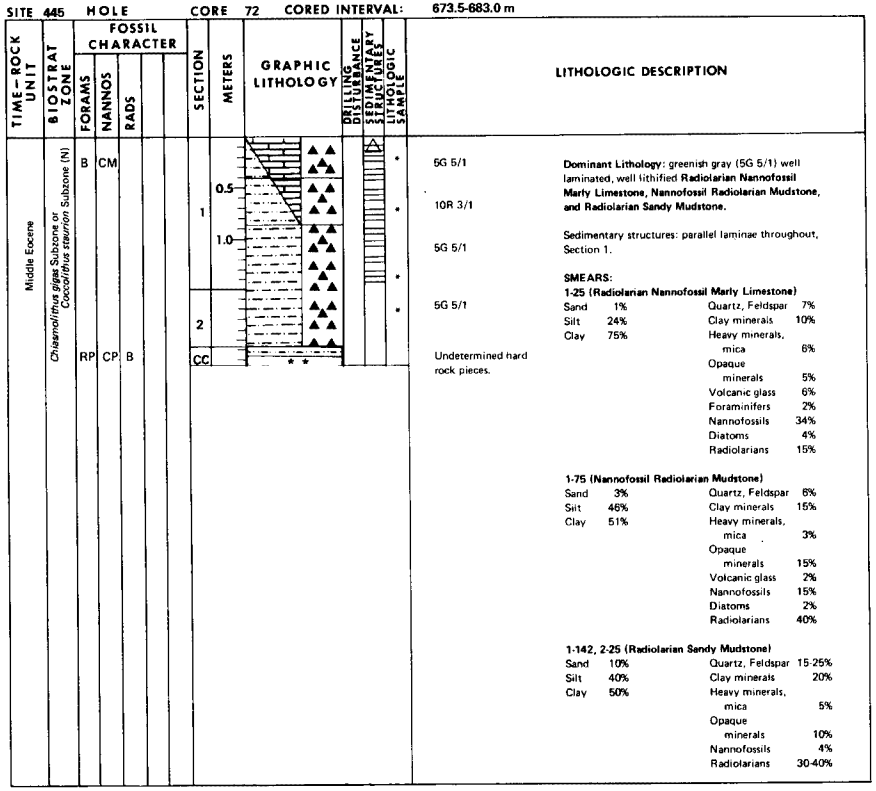
2-20 (Mudstone)

Sand	1%	Clay minerals	69%
Silt	15%	Nannofossils	<10%
Clay	84%	Radiolarians	<10%
		Heavy minerals, mica	3%
		Quartz, Feldspar	3%

CC (Silty Sandstone)

Sand	60%	Quartz, Feldspar	30%
Silt	30%	Clay minerals	28%
Clay	10%	Opaque minerals	10%
		Heavy minerals, mica	15%
		Carbonate unspecified	10%
		Foraminifers	2%
		Nannofossils	3%
		Radiolarians	2%

SITE 445 HOLE CORE 72 CORED INTERVAL: 673.5-683.0 m



5G 5/1

10R 3/1

5G 5/1

5G 5/1

Undetermined hard rock pieces.

Dominant Lithology: greenish gray (5G 5/1) well laminated, well lithified **Radiolarian Nannofossil Marly Limestone, Nannofossil Radiolarian Mudstone, and Radiolarian Sandy Mudstone.**

Sedimentary structures: parallel laminae throughout, Section 1.

SMEARS:

1-25 (Radiolarian Nannofossil Marly Limestone)

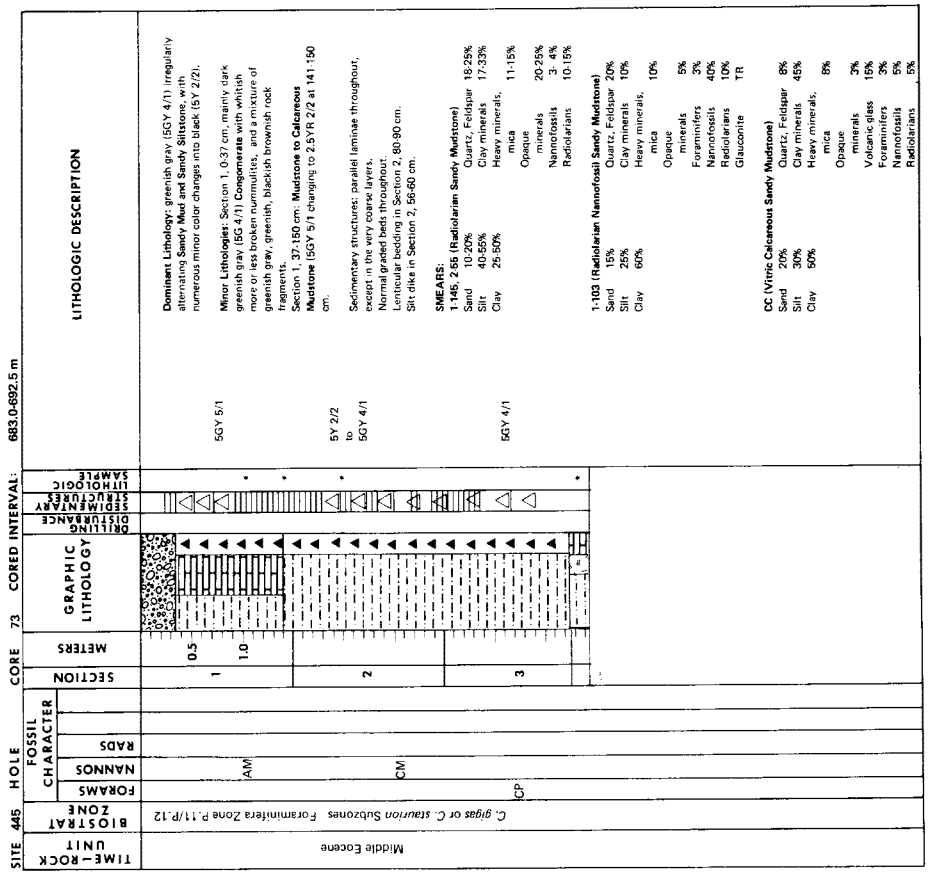
Sand	1%	Quartz, Feldspar	7%
Silt	24%	Clay minerals	10%
Clay	75%	Heavy minerals, mica	6%
		Opaque minerals	5%
		Volcanic glass	6%
		Foraminifers	2%
		Nannofossils	34%
		Diatoms	4%
		Radiolarians	15%

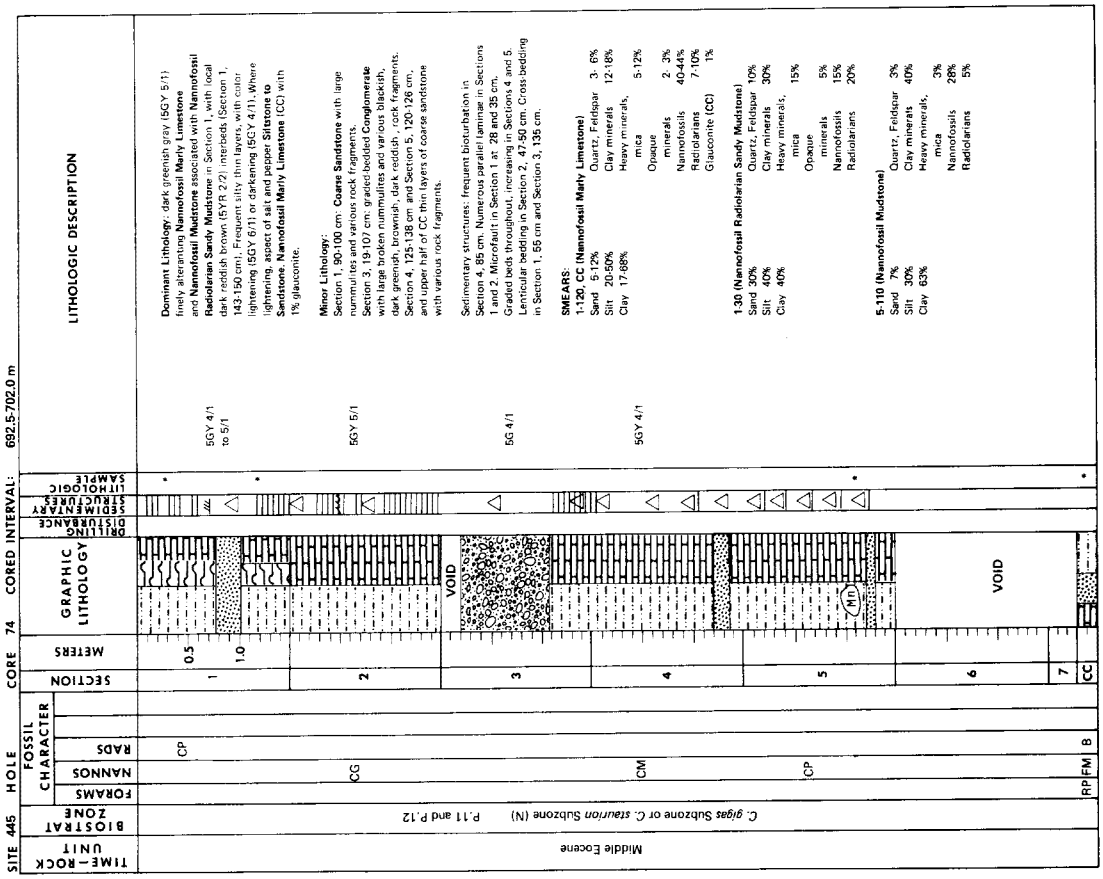
1-75 (Nannofossil Radiolarian Mudstone)

Sand	3%	Quartz, Feldspar	6%
Silt	46%	Clay minerals	15%
Clay	51%	Heavy minerals, mica	3%
		Opaque minerals	15%
		Volcanic glass	2%
		Nannofossils	15%
		Diatoms	2%
		Radiolarians	40%

1-142, 2-25 (Radiolarian Sandy Mudstone)

Sand	10%	Quartz, Feldspar	15-25%
Silt	40%	Clay minerals	20%
Clay	50%	Heavy minerals, mica	5%
		Opaque minerals	10%
		Nannofossils	4%
		Radiolarians	30-40%





SITE 445 HOLE CORE 75 CORED INTERVAL: 702.0-711.5 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Middle Eocene	*G. gigas* Subzone or *C. staurion* Subzone (N) P.11-P.12	CP	CP		1	0.5					5GY 6/1
			AM			1.0					
					2						5GY 4/1
			FM								
					3						
					4		VOID				
					5						N4
					6						N4
					7		VOID				
					CC						

Dominant Lithology: dark greenish gray (5GY 4/1) to gray (N5) **Calcareous Sandy Mudstone, Radiolarian Nannofossil Marly Limestone, and Radiolarian Nannofossil Mudstone** in Sections 1 to 5; **Calcareous Sandstone** in Section 6. Generally color darkening in silty layers and lightening (salt and pepper) in sandy layers (carbonates). Continuous alternating sequence, locally passing to a **Calcareous Mudstone** with silty layers (Section 1, Section 2 top, Section 3, base). **Calcareous Sandy Mudstone** (Section 2, 145 cm) with TR% glauconite.

Sedimentary structures:
Graded beds throughout Sections 1 to 4 with many minor graded sequences within layer sequences 5-10 cm thick, in the calcareous mudstone. Laminations throughout Sections 1 to 4 (silty layers, clay layers). Microfaults, scour features in Section 2 and 3. Minor bioturbation in Sections 1 and 3. Rounded clay clasts, dark greenish gray, in Sections 5 and 6.

SMEARS:

2-145 (Calcareous Sandy Mudstone)

Sand	15%	Quartz, Feldspar	10%
Silt	40%	Clay minerals	36%
Clay	25%	Heavy minerals, mica	9%
		Opaque minerals	10%
		Foraminifers	5%
		Nannofossils	10%
		Radiolarians	5%
		Glauconite	TR

3-133 (Radiolarian Nannofossil Marly Limestone)

Sand	5%	Quartz, Feldspar	5%
Silt	20%	Clay minerals	10%
Clay	75%	Heavy minerals, mica	2%
		Opaque minerals	5%
		Carbonate unspecified	10%
		Nannofossils	44%
		Radiolarians	20%

5-125 (Radiolarian Nannofossil Mudstone)

Sand	5%	Quartz, Feldspar	3%
Silt	15%	Clay minerals	33%
Clay	80%	Heavy minerals, mica	5%
		Opaque minerals	5%
		Volcanic glass	7%
		Nannofossils	20%
		Radiolarians	10%
		Sponge spicules	5%

6-150 (Calcareous Sandstone)

Sand	70%	Quartz, Feldspar	20%
Silt	20%	Clay minerals	2%
Clay	10%	Heavy minerals, mica	10%
		Opaque minerals and lithic fragments	50%
		Carbonate unspecified	7%
		Foraminifers	9%

SITE 445 HOLE CORE 76 CORED INTERVAL: 711.5-721.0 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Middle Eocene	*C. gigas* Subzone or *C. staurion* Subzone (N) P.11-P.12		AP		1	0.5					5GY 4/1
						1.0					
			AP		2						
		AP	AP		3						5G 4/1
			CP		4						5GY 4/1
			CP		5						5GY 4/1
					6		VOID				
					7						
		FP	CP	B	CC						

Dominant Lithology: finely alternating **Nannofossil Mudstone–Nannofossil Sandy Mudstone and Nannofossil Limestone–Nannofossil Marly Limestone;** dominantly dark greenish gray (5GY 4/1), forming fine color band alternation of darker and lighter throughout, large grading upward sequences enclosing smaller sequences. Some **Sand** layers with color lightening (carbonates) = light gray. Nannofossil limestone and nannofossil sandy mudstone with TR-1% glauconite (3-75, 5-75).
Minor Lithologies: Section 1, 0-36 cm and 110-130 cm, coarse gravelly **Sandstone** grading upward into fine **Sandstone/Siltstone,** with foraminifers and grayish green clay clasts. Color dark (N5) salt and pepper.
Section 5, 0-5 cm, **Foraminiferal Lithic Conglomerate,** with both round and angular clasts (nummulites, limestone, sandstone, mudstone, basalt(?), quartz, glauconite).

Sedimentary structure: parallel laminae throughout. Graded beds mainly in Sections 1, 2, 4, and 5 base. Minor bioturbation in Sections 1, 2, 4 and 5. Clay clasts in Section 1, 110-130 cm. Changes in deformation direction in Section 1 ≤ 10° to 5° ≥, Section 2 10° ≥, Section 3 5° ≥ to ≤ 5°, Section 5 ≤ 5° to 5° ≥

SMEARS:

2-75 (Nannofossil Mudstone)

Sand	5%	Quartz, Feldspar	13%	Volcanic glass	2%
Silt	10%	Clay minerals	45%	Carbonate unspecified	10%
Clay	85%	Opaque minerals	5%	Nannofossils	3%
		Heavy minerals, mica	3%		

5-75 (Nannofossil Sandy Mudstone)

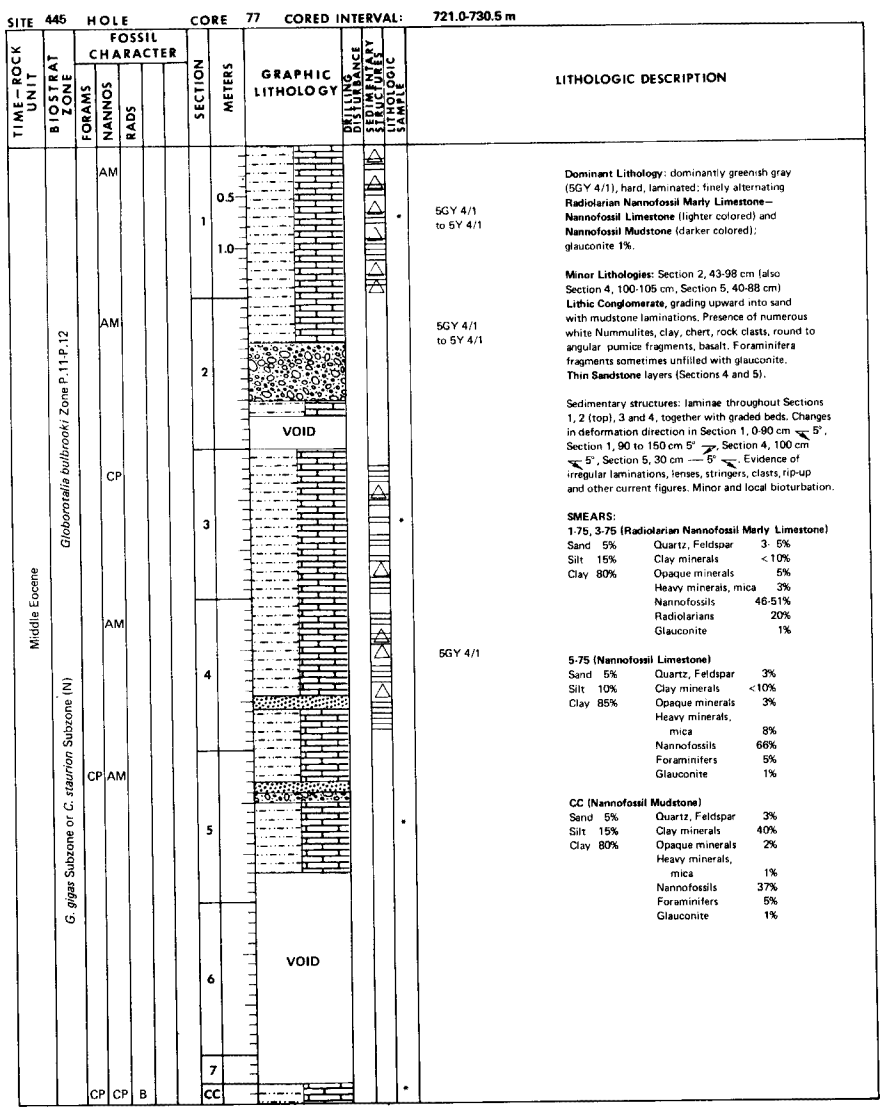
Sand	15%	Quartz, Feldspar	7%	Foraminifers	5%
Silt	15%	Clay minerals	25%	Nannofossils	30%
Clay	70%	Opaque minerals	3%	Radiolarians	10%
		Heavy minerals, mica	13%	Glauconite	1%
		Carbonate unspecified	16%		

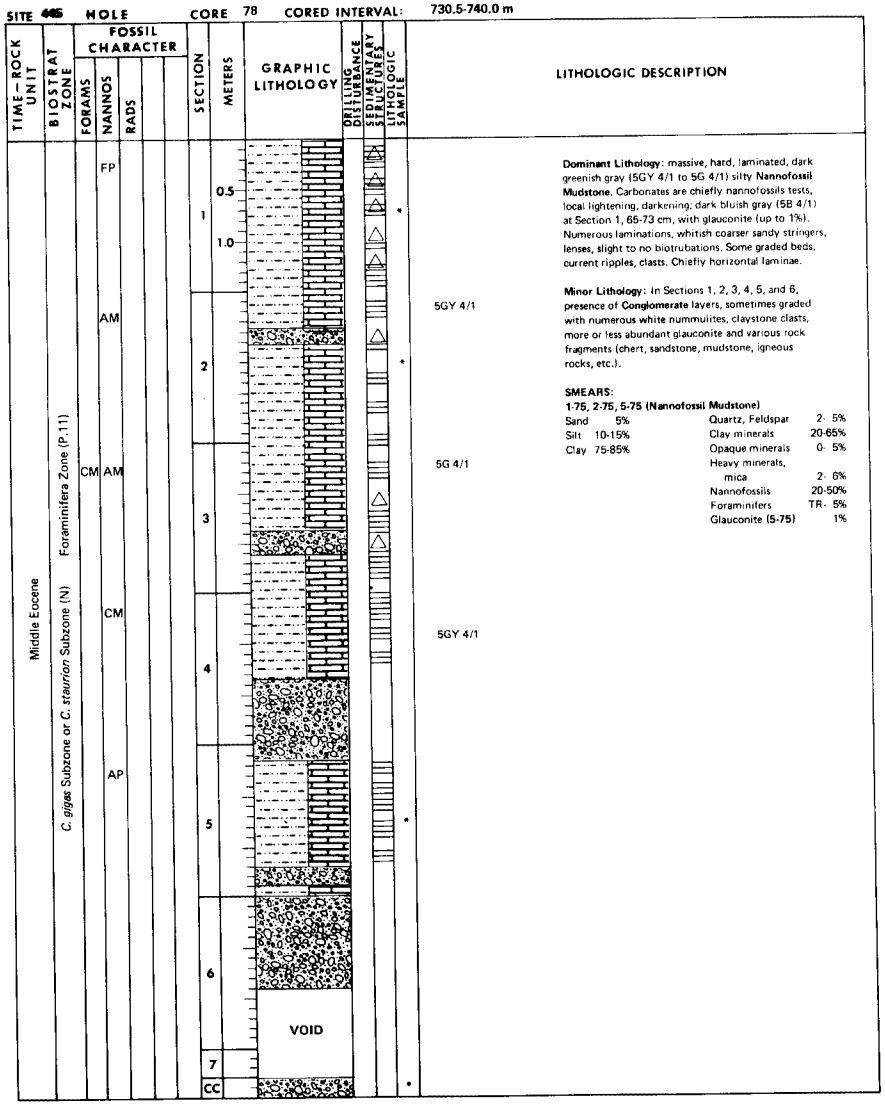
3-75 (Nannofossil Limestone)

Sand	5%	Clay minerals	<10%	Foraminifers	<5%
Silt	15%	Quartz, Feldspar	5%	Nannofossils	61%
Clay	80%	Opaque minerals	5%	Radiolarians	<10%
		Heavy minerals, mica	4%	Glauconite	TR

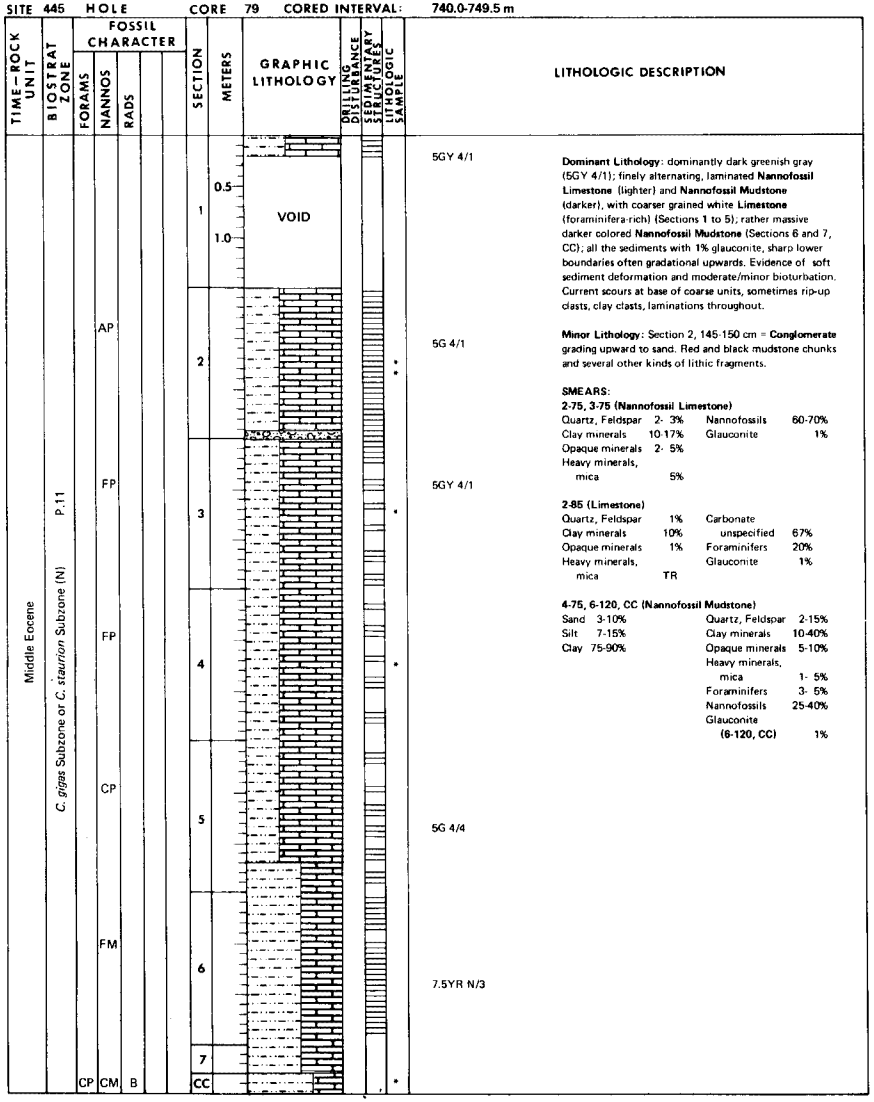
CC (Nannofossil Marly Limestone)

Sand	10%	Quartz, Feldspar	5%
Silt	30%	Clay minerals	<10%
Clay	60%	Opaque minerals	1%
		Heavy minerals, mica	10%
		Nannofossils	43%
		Radiolarians	7%


SITE 445 HOLE CORE 77 CORED INTERVAL: 721.0-730.5 m
TIME-ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Middle Eocene
Globorotalia bulbrooki Zone P.11-P.12
G. gigas Subzone or C. staurion Subzone (N)
AM
AM
CP
AM
CP AM
CP CP B
VOID
VOID
5GY 4/1 to 5Y 4/1
5GY 4/1 to 5Y 4/1
5GY 4/1
Dominant Lithology: dominantly greenish gray (5GY 4/1), hard, laminated; finely alternating Radiolarian Nannofossil Marly Limestone–Nannofossil Limestone (lighter colored) and Nannofossil Mudstone (darker colored); glauconite 1%.
Minor Lithologies: Section 2, 43-98 cm (also Section 4, 100-105 cm, Section 5, 40-88 cm) Lithic Conglomerate, grading upward into sand with mudstone laminations. Presence of numerous white Nummulites, clay, chert, rock clasts, round to angular pumice fragments, basalt. Foraminifera fragments sometimes unfilled with glauconite. Thin Sandstone layers (Sections 4 and 5).
Sedimentary structures: laminae throughout Sections 1, 2 (top), 3 and 4, together with graded beds. Changes in deformation direction in Section 1, 0-90 cm 5°, Section 1, 90 to 150 cm 5°, Section 4, 100 cm 5°, Section 5, 30 cm 5°. Evidence of irregular laminations, lenses, stringers, clasts, rip-up and other current figures. Minor and local bioturbation.
SMEARS:
1-75, 3-75 (Radiolarian Nannofossil Marly Limestone)
Sand 5% Silt 15% Clay 80%
Quartz, Feldspar 3- 5%
Clay minerals <10%
Opaque minerals 5%
Heavy minerals, mica 3%
Nannofossils 46-51%
Radiolarians 20%
Glauconite 1%
5-75 (Nannofossil Limestone)
Sand 5% Silt 10% Clay 85%
Quartz, Feldspar 3%
Clay minerals <10%
Opaque minerals 3%
Heavy minerals, mica 8%
Nannofossils 66%
Foraminifers 5%
Glauconite 1%
CC (Nannofossil Mudstone)
Sand 5% Silt 15% Clay 80%
Quartz, Feldspar 3%
Clay minerals 40%
Opaque minerals 2%
Heavy minerals, mica 1%
Nannofossils 37%
Foraminifers 5%
Glauconite 1%


SITE 445 HOLE CORE 78 CORED INTERVAL: 730.5-740.0 m
TIME-ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Middle Eocene
Foraminifera Zone (P.11)
C. gigas Subzone or C. staurion Subzone (N)
FP
AM
CM AM
CM
AP
VOID
5GY 4/1
5G 4/1
5GY 4/1
Dominant Lithology: massive, hard, laminated, dark greenish gray (5GY 4/1 to 5G 4/1) silty Nannofossil Mudstone. Carbonates are chiefly nannofossils tests, local lightening, darkening; dark bluish gray (5B 4/1) at Section 1, 65-73 cm, with glauconite (up to 1%). Numerous laminations, whitish coarser sandy stringers, lenses, slight to no biotrubations. Some graded beds, current ripples, clasts. Chiefly horizontal laminae.
Minor Lithology: In Sections 1, 2, 3, 4, 5, and 6, presence of Conglomerate lavers, sometimes graded with numerous white nummulites, claystone clasts, more or less abundant glauconite and various rock fragments (chert, sandstone, mudstone, igneous rocks, etc.).
SMEARS:
1-75, 2-75, 5-75 (Nannofossil Mudstone)
Sand 5% Silt 10-15% Clay 75-85%
Quartz, Feldspar 2- 5%
Clay minerals 20-65%
Opaque minerals 0- 5%
Heavy minerals, mica 2- 6%
Nannofossils 20-50%
Foraminifers TR- 5%
Glauconite (5-75) 1%

SITE 445 HOLE CORE 79 CORED INTERVAL: 740.0-749.5 m



5GY 4/1

5G 4/1

5GY 4/1

5G 4/4

7.5YR N/3

Dominant Lithology: dominantly dark greenish gray (5GY 4/1); finely alternating, laminated **Nannofossil Limestone** (lighter) and **Nannofossil Mudstone** (darker), with coarser grained white **Limestone** (foraminifera-rich) (Sections 1 to 5); rather massive darker colored **Nannofossil Mudstone** (Sections 6 and 7, CC); all the sediments with 1% glauconite, sharp lower boundaries often gradational upwards. Evidence of soft sediment deformation and moderate/minor bioturbation. Current scours at base of coarse units, sometimes rip-up clasts, clay clasts, laminations throughout.

Minor Lithology: Section 2, 145-150 cm = **Conglomerate** grading upward to sand. Red and black mudstone chunks and several other kinds of lithic fragments.

SMEARS:

2-75, 3-75 (Nannofossil Limestone)

Quartz, Feldspar	2- 3%	Nannofossils	60-70%
Clay minerals	10-17%	Glauconite	1%
Opaque minerals	2- 5%		
Heavy minerals, mica	5%		

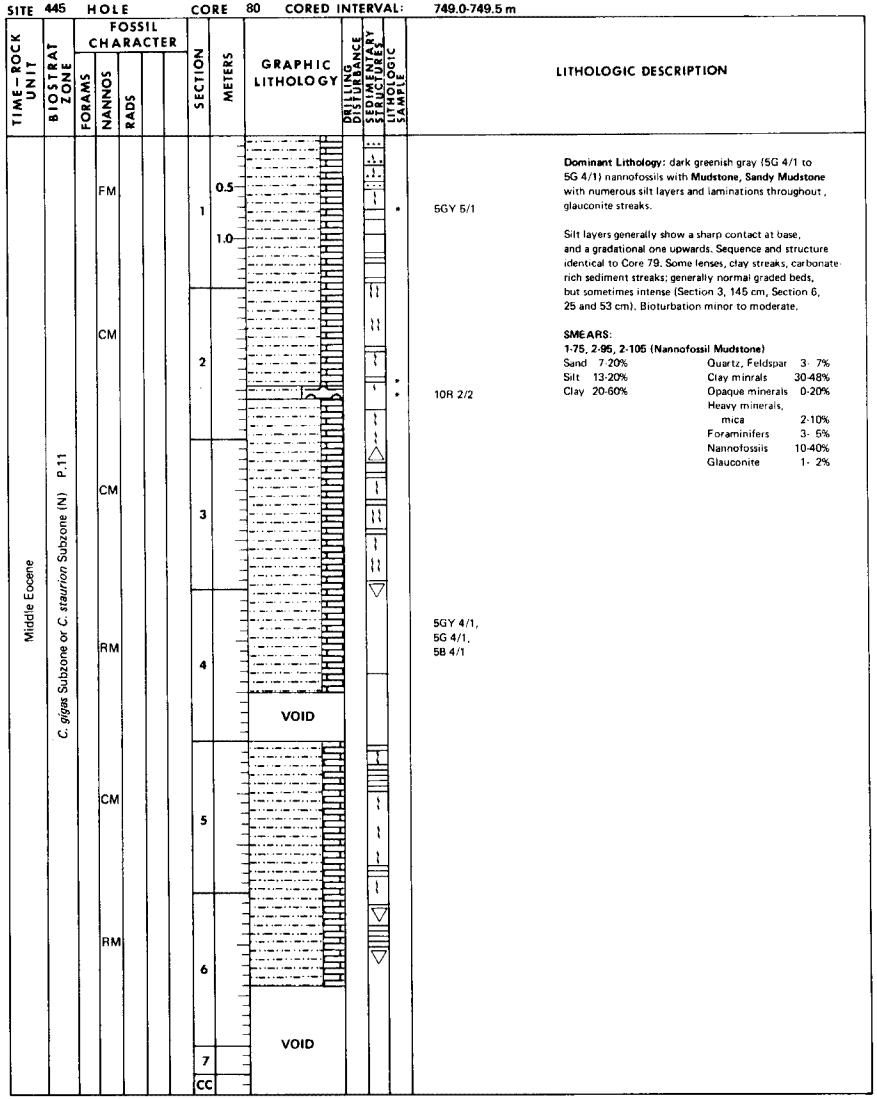
2-85 (Limestone)

Quartz, Feldspar	1%	Carbonate unspecified	67%
Clay minerals	10%	Foraminifers	20%
Opaque minerals	1%	Glauconite	1%
Heavy minerals, mica	TR		

4-75, 6-120, CC (Nannofossil Mudstone)

Sand	3-10%	Quartz, Feldspar	2-15%
Silt	7-15%	Clay minerals	10-40%
Clay	75-90%	Opaque minerals	5-10%
		Heavy minerals, mica	1- 5%
		Foraminifers	3- 5%
		Nannofossils	25-40%
		Glauconite (6-120, CC)	1%

SITE 445 HOLE CORE 80 CORED INTERVAL: 749.0-749.5 m



5GY 5/1

10R 2/2

5GY 4/1,
5G 4/1,
5B 4/1

Dominant Lithology: dark greenish gray (5G 4/1 to 5G 4/1) nannofossils with **Mudstone, Sandy Mudstone** with numerous silt layers and laminations throughout, glauconite streaks.

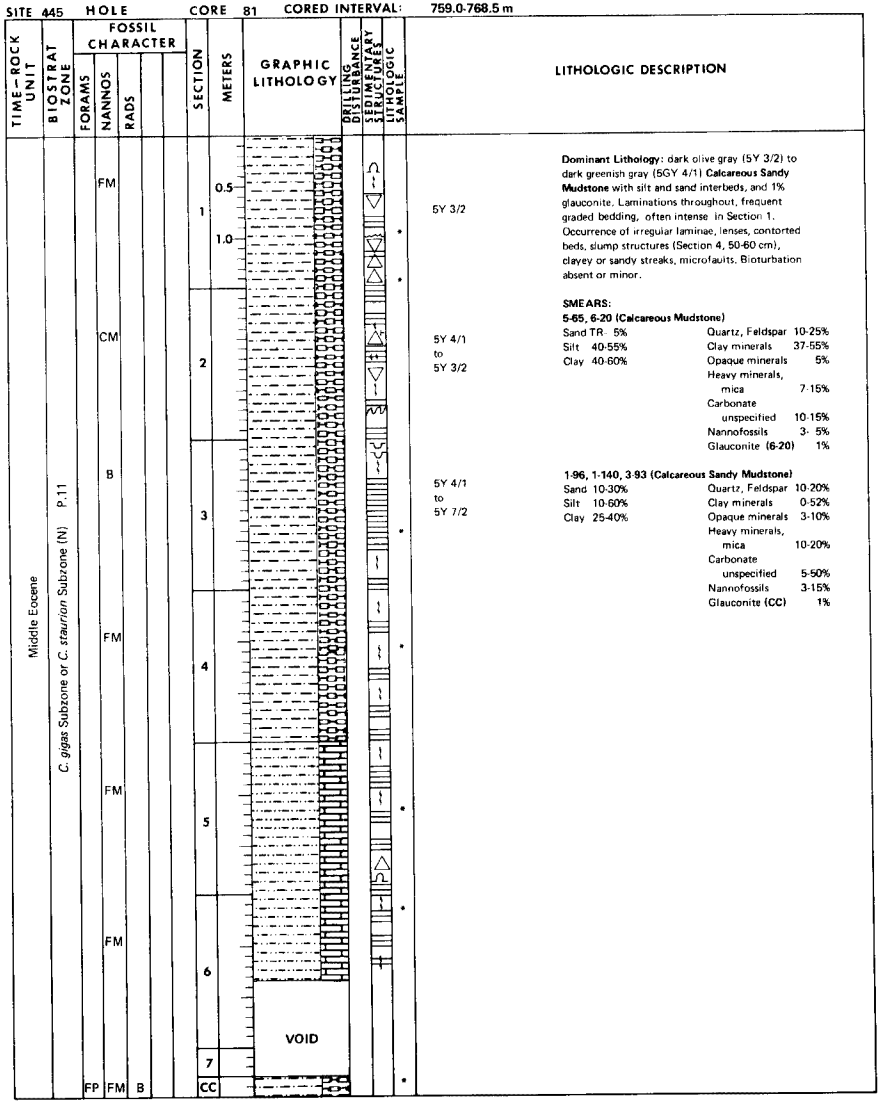
Silt layers generally show a sharp contact at base, and a gradational one upwards. Sequence and structure identical to Core 79. Some lenses, clay streaks, carbonate-rich sediment streaks; generally normal graded beds, but sometimes intense (Section 3, 145 cm, Section 6, 25 and 53 cm). Bioturbation minor to moderate.

SMEARS:

1-75, 2-95, 2-105 (Nannofossil Mudstone)

Sand	7-20%	Quartz, Feldspar	3- 7%
Silt	13-20%	Clay minrals	30-48%
Clay	20-60%	Opaque minerals	0-20%
		Heavy minerals, mica	2-10%
		Foraminifers	3- 5%
		Nannofossils	10-40%
		Glauconite	1- 2%

SITE 445 HOLE CORE 81 CORED INTERVAL: 759.0-768.5 m



Dominant Lithology: dark olive gray (5Y 3/2) to dark greenish gray (5GY 4/1) **Calcareous Sandy Mudstone** with silt and sand interbeds, and 1% glauconite. Laminations throughout, frequent graded bedding, often intense in Section 1. Occurrence of irregular laminae, lenses, contorted beds, slump structures (Section 4, 50-60 cm), clayey or sandy streaks, microfaults. Bioturbation absent or minor.

SMEARS:

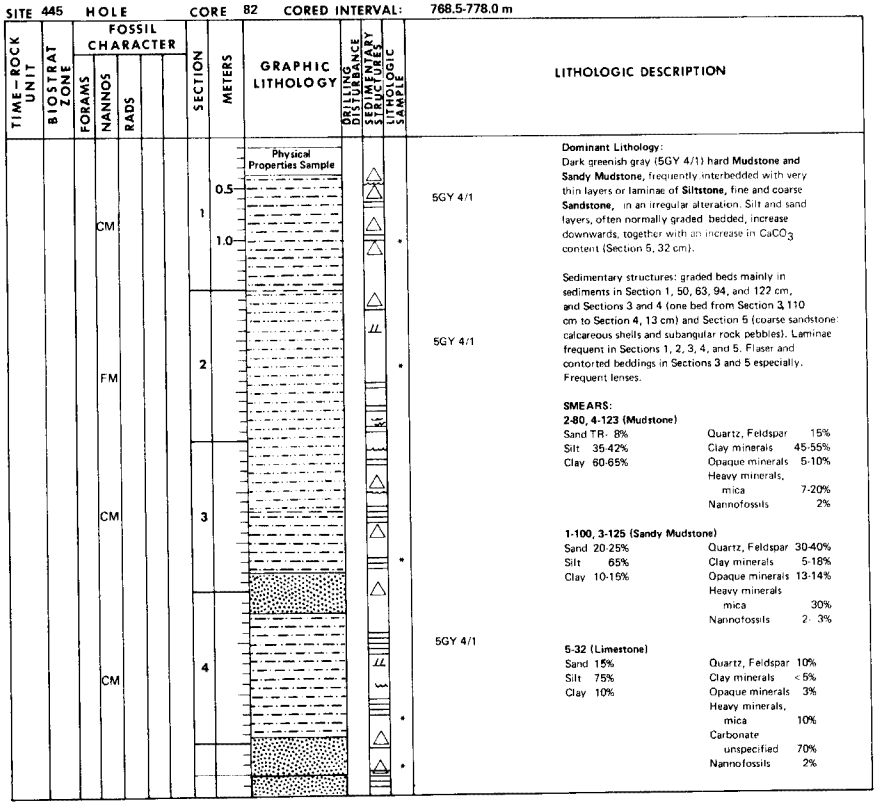
5-65, 6-20 (Calcareous Mudstone)

Sand	TR- 5%	Quartz, Feldspar	10-25%
Silt	40-55%	Clay minerals	37-55%
Clay	40-60%	Opaque minerals	5%
		Heavy minerals, mica	7-15%
		Carbonate unspecified	10-15%
		Nannofossils	3- 5%
		Glauconite (6-20)	1%

1-96, 1-140, 3-93 (Calcareous Sandy Mudstone)

Sand	10-30%	Quartz, Feldspar	10-20%
Silt	10-60%	Clay minerals	0-52%
Clay	25-40%	Opaque minerals	3-10%
		Heavy minerals, mica	10-20%
		Carbonate unspecified	5-50%
		Nannofossils	3-15%
		Glauconite (CC)	1%

SITE 445 HOLE CORE 82 CORED INTERVAL: 768.5-778.0 m



Dominant Lithology:
Dark greenish gray (5GY 4/1) hard **Mudstone and Sandy Mudstone,** frequently interbedded with very thin layers or laminae of **Siltstone,** fine and coarse **Sandstone,** in an irregular alteration. Silt and sand layers, often normally graded bedded, increase downwards, together with an increase in $CaCO_3$ content (Section 5, 32 cm).

Sedimentary structures: graded beds mainly in sediments in Section 1, 50, 63, 94, and 122 cm, and Sections 3 and 4 (one bed from Section 3, 110 cm to Section 4, 13 cm) and Section 5 (coarse sandstone: calcareous shells and subangular rock pebbles). Laminae frequent in Sections 1, 2, 3, 4, and 5. Flaser and contorted beddings in Sections 3 and 5 especially. Frequent lenses.

SMEARS:

2-80, 4-123 (Mudstone)

Sand	TR- 8%	Quartz, Feldspar	15%
Silt	35-42%	Clay minerals	45-55%
Clay	60-65%	Opaque minerals	5-10%
		Heavy minerals, mica	7-20%
		Nannofossils	2%

1-100, 3-125 (Sandy Mudstone)

Sand	20-25%	Quartz, Feldspar	30-40%
Silt	65%	Clay minerals	5-18%
Clay	10-15%	Opaque minerals	13-14%
		Heavy minerals mica	30%
		Nannofossils	2- 3%

5-32 (Limestone)

Sand	15%	Quartz, Feldspar	10%
Silt	75%	Clay minerals	< 5%
Clay	10%	Opaque minerals	3%
		Heavy minerals, mica	10%
		Carbonate unspecified	70%
		Nannofossils	2%

MGG 1505 5028

SITE 445 HOLE CORE 83 CORED INTERVAL: 778.0-787.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION
Middle Eocene	C. gigas Subzone or C. staurion Subzone (N) P.11		FM		1
			CM		2
			CM		3
			AP		4
			FM		5

Colors: 5GY 4/1 (Section 1); 5GY 4/1 (Section 3)

LITHOLOGIC DESCRIPTION

Dominant Lithology: mainly dark greenish gray (5GY 4/1), hard **Sandy Mudstone, Mudstone, and Calcareous Sandy Mudstone,** interbedded with many sandy thin layers and laminations. Graded beds occur at some intervals, and micro-convolutions and microfaults frequently occur throughout laminated mudstone. Graded conglomerate and coarse sandstone interbeds: at Section 3, 140 cm to Section4, 52 cm, Section 5 0-12 cm, and Section 5, 38-57 cm, with numerous small fragments of calcareous fossil shells and subangular to subrounded pebbles.

SMEARS:

3-75, 4-63 (Calcareous Sandy Mudstone)

Sand	15-25%	Quartz, Feldspar	17-20%
Silt	45-50%	Clay minerals	29-36%
Clay	25-40%	Opaques minerals	25%
		Heavy minerals, mica	16-17%
		Carbonate unspecified	15-33%
		Nannofossils	3- 5%

1-75 (Sandy Mudstone)

Sand	25%	Quartz, Feldspar	20%
Silt	40%	Clay minerals	44%
Clay	35%	Opaque minerals	10%
		Heavy minerals, mica	18%
		Carbonate unspecified	5%
		Nannofossils	3%

5-17, CC (Mudstone)

Sand	7-10%	Quartz, Feldspar	10-12%
Silt	25-30%	Clay minerals	38-62%
Clay	60-68%	Opaque minerals	6-10%
		Heavy minerals, mica	14%
		Nannofossils	TR- 5%

SITE 445 HOLE CORE 84 CORED INTERVAL: 787.5-797.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION
Middle Eocene	C. gigas Subzone or C. staurion Subzone (N) P.11		R		1
			FP		2
		RP	R		3
					4
					5
					6
					7
		FP	B	B	CC

VOID (Sections 4–7)

Colors: 5GY 4/1 (Section 1); 5G 4/1, N4 (Section 2); 5GY 4/1 (Section 3)

LITHOLOGIC DESCRIPTION

Dominant Lithologies:

Section 1 – **Sandy Mudstone,** with fine laminations, lenses, patches, CO_3 streaks.

Section 2 – **Silty Mudstones, Siltstones, Sandstone, Mudstones;** white calcareous streaks; coarse beds without laminations.

Section 3 – graded **Sandstones Breccias** to 98 cm; **Mudstones, Silty Mudstones** at 98-150 cm; fragments = lithics up to 5 cm, including igneous, large foraminifers. Below 98 cm = alteration of fine **Mudstone/Silty Mudstone** without laminations.

SMEARS:

1-71 (Sandy Mudstone)

Sand	20%	Quartz, Feldspar	10%
Silt	40%	Mica	18%
Clay	40%	Heavy minerals	4%
		Clay minerals	43%
		Volcanic glass	8%
		Opaque minerals	10%
		Carbonate unspecified	5%
		Nannofossils	2%

2-85 (Mudstone)

Sand	5%	Quartz, Feldspar	15%
Silt	25%	Mica	8%
Clay	70%	Heavy minerals	2%
		Clay minerals	50%
		Opaque minerals	10%
		Volcanic glass	8%
		Carbonate unspecified	4%
		Nannofossils	3%

3-119 (Silty Mud)

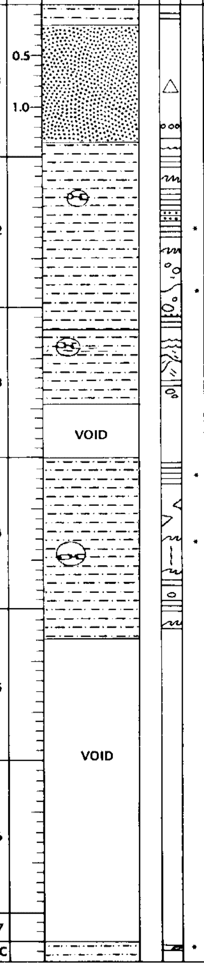
Quartz, Feldspar 19%
Clay minrals 45%

CC (Silty Sandstone)

Sand 75% Lithics,Opaques 70%

SITE 445 HOLE CORE 85 CORED INTERVAL: 797.0-806.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION
Middle Eocene	C. gigas Subzone or C. staurion Subzone (N) P.11	FM	FM		1
			FM		2
			FP		3
			FP		4
					5
					6
					7
		FP	FP	B	CC



Colors: 5GY 4/1; 5GY 4/1; 5Y 4/1; 5GY 4/1, 5Y 4/1; 5GY 4/1; 5GY 4/1; 5GY 4/1

LITHOLOGIC DESCRIPTION

Dominant Lithologies:
Mudstone and Sandy Mudstone.
Section 1 = fine, alternating **Sandstone and Siltstone.**

Section 2 = irregular alternations of **Mudstone, Siltstone.** Clay patches in silty mdudy matrix 100-115 cm, 130-150 cm.

Section 3 = alternation of **Silty Mudstone** and soft fine **Claystone**, with laminations irregular at 0-22 cm. 22-98 cm: alternating **Mudstone and Siltstone** without laminations. Lenticular soft-sediment deformation.

Minor Lithologies:
Sandstone
Section 1, 14-135 cm = irregular graded bed; very coarse sandstone to sandstone, composed of rock fragments – igneous and sedimentary – and pelecypod fragments.

SMEARS:

2-75 (Calcareous Sandy Mudstone)

Sand	20%	Quartz, Feldspar	10%
Silt	40%	Heavy minerals	3%
Clay	40%	Clay minerals	38%
		Rock fragments	25%
		Carbonate unspecified	18%
		Sponge spicules	1%

2-138 (Mudstone)

Sand	8%	Quartz, Feldspar	25%
Silt	35%	Heavy minerals	5%
Clay	63%	Clay minerals	42%
		Rock fragments	8%
		Volcanic glass	8%
		Carbonate unspecified	4%
		Zeolites	3%

4-20 (Mudstone)

Sand	5%	Quartz, Feldspar	15%
Silt	20%	Heavy minerals	11%
Clay	75%	Clay minerals	62%
		Rock fragments	8%
		Volcanic glass	2%
		Carbonate unspecified	2%

4-89 (Calcareous Sandy Mudstone)

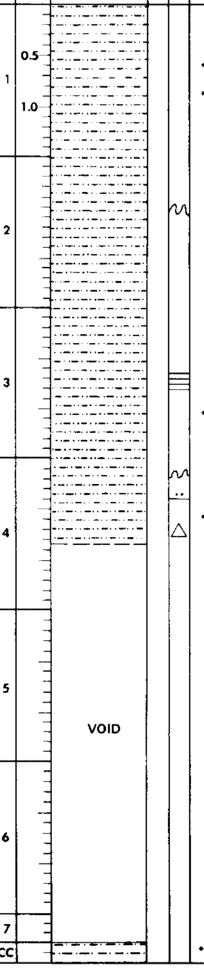
Sand	40%	Quartz, Feldspar	15%
Silt	40%	Heavy minerals	12%
Clay	20%	Clay minerals	15%
		Rock fragments	29%
		Volcanic glass	TR
		Carbonate unspecified	29%

CC (Silty Mudstone)

Sand	15%	Quartz, Feldspar	15%
Silt	40%	Heavy minerals	10%
Clay	45%	Clay minerals	48%
		Rock fragments	20%
		Volcanic glass	1%
		Carbonate unspecified	6%

SITE 445 HOLE CORE 86 CORED INTERVAL: 806.5-816.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FORAMS	NANNOS	RADS	SECTION
Middle Eocene	C. gigas Subzone or C. staurion Subzone (N) P.11		CP		1
			FM		2
			FP		3
			FP		4
					5
					6
					7
		CP	CM	B	CC



Colors: 5GY 4/1; 5GY 4/1; 5GY 4/1 to 5Y 5/1; 5GY 4/1

LITHOLOGIC DESCRIPTION

Dominant Lithologies:
Section 1 = alternating **Mudstone and Muddy Siltstone**; lighter carbonate streaks.

Section 2 = **Silty Mudstone**, with few silt layers.

Section 3 = as per Section 2, some laminations; **Mudstone** with nannofossils.

Section 4 = **Muddy Siltstone, Silty Mudstone, Sandy Mudstone**, graded beds, convolute beds, laminae lenses.

SMEARS:

1-90 (Mudstone with Carbonate)

Sand	8%	Quartz, Feldspar	7%
Silt	25%	Mica	5%
Clay	67%	Heavy minerals	2%
		Clay minerals	67%
		Opaque minerals	6%
		Volcanic glass	1%
		Carbonate unspecified	5%
		Foraminifers	TR
		Nannofossils	7%

1-60 (Sandy Clayey Mudstone)

Sand	20%	Quartz, Feldspar	15%
Silt	55%	Opaques, Lithics	28%
Clay	25%		

3-109 (Mudstone with Nannofossils)

Sand	3%	Quartz, Feldspar	25%
Silt	27%	Clay minerals	57%
Clay	70%	Nannofossils	7%

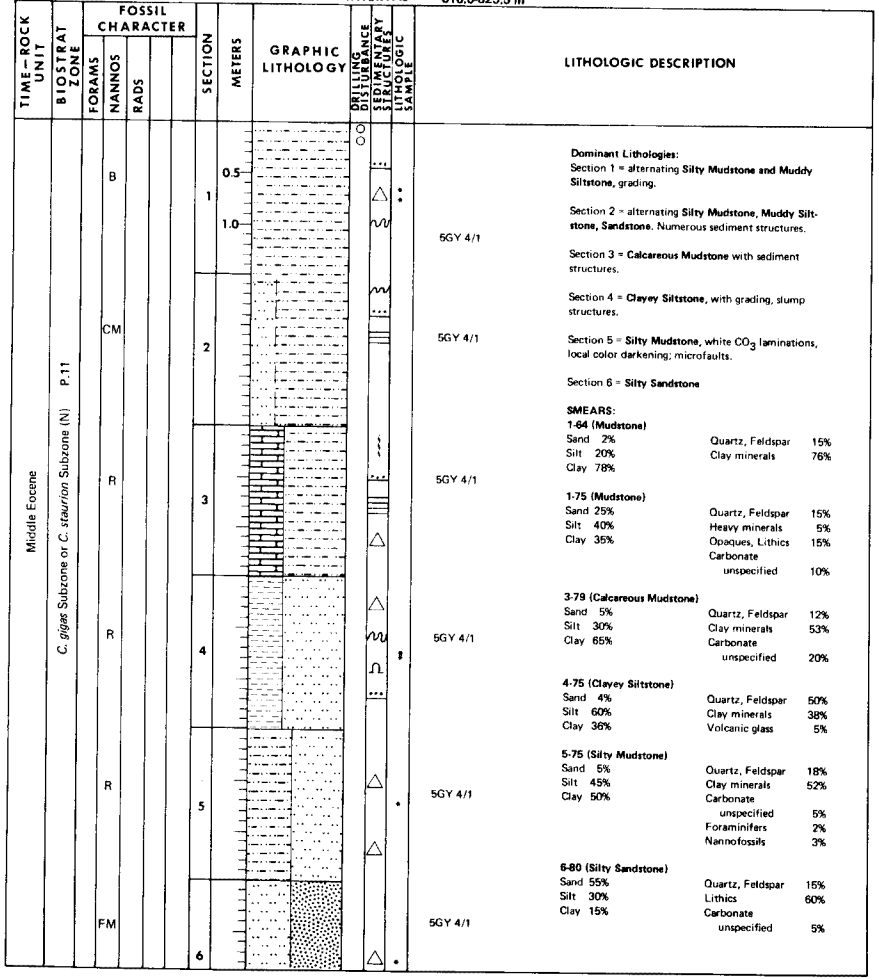
4-60 (Sandy Mudstone)

Sand	20%	Quartz, Feldspar	15%
Silt	30%	Clay minerals	57%
Clay	50%	Heavy minerals	10%

CC (Silty Sandstone)

Sand	70%	Quartz, Feldspar	13%
Silt	20%	Opaques, Lithics	65%
Clay	10%	Clay minerals	5%
		Carbonate unspecified	5%

SITE 445 HOLE CORE 87 CORED INTERVAL: 816.0-825.5 m



Dominant Lithologies:
Section 1 = alternating **Silty Mudstone and Muddy Siltstone,** grading.

Section 2 = alternating **Silty Mudstone, Muddy Siltstone, Sandstone.** Numerous sediment structures.

Section 3 = **Calcareous Mudstone** with sediment structures.

Section 4 = **Clayey Siltstone,** with grading, slump structures.

Section 5 = **Silty Mudstone,** white CO_3 laminations, local color darkening; microfaults.

Section 6 = **Silty Sandstone**

SMEARS:

1-64 (Mudstone)

Sand	2%	Quartz, Feldspar	15%
Silt	20%	Clay minerals	76%
Clay	78%		

1-75 (Mudstone)

Sand	25%	Quartz, Feldspar	15%
Silt	40%	Heavy minerals	5%
Clay	35%	Opaques, Lithics	15%
		Carbonate unspecified	10%

3-79 (Calcareous Mudstone)

Sand	5%	Quartz, Feldspar	12%
Silt	30%	Clay minerals	53%
Clay	65%	Carbonate unspecified	20%

4-75 (Clayey Siltstone)

Sand	4%	Quartz, Feldspar	50%
Silt	60%	Clay minerals	38%
Clay	36%	Volcanic glass	5%

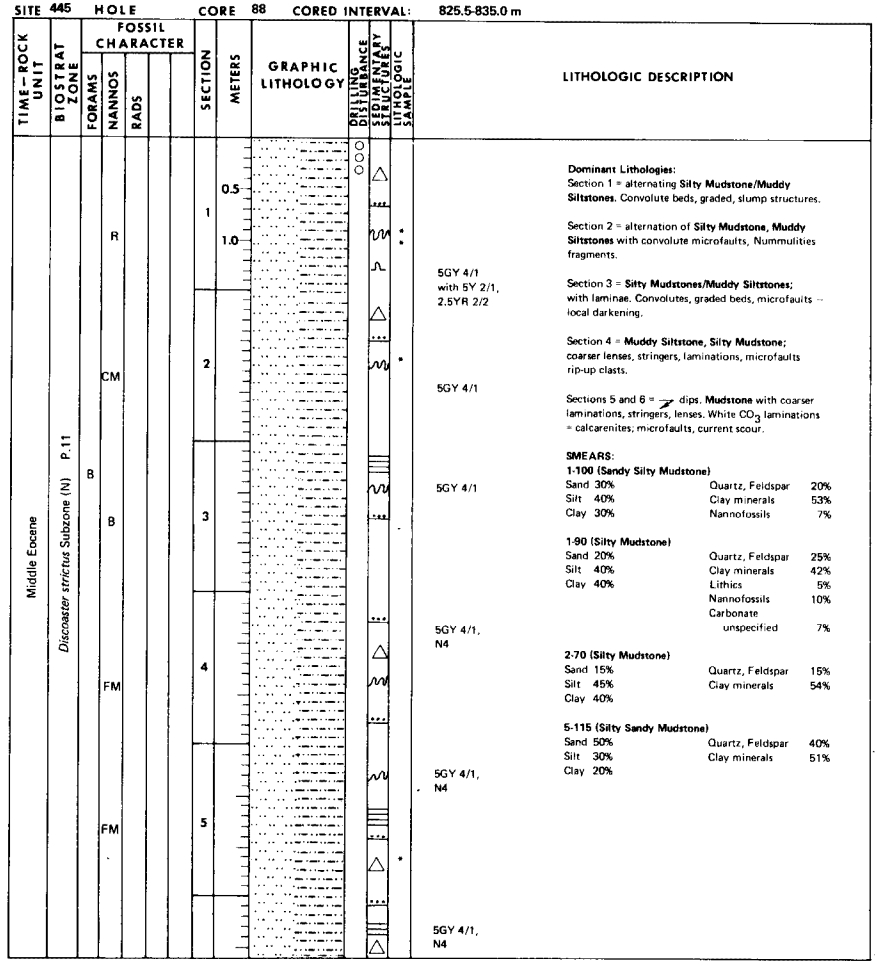
5-75 (Silty Mudstone)

Sand	5%	Quartz, Feldspar	18%
Silt	45%	Clay minerals	52%
Clay	50%	Carbonate unspecified	5%
		Foraminifers	2%
		Nannofossils	3%

6-80 (Silty Sandstone)

Sand	55%	Quartz, Feldspar	15%
Silt	30%	Lithics	60%
Clay	15%	Carbonate unspecified	5%

SITE 445 HOLE CORE 88 CORED INTERVAL: 825.5-835.0 m



Dominant Lithologies:
Section 1 = alternating **Silty Mudstone/Muddy Siltstones.** Convolute beds, graded, slump structures.

Section 2 = alternation of **Silty Mudstone, Muddy Siltstones** with convolute microfaults, Nummulities fragments.

Section 3 = **Silty Mudstones/Muddy Siltstones;** with laminae. Convolutes, graded beds, microfaults – local darkening.

Section 4 = **Muddy Siltstone, Silty Mudstone;** coarser lenses, stringers, laminations, microfaults rip-up clasts.

Sections 5 and 6 = ↗ dips. **Mudstone** with coarser laminations, stringers, lenses. White CO_3 laminations = calcarenites; microfaults, current scour.

SMEARS:

1-100 (Sandy Silty Mudstone)

Sand	30%	Quartz, Feldspar	20%
Silt	40%	Clay minerals	53%
Clay	30%	Nannofossils	7%

1-90 (Silty Mudstone)

Sand	20%	Quartz, Feldspar	25%
Silt	40%	Clay minerals	42%
Clay	40%	Lithics	5%
		Nannofossils	10%
		Carbonate unspecified	7%

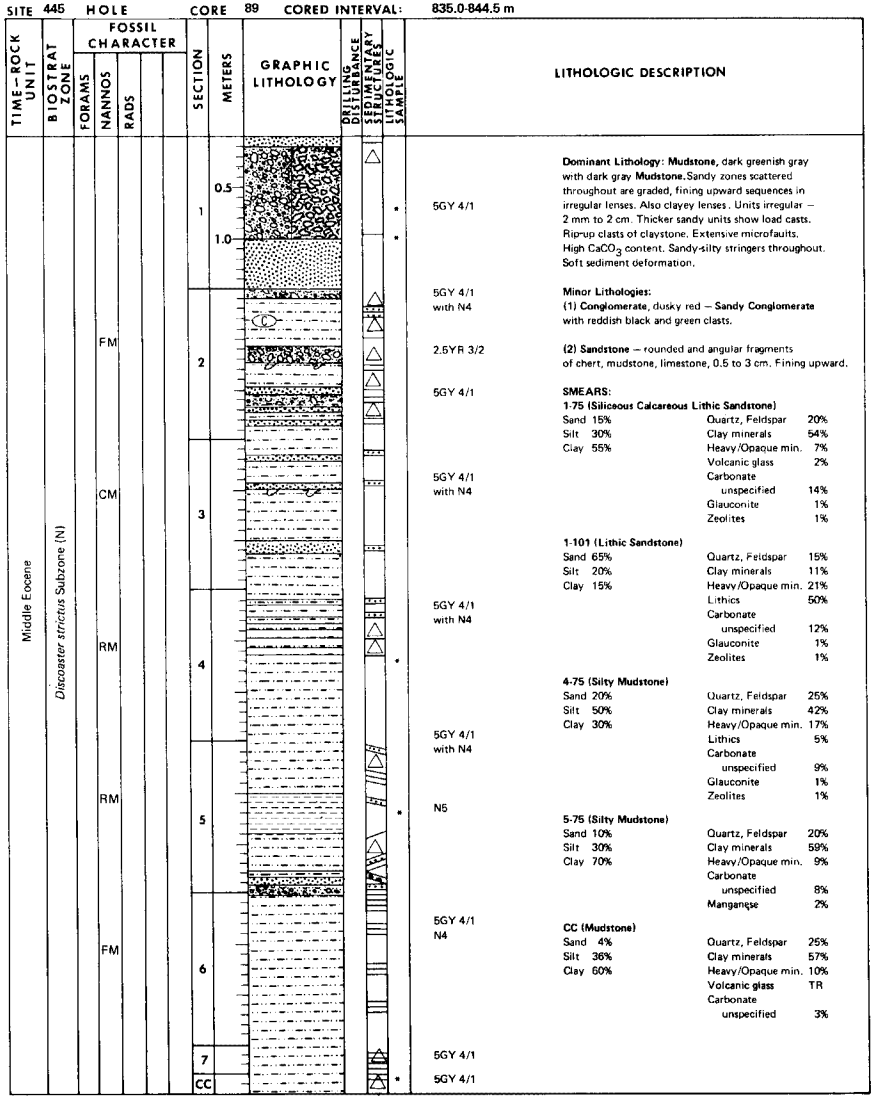
2-70 (Silty Mudstone)

Sand	15%	Quartz, Feldspar	15%
Silt	45%	Clay minerals	54%
Clay	40%		

5-115 (Silty Sandy Mudstone)

Sand	50%	Quartz, Feldspar	40%
Silt	30%	Clay minerals	51%
Clay	20%		

SITE 445 HOLE CORE 89 CORED INTERVAL: 835.0-844.5 m



Dominant Lithology: Mudstone, dark greenish gray with dark gray **Mudstone.** Sandy zones scattered throughout are graded, fining upward sequences in irregular lenses. Also clayey lenses. Units irregular – 2 mm to 2 cm. Thicker sandy units show load casts. Rip-up clasts of claystone. Extensive microfaults. High $CaCO_3$ content. Sandy-silty stringers throughout. Soft sediment deformation.

Minor Lithologies:
(1) **Conglomerate,** dusky red – **Sandy Conglomerate** with reddish black and green clasts.

(2) Sandstone – rounded and angular fragments of chert, mudstone, limestone, 0.5 to 3 cm. Fining upward.

SMEARS:

1-75 (Siliceous Calcareous Lithic Sandstone)

Sand	15%	Quartz, Feldspar	20%
Silt	30%	Clay minerals	54%
Clay	55%	Heavy/Opaque min.	7%
		Volcanic glass	2%
		Carbonate unspecified	14%
		Glauconite	1%
		Zeolites	1%

1-101 (Lithic Sandstone)

Sand	65%	Quartz, Feldspar	15%
Silt	20%	Clay minerals	11%
Clay	15%	Heavy/Opaque min.	21%
		Lithics	50%
		Carbonate unspecified	12%
		Glauconite	1%
		Zeolites	1%

4-75 (Silty Mudstone)

Sand	20%	Quartz, Feldspar	25%
Silt	50%	Clay minerals	42%
Clay	30%	Heavy/Opaque min.	17%
		Lithics	5%
		Carbonate unspecified	9%
		Glauconite	1%
		Zeolites	1%

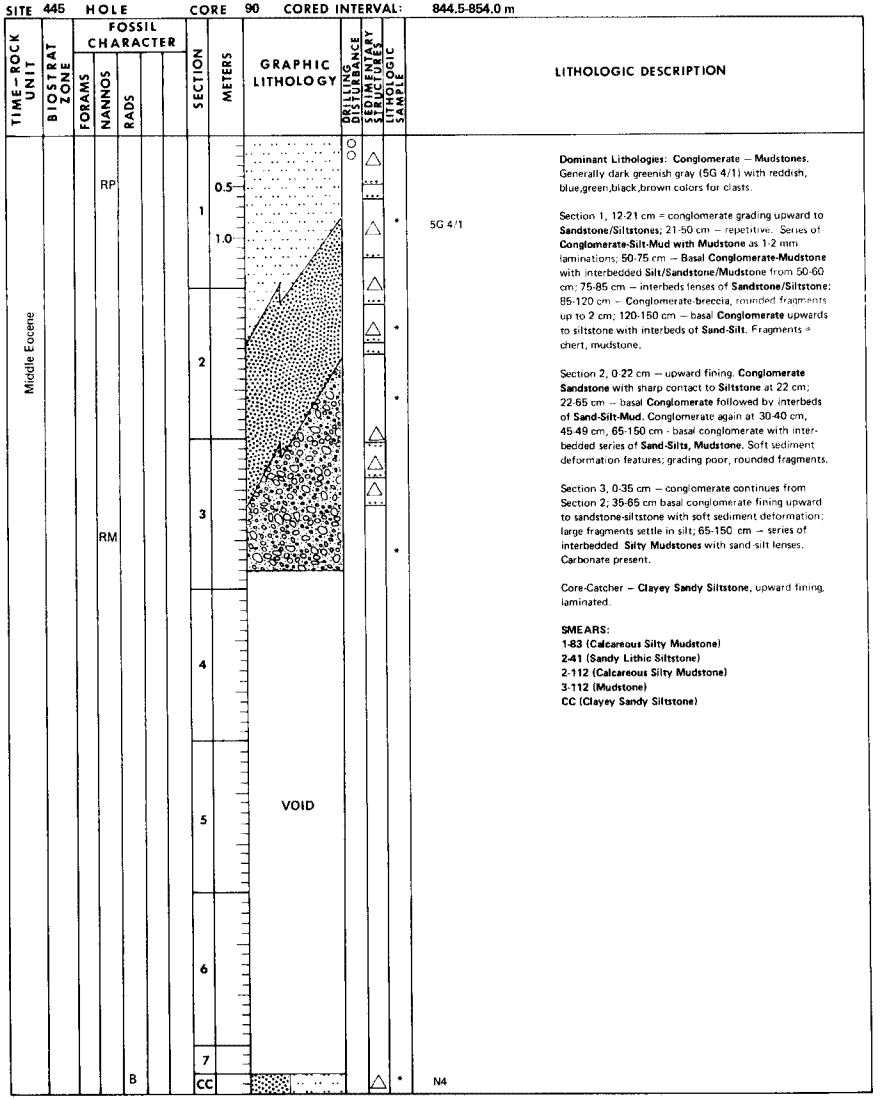
5-75 (Silty Mudstone)

Sand	10%	Quartz, Feldspar	20%
Silt	30%	Clay minerals	59%
Clay	70%	Heavy/Opaque min.	9%
		Carbonate unspecified	8%
		Manganese	2%

CC (Mudstone)

Sand	4%	Quartz, Feldspar	25%
Silt	36%	Clay minerals	57%
Clay	60%	Heavy/Opaque min.	10%
		Volcanic glass	TR
		Carbonate unspecified	3%

SITE 445 HOLE CORE 90 CORED INTERVAL: 844.5-854.0 m



Dominant Lithologies: Conglomerate – Mudstones. Generally dark greenish gray (5G 4/1) with reddish, blue,green,black,brown colors for clasts.

Section 1, 12-21 cm = conglomerate grading upward to **Sandstone/Siltstones;** 21-50 cm – repetitive. Series of **Conglomerate-Silt-Mud with Mudstone** as 1-2 mm laminations; 50-75 cm – Basal **Conglomerate-Mudstone** with interbedded **Silt/Sandstone/Mudstone** from 50-60 cm; 75-85 cm – interbeds lenses of **Sandstone/Siltstone;** 85-120 cm – Conglomerate-breccia, rounded fragments up to 2 cm; 120-150 cm – basal **Conglomerate** upwards to siltstone with interbeds of **Sand-Silt.** Fragments = chert, mudstone.

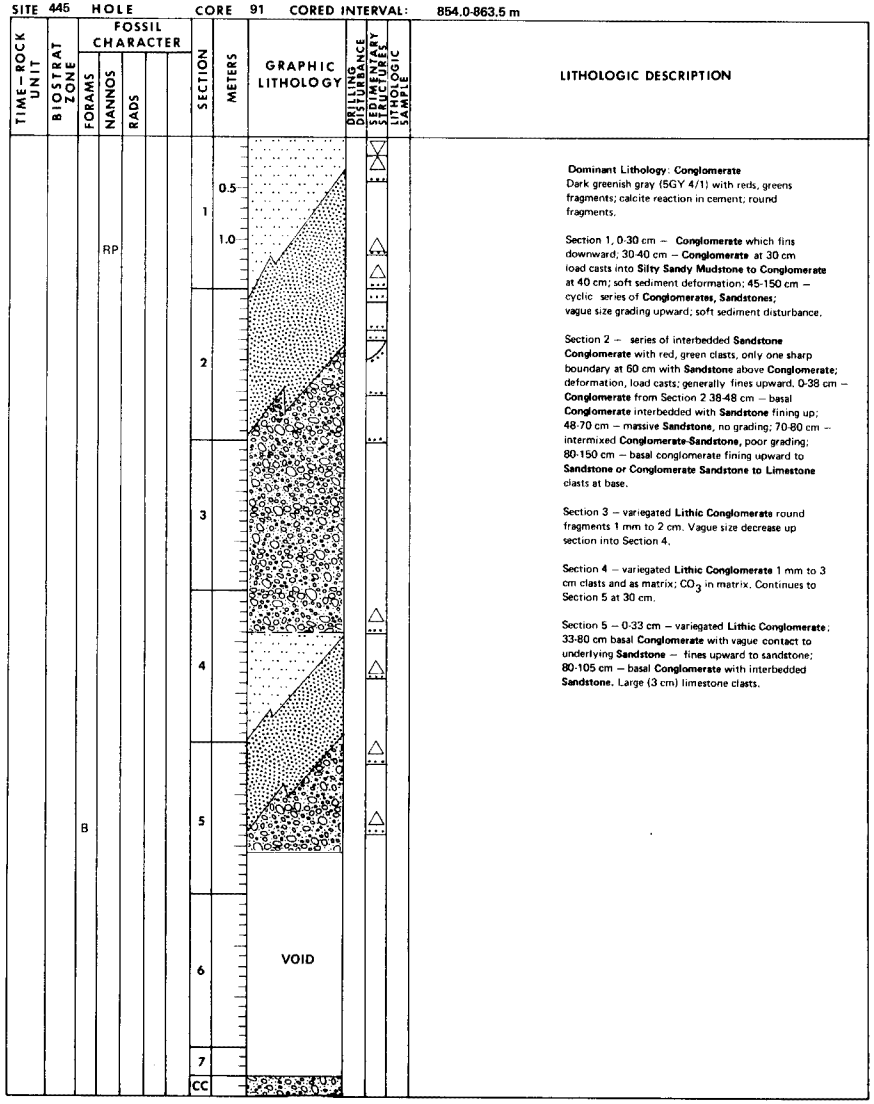
Section 2, 0-22 cm – upward fining. **Conglomerate Sandstone** with sharp contact to **Siltstone** at 22 cm; 22-65 cm – basal **Conglomerate** followed by interbeds of **Sand-Silt-Mud.** Conglomerate again at 30-40 cm, 45-49 cm, 65-150 cm - basal conglomerate with interbedded series of **Sand-Silts, Mudstone.** Soft sediment deformation features; grading poor, rounded fragments.

Section 3, 0-35 cm – conglomerate continues from Section 2; 35-65 cm basal conglomerate fining upward to sandstone-siltstone with soft sediment deformation; large fragments settle in silt; 65-150 cm – series of interbedded **Silty Mudstones** with sand-silt lenses. Carbonate present.

Core-Catcher – **Clayey Sandy Siltstone,** upward fining, laminated.

SMEARS:
1-83 (Calcareous Silty Mudstone)
2-41 (Sandy Lithic Siltstone)
2-112 (Calcareous Silty Mudstone)
3-112 (Mudstone)
CC (Clayey Sandy Siltstone)

SITE 445 HOLE CORE 91 CORED INTERVAL: 854.0-863.5 m



LITHOLOGIC DESCRIPTION

Dominant Lithology: Conglomerate
Dark greenish gray (5GY 4/1) with reds, greens fragments; calcite reaction in cement; round fragments.

Section 1, 0-30 cm – **Conglomerate** which fins downward; 30-40 cm – **Conglomerate** at 30 cm load casts into **Silty Sandy Mudstone to Conglomerate** at 40 cm; soft sediment deformation; 45-150 cm – cyclic series of **Conglomerates, Sandstones;** vague size grading upward; soft sediment disturbance.

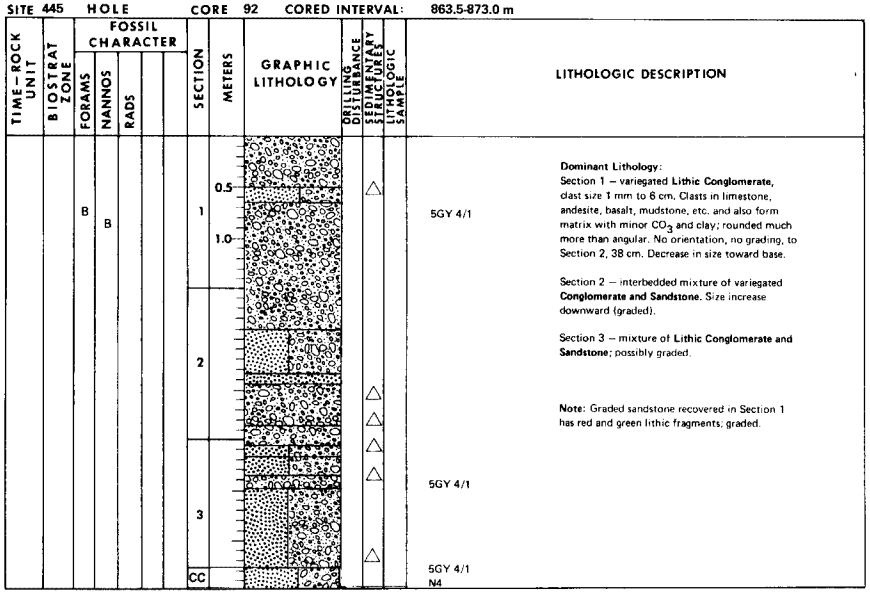
Section 2 – series of interbedded **Sandstone Conglomerate** with red, green clasts, only one sharp boundary at 60 cm with **Sandstone** above **Conglomerate;** deformation, load casts; generally fines upward. 0-38 cm – **Conglomerate** from Section 2 38-48 cm – basal **Conglomerate** interbedded with **Sandstone** fining up; 48-70 cm – massive **Sandstone,** no grading; 70-80 cm – intermixed **Conglomerate-Sandstone,** poor grading; 80-150 cm – basal conglomerate fining upward to **Sandstone or Conglomerate Sandstone to Limestone** clasts at base.

Section 3 – variegated **Lithic Conglomerate** round fragments 1 mm to 2 cm. Vague size decrease up section into Section 4.

Section 4 – variegated **Lithic Conglomerate** 1 mm to 3 cm clasts and as matrix; CO_3 in matrix. Continues to Section 5 at 30 cm.

Section 5 – 0-33 cm – variegated **Lithic Conglomerate;** 33-80 cm basal **Conglomerate** with vague contact to underlying **Sandstone** – fines upward to sandstone; 80-105 cm – basal **Conglomerate** with interbedded **Sandstone.** Large (3 cm) limestone clasts.

SITE 445 HOLE CORE 92 CORED INTERVAL: 863.5-873.0 m



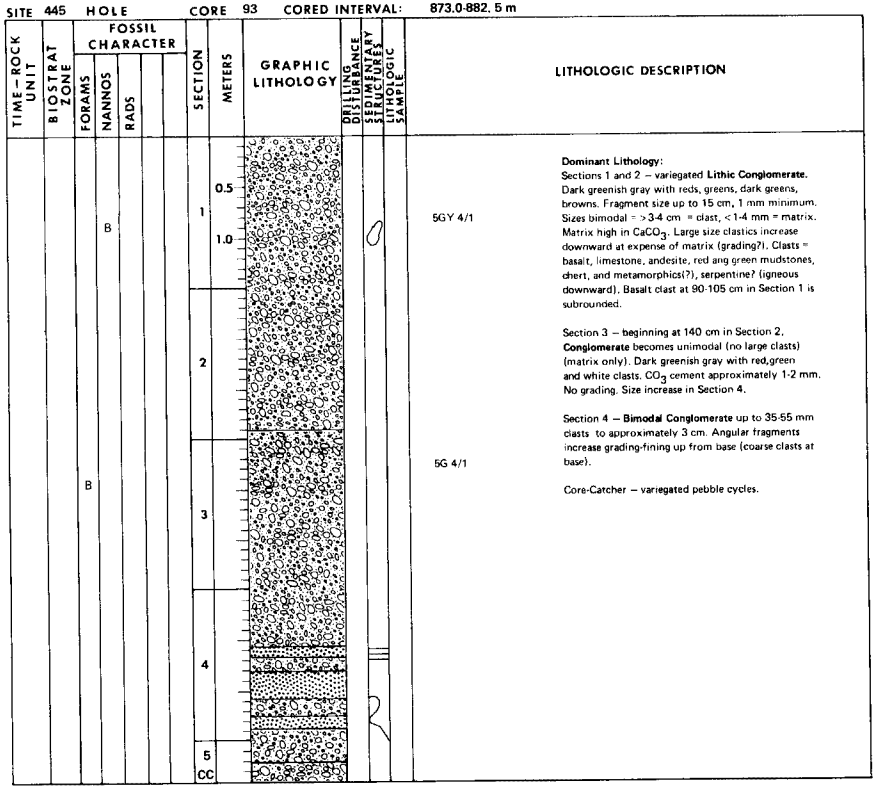
Dominant Lithology:
Section 1 – variegated **Lithic Conglomerate,** clast size 1 mm to 6 cm. Clasts in limestone, andesite, basalt, mudstone, etc. and also form matrix with minor CO_3 and clay; rounded much more than angular. No orientation, no grading, to Section 2, 38 cm. Decrease in size toward base.

Section 2 – interbedded mixture of variegated **Conglomerate and Sandstone.** Size increase downward (graded).

Section 3 – mixture of **Lithic Conglomerate and Sandstone;** possibly graded.

Note: Graded sandstone recovered in Section 1 has red and green lithic fragments; graded.

SITE 445 HOLE CORE 93 CORED INTERVAL: 873.0-882.5 m



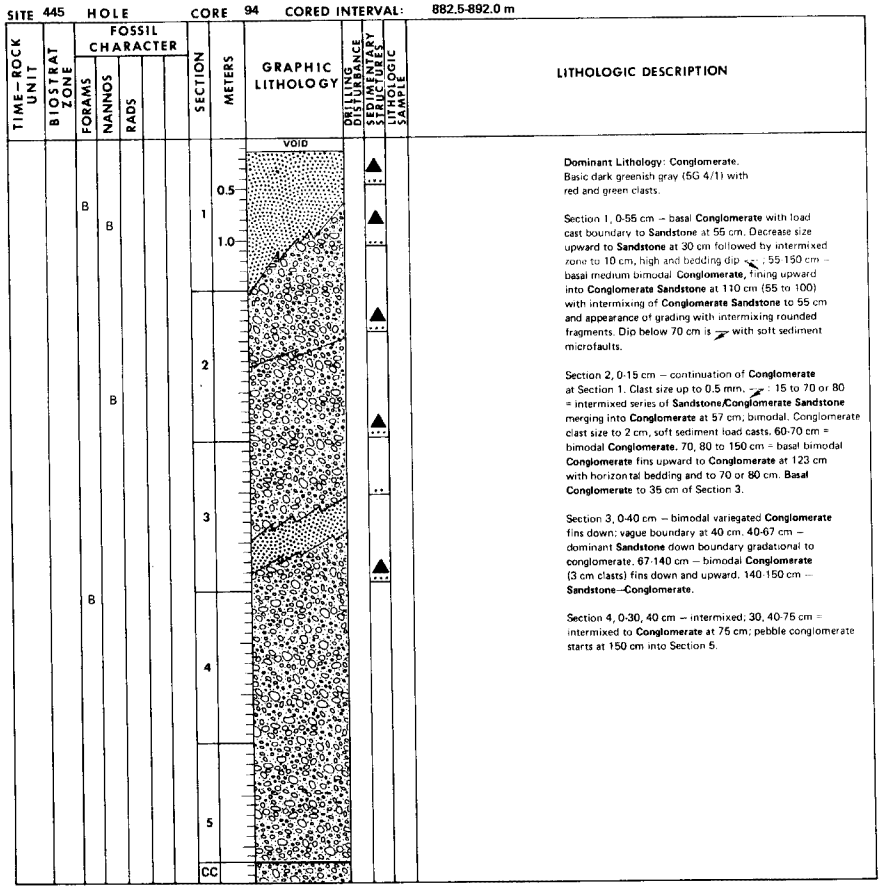
Dominant Lithology:
Sections 1 and 2 – variegated **Lithic Conglomerate.** Dark greenish gray with reds, greens, dark greens, browns. Fragment size up to 15 cm, 1 mm minimum. Sizes bimodal = >3-4 cm = clast, <1-4 mm = matrix. Matrix high in $CaCO_3$. Large size clastics increase downward at expense of matrix (grading?). Clasts = basalt, limestone, andesite, red ang green mudstones, chert, and metamorphics(?), serpentine? (igneous downward). Basalt clast at 90-105 cm in Section 1 is subrounded.

Section 3 – beginning at 140 cm in Section 2, **Conglomerate** becomes unimodal (no large clasts) (matrix only). Dark greenish gray with red,green and white clasts. CO_3 cement approximately 1-2 mm. No grading. Size increase in Section 4.

Section 4 – **Bimodal Conglomerate** up to 35-55 mm clasts to approximately 3 cm. Angular fragments increase grading-fining up from base (coarse clasts at base).

Core-Catcher – variegated pebble cycles.

SITE 445 HOLE CORE 94 CORED INTERVAL: 882.5-892.0 m



Dominant Lithology: Conglomerate. Basic dark greenish gray (5G 4/1) with red and green clasts.

Section 1, 0-55 cm – basal **Conglomerate** with load cast boundary to **Sandstone** at 55 cm. Decrease size upward to **Sandstone** at 30 cm followed by intermixed zone to 10 cm, high and bedding dip ≤ ; 55-150 cm – basal medium bimodal **Conglomerate,** fining upward into **Conglomerate Sandstone** at 110 cm (55 to 100) with intermixing of **Conglomerate Sandstone** to 55 cm and appearance of grading with intermixing rounded fragments. Dip below 70 cm is ≥ with soft sediment microfaults.

Section 2, 0-15 cm – continuation of **Conglomerate** at Section 1. Clast size up to 0.5 mm. ≥ : 15 to 70 or 80 = intermixed series of **Sandstone/Conglomerate Sandstone** merging into **Conglomerate** at 57 cm; bimodal. Conglomerate clast size to 2 cm, soft sediment load casts. 60-70 cm = bimodal **Conglomerate.** 70, 80 to 150 cm = basal bimodal **Conglomerate** fins upward to **Conglomerate** at 123 cm with horizontal bedding and to 70 or 80 cm. **Basal Conglomerate** to 35 cm of Section 3.

Section 3, 0-40 cm – bimodal variegated **Conglomerate** fins down; vague boundary at 40 cm. 40-67 cm – dominant **Sandstone** down boundary gradational to conglomerate. 67-140 cm – bimodal **Conglomerate** (3 cm clasts) fins down and upward. 140-150 cm – **Sandstone–Conglomerate.**

Section 4, 0-30, 40 cm – intermixed; 30, 40-75 cm = intermixed to **Conglomerate** at 75 cm; pebble conglomerate starts at 150 cm into Section 5.

SITE SUMMARY SHEET

SITE 446 HOLES 446 and 446A

Date occupied	January 18, 1978
Date departed	January 26, 1978
Time on hole	7 1/2 days
Position: latitude	24° 42.04'N
longitude	132° 46.49'E
Water depth (sea level)	4952.0 corrected meters, echo sounding
Water depth (rig floor)	4962.5 corrected meters, echo sounding
Bottom felt at	4980.0 meters, drill pipe
Penetration	446 = 420.5 446A = 628.5 meters
Number of holes	2
Number of cores	446 = 46 446A = 28
Total length of cored section	446 = 420.5 446A = 256.5 meters
Total core recovered	446 = 197.1 446A = 117.1 meters
Percentage core recovery	446 = 47 446A = 46%
Oldest Sediment Cored	
Depth sub-bottom	446 = 395.7 446A = 619.0 meters
Nature	claystone
Age	446 = early Eocene 446A = late early Eocene
Measured velocity	446 = 1.85 446A = 2.53 km/s
Basement	
Depth sub-bottom	446 = 420.5 446A = 621.0 meters
Nature	446 = basalt 446A = basalt sills
Velocity range	446 = 4.22-5.38 446A = 3.74-5.84 km/s

Principal Results:

Site 446 is located in the Daito Basin south of the Daito Ridge in the northwestern Philippine Sea. The sedimentary section consists of 14 meters of Pliocene terrigenous mud and clay which overlies 158.5 meters of Pliocene, Miocene, Oligocene, and late Eocene pelagic clay. Next below is 190.0 meters of middle to late early Eocene mudstone, claystone, siltstone and turbidite sandstone. Underlying those rocks is a 266.0-meter succession of interlayered calcareous mudstone, siltstone, sandstone, conglomerate and ash intruded by 16 post-early Eocene basalt sills.

Shipboard paleomagnetic analysis shows that Site 446 has migrated from an equatorial latitude over the past 52 million years. The age of the basement of the northwestern Philippine Sea is possibly as young as early Eocene.

SITE 446 HOLE CORE 1 CORED INTERVAL: 0.0-1.5 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Pliocene	N.21	CM	B	B	1	0.5, 1.0	VOID	○			10YR 4/3

Dominant Lithology: Brown Mud (10YR 4/3), one pumice pebble at 105 cm (dark brown drilling breccia).

GRAIN SIZE:
1-91 (0.2, 30.9, 68.9)

CARBON-CARBONATE:
1-96 (0.2, 0.2, 0)

SITE 446 HOLE CORE 2 CORED INTERVAL: 1.5-11.0 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Pliocene	N.18 *Discoaster asymmetricus* or *Discoaster tamalis* Subzone (N)		FP		1	0.5		○		•	
		CM	FP	B	CC			○		•	

Dominant Lithology: Mud/Clay, brown (10YR 5/3), homogeneous soupy to firm. Coarse sandy pumice patches at Section 1, 67-69 cm. No sedimentary structures.

SMEARS:
1-40, CC (Mud/Clay)

Sand	1- 2%	Quartz, Feldspar	5- 7%
Silt	9-16%	Clay minerals	80%
Clay	82-90%	Heavy minerals	1%
		Mica	3%
		Opaque minerals	1%
		Calcareous fossils	TR- 7%
		Zeolites	1- 2%

SITE 445 HOLE CORE 3 CORED INTERVAL: 11.0-20.5 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Miocene	*Cert. formosa robusta* N.12		B		1	0.5, 1.0	VOID	○		•	10YR 5/3
		FM						○		•	10YR 4/3
					2					•	10YR 5/3
										•	10YR 4/3
					3					•	10YR 5/3
			B		4					•	10YR 4/3
					5		VOID				
					6		VOID				10YR 4/3 10YR 5/3
					7						
			B	B	CC						10YR 5/3

Dominant Lithology: Mud, brown, homogeneous, soft to semi-firm patches of more firm clay form granules and pebbles -- hard and distinct -- (mistaken for sandy or pumaceous on preliminary observation).

Minor Lithology present is a **Mud** (very clayey), brown, homogeneous. Slightly darker color results from slight increase in micronodules. Silt fraction very minor.

No sedimentary structures observed.

SMEARS:
1-75

Sand	0%	Quartz, Feldspar	7%
Silt	>20%	Clay minerals	89%
Clay	>70%	Heavy minerals	1%
		Manganese	3%
		Zeolites	TR
		Mica	1%

1-100

Quartz, Feldspar	5%	Manganese	2%
Clay minerals	79%	Zeolites	5%
Heavy minrals	2%	Mica	1%

2-99

Quartz, Feldspar	3%	Volcanic glass	1%
Clay minerals	89%	Manganese	2%
Heavy minerals	1%	Mica	2%
Zeolites	3%		

2-135

Quartz, Feldspar	2%	Manganese	5%
Clay minrals	85%	Zeolites	7%
Heavy minerals	1%	Mica	1%

3-30

Sand	< 1%	Quartz, Feldspar	2%
Silt	>25%	Clay minerals	92%
Clay	<75%	Heavy minerals	1%
		Manganese	2%
		Zeolites	2%
		Mica	2%

4-75

Quartz, Feldspar	3%	Manganese	3%
Clay minerals	91%	Zeolites	1%
Heavy minerals	1%	Mica	2%

6-50

Quartz, Feldspar	2%	Manganese	2%
Clay minerals	92%	Zeolites	2%
Heavy minerals	1%	Mica	1%

GRAIN SIZE:
1-55 (0.1, 29.4, 70.4)
3-55 (0.1, 27.4, 72.5)

CARBON-CARBONATE:
1-59 (0.1, 0.1, 0)
3-59 (0.1, 0.1, 0)
5-59 (0.1, 0.1, 0)

SITE 446 HOLE CORE 4 CORED INTERVAL: 20.5-30.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Middle Miocene	Foram Zone N.12	FM	B	B	7		VOID				10YR 5/3, 10YR 3/3
					CC						

Brown Mud with dark brown patch. Granular patch at 8-12 cm, dark patch at 20-30 cm.

SMEARS:

CC-6

Sand	0%	Quartz, Feldspar	5%	Opaque min.	1%
Silt	9%	Clay minerals	89%	Mica	3%
Clay	91%	Heavy minerals	1%	Zeolites	1%

CC-26

Sand	1%	Quartz, Feldspar	3%	Mica	1%
Silt	9%	Clay minerals	86%	Manganese	7%
Clay	90%	Heavy minerals	TR	Zeolites	3%
		Opaque minerals	TR		

SITE 446 HOLE CORE 5 CORED INTERVAL: 30.0-39.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
					1	0.5	VOID				
						1.0				•	10YR 3/3
					2					•	
		B	B		3					•	10YR 3/3 with 10YR 5/4
					4					•	10YR 3/3
		B	B		5						10YR 3/3 with 10YR 5/4
					6					•	10YR 4/3
										•	
					7		VOID				
				B	CC					•	10YR 3/3

Mud, soupy to firm, brown to dark brown, with yellowish brown patches, massive, homogeneous. Composition includes micronodules, zeolites, mica, terrigenous components.

SMEARS:

1-120

Quartz, Feldspar	3%
Clay minerals	91%
Heavy minerals	1%
Mica	TR
Manganese	3%
Zeolites	2%

2-140

Quartz, Feldspar	2%
Clay minerals	92%
Heavy minerals	1%
Mica	2%
Manganese	1%
Zeolites	1%

3-75

Sand	< 1%	Quartz, Feldspar	1%
Silt	>20%	Clay minerals	92%
Clay	>75%	Heavy minerals	1%
		Opaque minerals	1%
		Mica	1%
		Manganese	3%
		Zeolites	1%

4-75

Quartz, Feldspar	3%
Clay minerals	94%
Heavy minerals	TR
Opaque minerals	1%
Mica	1%
Manganese	1%
Zeolites	1%

6-62

Quartz, Feldspar	3%	Mica	2%
Clay minerals	92%	Manganese	1%
Opaque minerals	TR	Zeolites	1%

8-90

Quartz, Feldspar	4%	Mica	5%
Clay minerals	89%	Manganese	TR
Heavy minerals	1%	Zeolites	1%
Opaque minerals	TR		

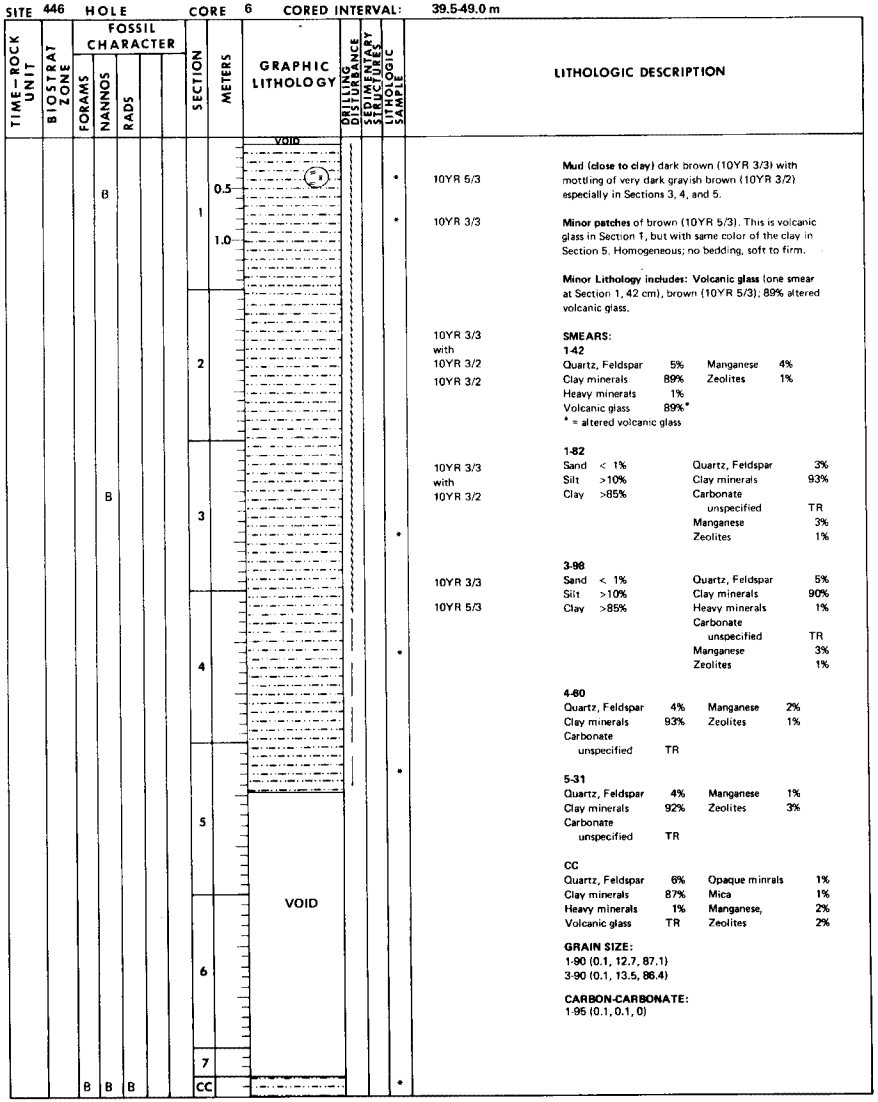
CC

Quartz, Feldspar	4%	Opaque minerals	1%
Clay minerals	88%	Mica	3%
Heavy minerals	1%	Manganese	1%
Volcanic glass	TR	Zeolites	1%

GRAIN SIZE:
3-82 (0.6, 23.4, 76.0)
5-82 (0.3, 22.0, 77.7)

CARBON-CARBONATE:
3-87 (0.1, 0.1, 0)
5-87 (0.1, 0.1, 0)

SITE 446 HOLE CORE 6 CORED INTERVAL: 39.5-49.0 m



LITHOLOGIC DESCRIPTION

10YR 5/3

Mud (close to clay) dark brown (10YR 3/3) with mottling of very dark grayish brown (10YR 3/2) especially in Sections 3, 4, and 5.

10YR 3/3

Minor patches of brown (10YR 5/3). This is volcanic glass in Section 1, but with same color of the clay in Section 5. Homogeneous; no bedding, soft to firm.

Minor Lithology includes: Volcanic glass (one smear at Section 1, 42 cm), brown (10YR 5/3); 89% altered volcanic glass.

10YR 3/3 with 10YR 3/2 10YR 3/2

SMEARS:

1-42

Quartz, Feldspar	5%	Manganese	4%
Clay minerals	89%	Zeolites	1%
Heavy minerals	1%		
Volcanic glass	89%*		

* = altered volcanic glass

10YR 3/3 with 10YR 3/2

1-82

Sand	< 1%	Quartz, Feldspar	3%
Silt	>10%	Clay minerals	93%
Clay	>85%	Carbonate unspecified	TR
		Manganese	3%
		Zeolites	1%

10YR 3/3

10YR 5/3

3-98

Sand	< 1%	Quartz, Feldspar	5%
Silt	>10%	Clay minerals	90%
Clay	>85%	Heavy minerals	1%
		Carbonate unspecified	TR
		Manganese	3%
		Zeolites	1%

4-80

Quartz, Feldspar	4%	Manganese	2%
Clay minerals	93%	Zeolites	1%
Carbonate unspecified	TR		

5-31

Quartz, Feldspar	4%	Manganese	1%
Clay minerals	92%	Zeolites	3%
Carbonate unspecified	TR		

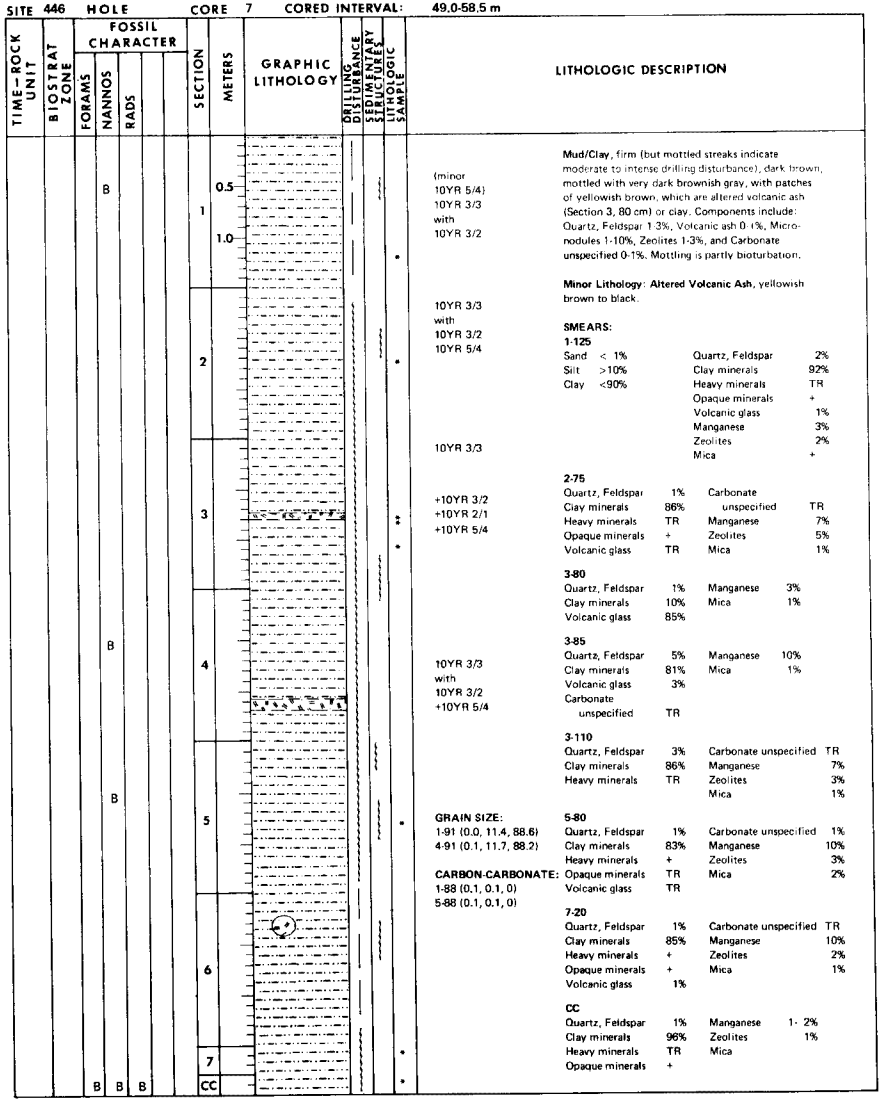
CC

Quartz, Feldspar	6%	Opaque minrals	1%
Clay minerals	87%	Mica	1%
Heavy minerals	1%	Manganese,	2%
Volcanic glass	TR	Zeolites	2%

GRAIN SIZE:
1-90 (0.1, 12.7, 87.1)
3-90 (0.1, 13.5, 86.4)

CARBON-CARBONATE:
1-95 (0.1, 0.1, 0)

SITE 446 HOLE CORE 7 CORED INTERVAL: 49.0-58.5 m



LITHOLOGIC DESCRIPTION

(minor 10YR 5/4) 10YR 3/3 with 10YR 3/2

Mud/Clay, firm (but mottled streaks indicate moderate to intense drilling disturbance), dark brown, mottled with very dark brownish gray, with patches of yellowish brown, which are altered volcanic ash (Section 3, 80 cm) or clay. Components include: Quartz, Feldspar 1-3%, Volcanic ash 0-1%, Micronodules 1-10%, Zeolites 1-3%, and Carbonate unspecified 0-1%. Mottling is partly bioturbation.

10YR 3/3 with 10YR 3/2 10YR 5/4

Minor Lithology: Altered Volcanic Ash, yellowish brown to black.

SMEARS:

1-125

Sand	< 1%	Quartz, Feldspar	2%
Silt	>10%	Clay minerals	92%
Clay	<90%	Heavy minerals	TR
		Opaque minerals	+
		Volcanic glass	1%
		Manganese	3%
		Zeolites	2%
		Mica	+

10YR 3/3

2-75

Quartz, Feldspar	1%	Carbonate unspecified	TR
Clay minerals	86%	Manganese	7%
Heavy minerals	TR	Zeolites	5%
Opaque minerals	+	Mica	1%
Volcanic glass	TR		

+10YR 3/2 +10YR 2/1 +10YR 5/4

3-80

Quartz, Feldspar	1%	Manganese	3%
Clay minerals	10%	Mica	1%
Volcanic glass	85%		

3-85

Quartz, Feldspar	5%	Manganese	10%
Clay minerals	81%	Mica	1%
Volcanic glass	3%		
Carbonate unspecified	TR		

10YR 3/3 with 10YR 3/2 +10YR 5/4

3-110

Quartz, Feldspar	3%	Carbonate unspecified	TR
Clay minerals	86%	Manganese	7%
Heavy minerals	TR	Zeolites	3%
		Mica	1%

GRAIN SIZE:
1-91 (0.0, 11.4, 88.6)
4-91 (0.1, 11.7, 88.2)

5-80

Quartz, Feldspar	1%	Carbonate unspecified	1%
Clay minerals	83%	Manganese	10%
Heavy minerals	+	Zeolites	3%
Opaque minerals	TR	Mica	2%
Volcanic glass	TR		

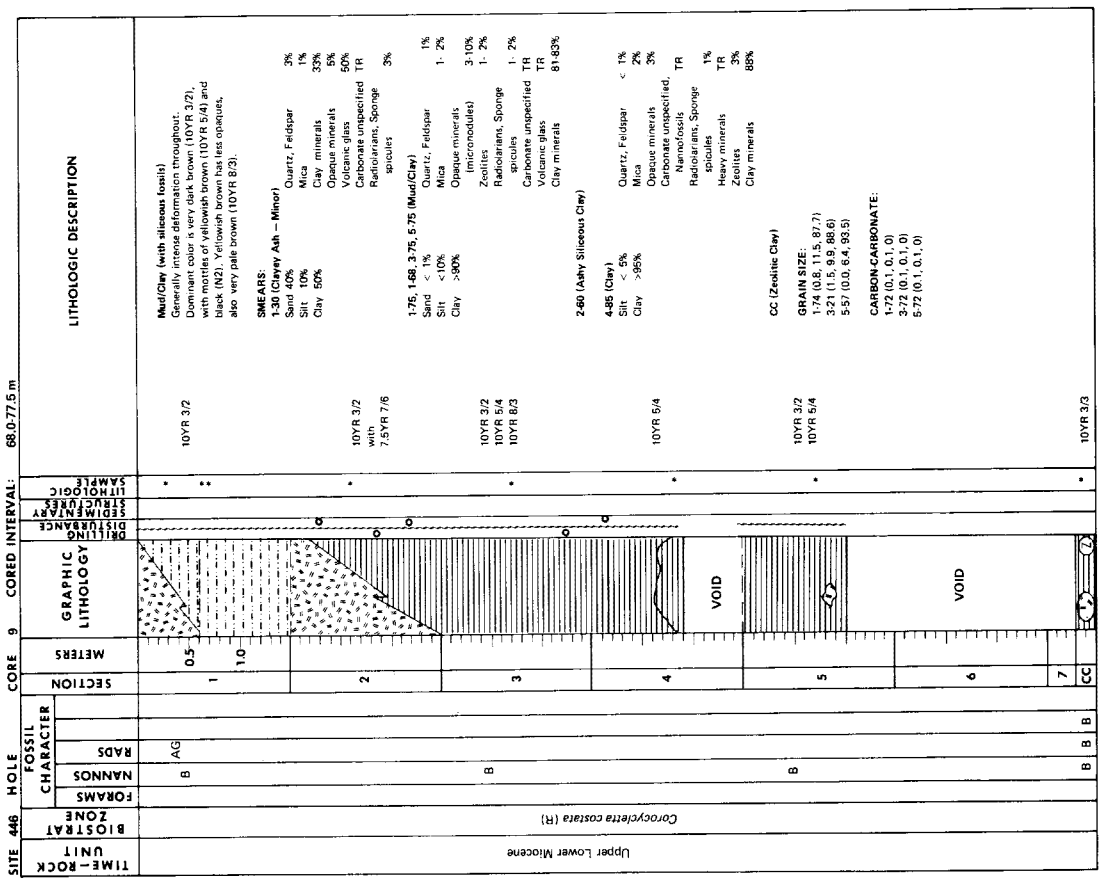
CARBON-CARBONATE:
1-88 (0.1, 0.1, 0)
5-88 (0.1, 0.1, 0)

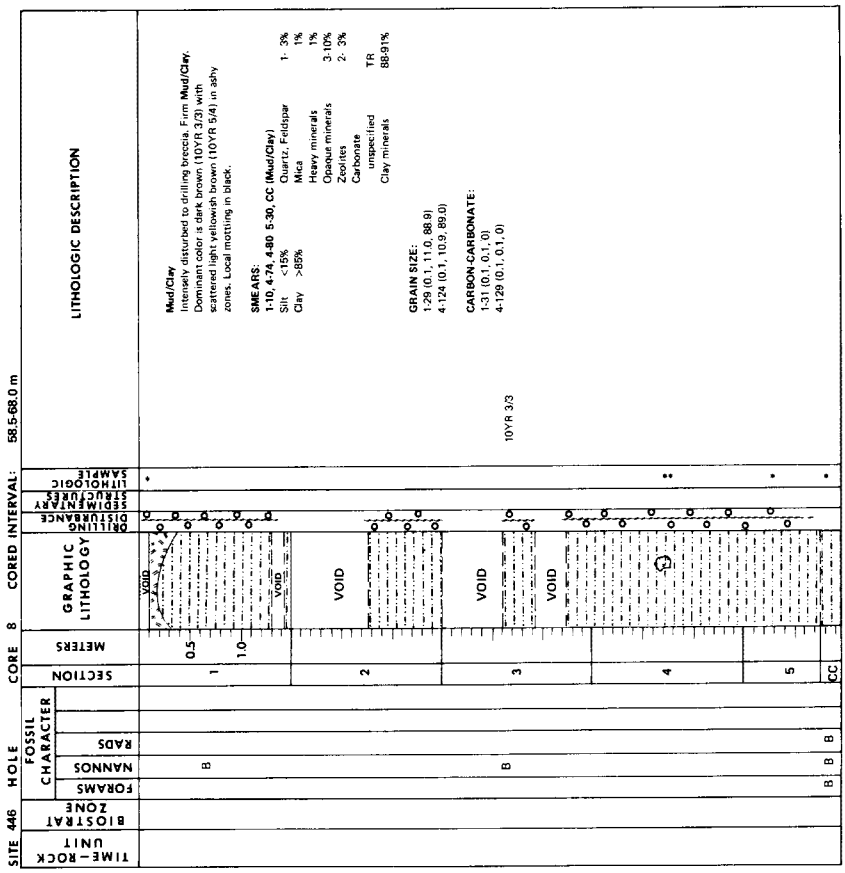
7-20

Quartz, Feldspar	1%	Carbonate unspecified	TR
Clay minerals	85%	Manganese	10%
Heavy minerals	+	Zeolites	2%
Opaque minerals	+	Mica	1%
Volcanic glass	1%		

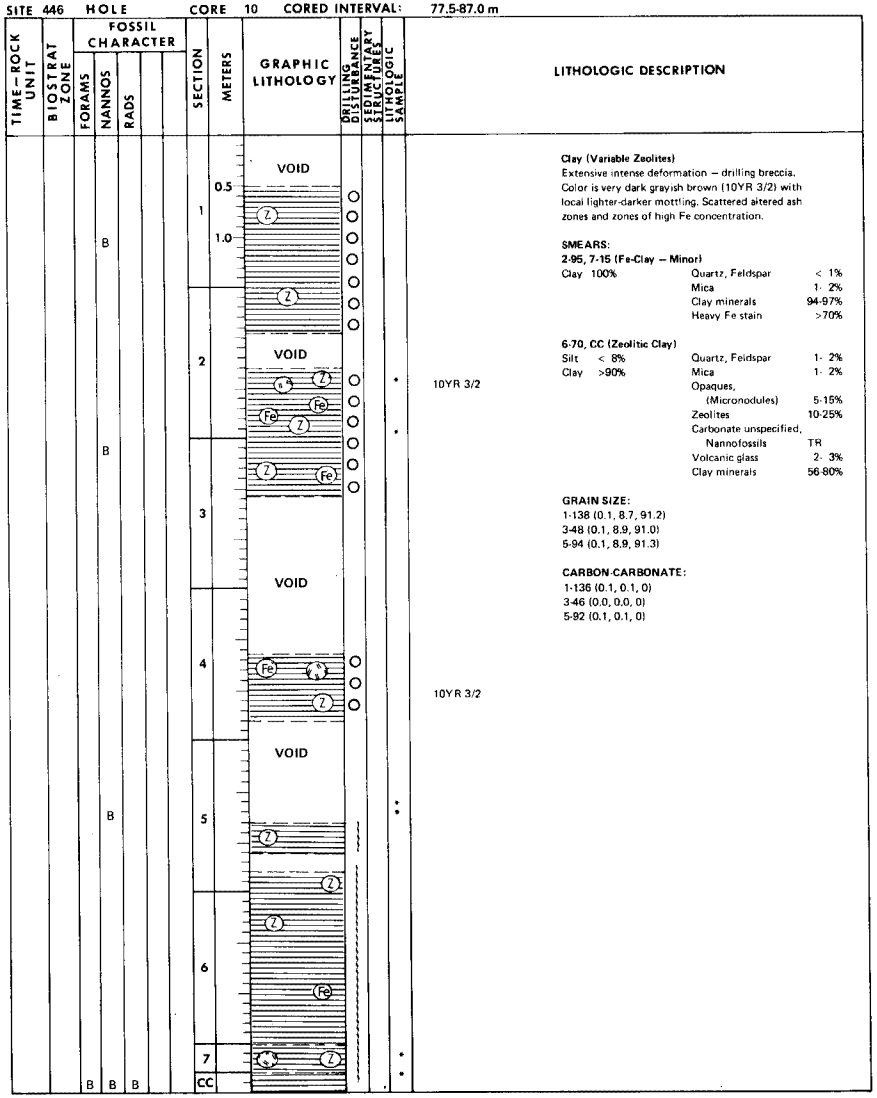
CC

Quartz, Feldspar	1%	Manganese	1- 2%
Clay minerals	96%	Zeolites	1%
Heavy minerals	TR	Mica	
Opaque minerals	+		





SITE 446 HOLE CORE 10 CORED INTERVAL: 77.5-87.0 m



Clay (Variable Zeolites)
Extensive intense deformation – drilling breccia. Color is very dark grayish brown (10YR 3/2) with local lighter-darker mottling. Scattered altered ash zones and zones of high Fe concentration.

SMEARS:

2-95, 7-15 (Fe-Clay – Minor)

Clay 100%	Quartz, Feldspar	< 1%
	Mica	1- 2%
	Clay minerals	94-97%
	Heavy Fe stain	>70%

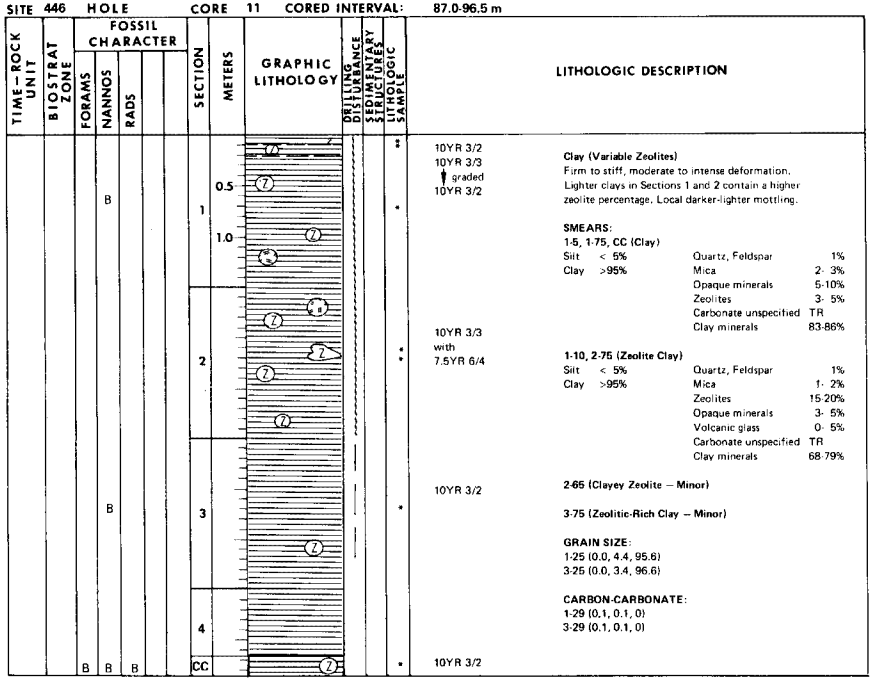
6-70, CC (Zeolitic Clay)

Silt < 8%	Quartz, Feldspar	1- 2%
Clay >90%	Mica	1- 2%
	Opaques, (Micronodules)	5-15%
	Zeolites	10-25%
	Carbonate unspecified, Nannofossils	TR
	Volcanic glass	2- 3%
	Clay minerals	56-80%

GRAIN SIZE:
1-138 (0.1, 8.7, 91.2)
3-48 (0.1, 8.9, 91.0)
5-94 (0.1, 8.9, 91.3)

CARBON-CARBONATE:
1-136 (0.1, 0.1, 0)
3-46 (0.0, 0.0, 0)
5-92 (0.1, 0.1, 0)

SITE 446 HOLE CORE 11 CORED INTERVAL: 87.0-96.5 m



Clay (Variable Zeolites)
Firm to stiff, moderate to intense deformation. Lighter clays in Sections 1 and 2 contain a higher zeolite percentage. Local darker-lighter mottling.

SMEARS:

1-5, 1-75, CC (Clay)

Silt < 5%	Quartz, Feldspar	1%
Clay >95%	Mica	2- 3%
	Opaque minerals	5-10%
	Zeolites	3- 5%
	Carbonate unspecified	TR
	Clay minerals	83-86%

1-10, 2-75 (Zeolite Clay)

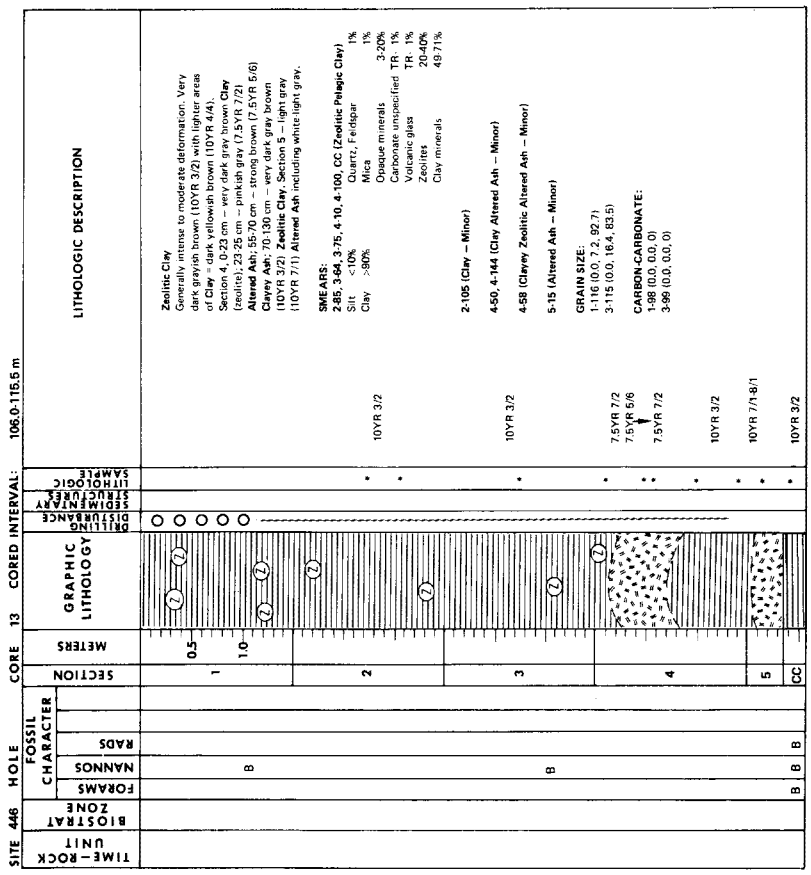
Silt < 5%	Quartz, Feldspar	1%
Clay >95%	Mica	1- 2%
	Zeolites	15-20%
	Opaque minerals	3- 5%
	Volcanic glass	0- 5%
	Carbonate unspecified	TR
	Clay minerals	68-79%

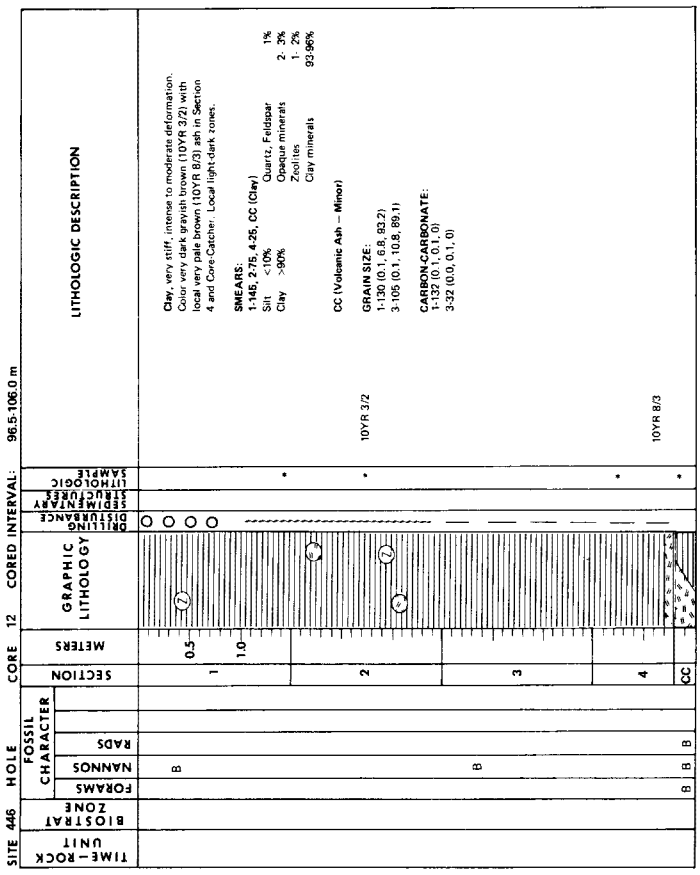
2-65 (Clayey Zeolite – Minor)

3-75 (Zeolitic-Rich Clay – Minor)

GRAIN SIZE:
1-25 (0.0, 4.4, 95.6)
3-25 (0.0, 3.4, 96.6)

CARBON-CARBONATE:
1-29 (0.1, 0.1, 0)
3-29 (0.1, 0.1, 0)





SITE 446 HOLE CORE 14 CORED INTERVAL: 115.5-125.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE		LITHOLOGIC DESCRIPTION
Middle Oligocene	*Sphenolithus distentus* Zone (N) ? / *G. ampliapertura* N.1 – P.20 Zone	B	B		1	0.5	VOID			*	10YR 3/2	**Zeolitic Clay** Firm to stiff with intense deformation. Colors dominantly very dark grayish brown (10YR 3/2), dark brown (10YR 3/3). Yellowish brown (10YR 6/4) streaks throughout. Local dark mottling.
						1.0				**	10YR 3/3	**SMEARS:** **1-35, 1-88, 1-90, 4-50, 5-75, CC (Zeolitic Clay with variable Zeolites)** Silt <10% / Clay >90% Quartz, Feldspar TR- 1%; Mica TR- 2%; Volcanic glass 1%; Opaque minerals 1-10%; Zeolites 2-30%; Carbonate unspecified TR; Clay minerals 55-97%
					2						10YR 3/3	**5-35, 5-45 (Clayey Nannofossil Ooze – Minor)** Sand 5% / Silt 5% / Clay 90% Quartz, Feldspar 1- 2%; Mica 1%; Heavy minerals TR; Volcanic glass 1%; Foraminifers 5-70%; Zeolites 5-10%; Opaque minerals 3- 5%; Clay minerals 40%; Nannofossils 38-47%
		B	B		3						10YR 3/3	
											10YR 3/2	**GRAIN SIZE:** 1-140 (0.0, 9.5, 90.5) 3-61 (0.0, 8.4, 91.6) 5-61 (0.0, 18.1, 81.9)
					4					*		**CARBON-CARBONATE:** 1-101 (0.0, 0.0, 0) 3-101 (0.1, 0.0, 0)
							VOID					
		CM			5					*	10YR 3/2	
			AP							**		
				B						*	10YR 3/2 with 10YR 5/4	
							VOID					
		CP	B	B	CC					*	10Y 3/2	

SITE 446 HOLE CORE 15 CORED INTERVAL: 125.0-134.5 m

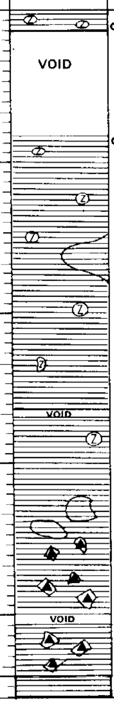
TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE		LITHOLOGIC DESCRIPTION
			B		1	0.5						**Zeolitic Clay and Clay** Firm, stiff, moderate to intense deformation; very dark grayish brown (10YR 3/2) with scattered lighter-darker zones.
						1.0						**SMEARS:** **2-75, 3-50, CC (Zeolitic Clay and Clay)** Silt 0- 5% / Clay 95-100% Quartz, Feldspar TR- 2%; Opaque minerals 7-12%; Zeolites 5-25%; Mica 1- 2%; Volcanic glass TR- 1%; Clay minerals 60-86%
					2					*	10YR 3/2	**GRAIN SIZE:**
											10YR 3/3	1-123 (0.2, 13.9, 85.9) 3-123 (0.2, 27.0, 72.8)
			B		3					*		**CARBON-CARBONATE:** 1-127 (0.1, 0.1, 0) 3-127 (0.0, 0.0, 0)
		B	B	B	CC					*	10YR 3/3	

SITE 446 HOLE CORE 16 CORED INTERVAL: 134.5-144.0 m

Column headings: TIME-ROCK UNIT | BIOSTRAT ZONE | FOSSIL CHARACTER (FORAMS, NANNOS, RADS) | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE | LITHOLOGIC DESCRIPTION

Fossil character: NANNOS B (Section 1); NANNOS B (Section 4); FORAMS B, NANNOS B, RADS B (CC)

Sections: 1 (0.5, 1.0), 2, 3, 4, 5, CC



10YR 3/3

Zeolitic Clay,
dark brown (10YR 3/3), firm, stiff, intensely deformed.

10YR 3/3

Note:
Scattered stains of yellowish brown (10YR 5/6) to brownish yellow (10YR 6/6) **Clay** (large stains in Section 2, 90 cm and Section 3, 40-50 cm).
Numerous pieces of 2 mm to 2 cm angular, very dark gray (10YR 3/1) **Chert**, in Section 4, 65-150 cm and Section 5.

SMEARS:
1-5 Opaques 10%, Zeolites 5%
1-140 Opaques 1%, Zeolites 25%

10YR 7/2

2-65 (Zeolitic Clay)

Silt	15%	Feldspar	2%
Clay	85%	Mica	3%
		Clay minrals	50%
		Volcanic glass	TR
		Opaques (micronodules)	10%
		Zeolites	35%
		Carbonate unspecified	TR

10YR 3/3

2-93 (Clay – Minor)

Quartz, Feldspar	15%
Mica	2%
Heavy minerals	1%
Opaque minerals	1%
Clay minerals	81%

4-45

Quartz, Feldspar	12%
Mica	2%
Clay minrals	85%
Opaque minerals	1%

5-30 Opaques 10%, Zeolites 25%
CC Opaques 1%, Zeolites 3%

10YR 3/3 (10YR 3/1)

GRAIN SIZE:
1-135 (0.1, 16.3, 83.7)
3-135 (0.1, 21.1, 78.8)

10YR 3/3

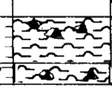
CARBON-CARBONATE:
1-140 (0.1, 0.1, 0)
3-140 (0.0, 0.0, 0)

SITE 446 HOLE CORE 17 CORED INTERVAL: 144.0-153.5 m

Column headings: TIME-ROCK UNIT | BIOSTRAT ZONE | FOSSIL CHARACTER (FORAMS, NANNOS, RADS) | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE | LITHOLOGIC DESCRIPTION

Time-rock unit: Lower Upper Eocene
Biostrat zone: *Podocyrtis chalara* (R)
Fossil character: FORAMS B, NANNOS B, RADS AG (Section 1); RADS AG (CC)

Sections: 1, CC (0.5)



10YR 3/3
10YR 5/6
2.5YR 2/2
10YR 3/3, 2.5YR 2/2

Clayey Radiolarian Ooze,
dark brown (10YR 3/3) to yellowish brown (10YR 5/6) firm to soft; many very dusky red (1.5YR 2/2) 2 mm to 6 cm **Chert** pieces.

SMEARS:
1-30 Radiolarians 18%, Sponge spicules 7%

1-40 (Clayey Radiolarian Ooze)

Sand	20%	Feldspar	1%
Silt	35%	Clay minerals	45%
Clay	45%	Volcanic glass	2%
		Opaque minerals	2%
		Radiolarians	35%
		Sponge spicules	15%

CC Radiolarians 40%, Sponge spicules 10%, Volcanic glass 5%

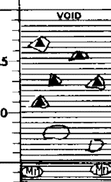
SITE 446 HOLE CORE 18 CORED INTERVAL: 153.5-163.0 m

Column headings: TIME-ROCK UNIT | BIOSTRAT ZONE | FOSSIL CHARACTER (FORAMS, NANNOS, RADS) | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE | LITHOLOGIC DESCRIPTION

Fossil character: FORAMS B, NANNOS B, RADS B (CC)

Sections: 1 (0.5, 1.0), CC, 2, 3, 4, 5

Lithologic samples: •(A), •(B) (CC)



Clay
Drilling breccia of mixed, reworked and in situ sediment, mainly very dark grayish brown (10YR 3/2) **Clay with Zeolites and Micronodules.**

Minor Lithologies include:
Section 1, 10-99 cm – scattered pieces of black (10YR 2/1), very dark gray (10YR 3/1) to very dusky red (2.5YR 2/2) **Chert** (up to 6 cm diameter).

Section 1, 99-150 cm – scattered stains of yellowish brown (10YR 5/6-5/8) **Clay.**

Core-Catcher – **Fe-Mn Nodules**, diameter 0.1-1.0 cm, in black (10YR 2/1) stains.

SMEARS:

1-17

Quartz, Feldspar	2%
Clay minerals	85%
Micronodules	8%
Zeolites	5%

1-122

Sand	< 1%	Quartz, Feldspar	12%
Silt	33%	Mica	2%
Clay	67%	Heavy minerals	1%
		Clay minerals	82%
		Opaque minerals	2%
		Volcanic glass	1%

CC (A)

Quartz, Feldspar	1%
Mica	2%
Clay minerals	94%
Volcanic glass	2%
Opaque minerals	1%
Zeolites	TR

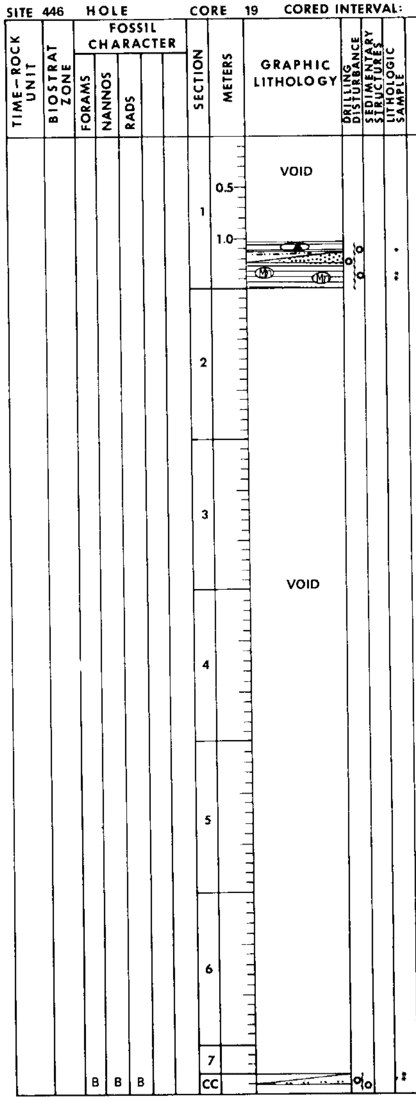
CC (B)

Quartz, Feldspar	2%
Mica	2%
Heavy minerals	1%
Clay minerals	89%
Opaque minerals	10%
Zeolites	1%

GRAIN SIZE:
1-122 (0.8, 32.5, 66.7)

CARBON-CARBONATE:
1-126 (0.0, 0.0, 0)

SITE 446 HOLE CORE 19 CORED INTERVAL: 163.0-172.5 m



LITHOLOGIC DESCRIPTION

Very Varying Lithology:
Section 1, 105-112 cm – brecciated pieces of black (10YR 2/1) and very dark grayish brown (10YR 3/2) **Chert and Pelagic Clay.**

Section 1, 112-122 cm – brecciated pieces of very dark grayish brown (2.5Y 3/2) and dark grayish brown (2.5Y 4/2) **Mud and Sand.**

Section 1, 122-150 cm – Very firm, moderately deformed brown (7.5YR 5/4) **Clay** with large impregnations of very dark gray (10YR 3/1) Mn-rich zones. Presence of Mn-Fe nodules (average size 1 mm).

Core-Catcher – brecciated pieces of brown (7.5YR 5/4) **Mudstone** and grayish brown (10YR 5/2) cross-bedded **Siltstone.**

SMEARS:

1-118 (Ashy Mineral Silty Sand – Minor)

Sand 50%		Quartz, Feldspar	42%
Silt 45%		Mica	5%
Clay 5%		Heavy minerals	20%
		Clay minerals	5%
		Opaque minerals	8%
		Volcanic glass	20%

1-139 (Clay)

Sand 2%		Quartz, Feldspar	3%
Silt 7%		Mica	TR
Clay 91%		Heavy minerals	TR
		Clay minerals	91%
		Volcanic glass	4%
		Micronodules	2%

1-143 (Zeolitic Clay with Micronodules – Minor)

Sand +		Quartz, Feldspar	2%
Silt 21%		Mica	1%
Clay 79%		Heavy minerals	TR
		Clay minerals	69%
		Micronodules	8%
		Zeolites	20%

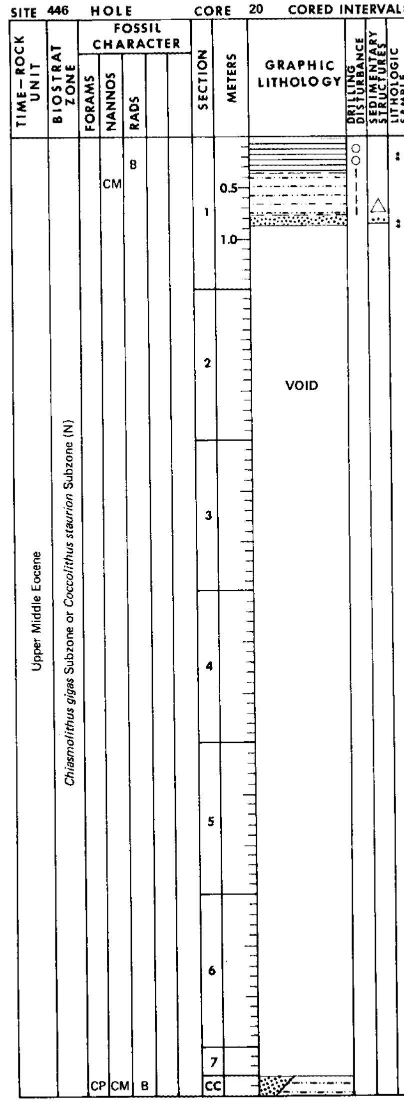
CC (Zeolitic Ashy Mudstone)

Sand 1%		Quartz, Feldspar	20%
Silt 51%		Heavy minerals	1%
Clay 42%		Clay minerals	42%
		Volcanic glass	25%
		Micronodules	1%
		Zeolites	10%
		Carbonate unspecified	TR
		Radiolarians	1%

CC (Mineral Clayey Siltstone)

Sand 5%		Quartz, Feldspar	20%
Silt 50%		Mica	5%
Clay 45%		Heavy minerals	5%
		Clay minerals	45%
		Opaque minerals	8%
		Volcanic glass	15%
		Zeolites	1%
		Radiolarians	1%

SITE 446 HOLE CORE 20 CORED INTERVAL: 172.5-182.0 m



LITHOLOGIC DESCRIPTION

10YR 4/2
7.5Y 5/4
10YR 3/2
5GY 5/1

Mudstones

Section 1, 0-19 cm – contamination.

Section 1, 19-33 cm – **Mudstones** with sharp contacts with colors dark grayish brown (10YR 4/2), brown (7.5Y 5/4) and very dark gray brown (10YR 3/2).

Section 1, 33-81 cm – greenish gray (5GY 5/1) **Mudstone** into salt and pepper **Sand,** graded.

Core-Catcher – dark greenish gray (5GY 4/1) sand, greenish gray (5GY 5/1) **Calcareous Mudstone.**

SMEARS:

1-23, 1-28, 1-32 (Clay)

Sand	1%	Quartz, Feldspar	2- 3%
Silt	6-15%	Mica	TR- 1%
Clay	84-93%	Heavy minerals	TR- 3%
		Volcanic glass	2%
		Opaque minerals	2-10%
		Zeolites	3- 5%
		Clay minerals	81-93%

1-90, CC (Mudstone)

Sand	< 1%	Quartz, Feldspar	9-12%
Silt	>65%	Mica	2- 3%
Clay	>30%	Heavy minerals	3- 4%
		Volcanic glass	3- 5%
		Opaque minerals	3%
		Carbonate unspecified	1%
		Clay minerals	73-75%

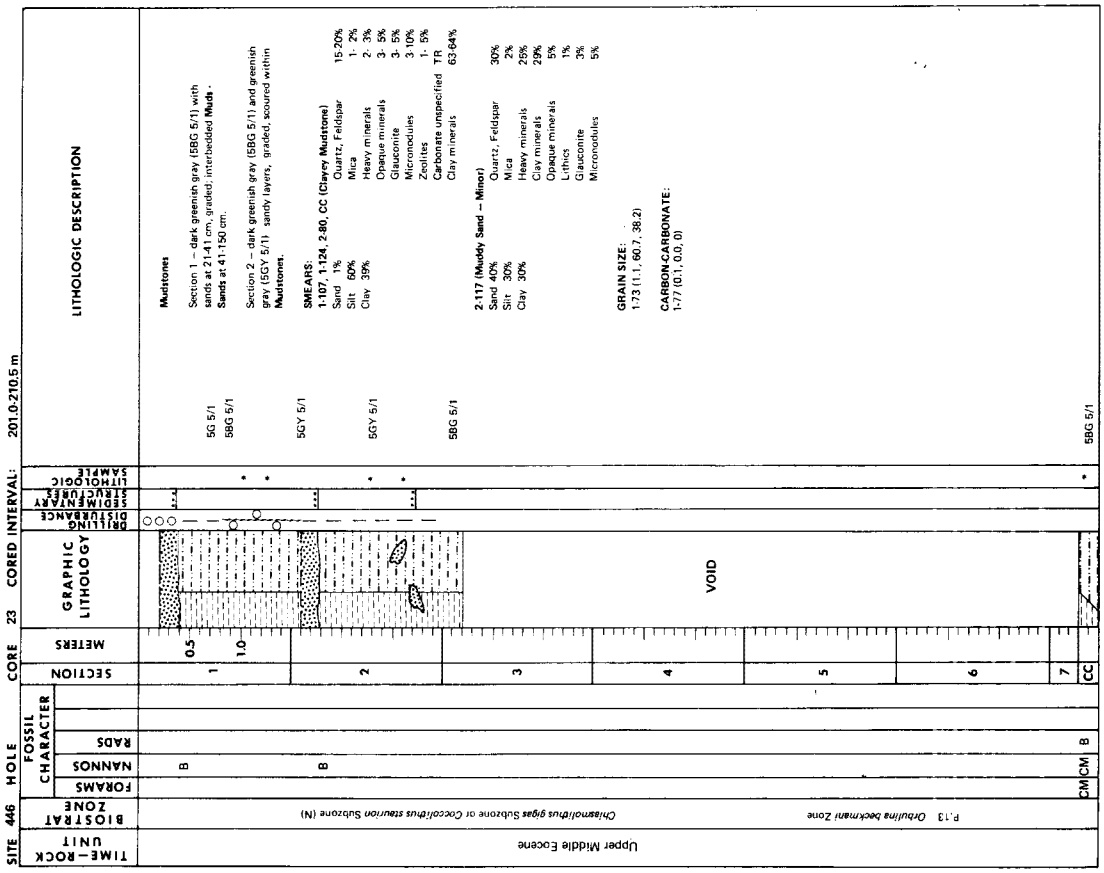
CC (Sand – Minor)

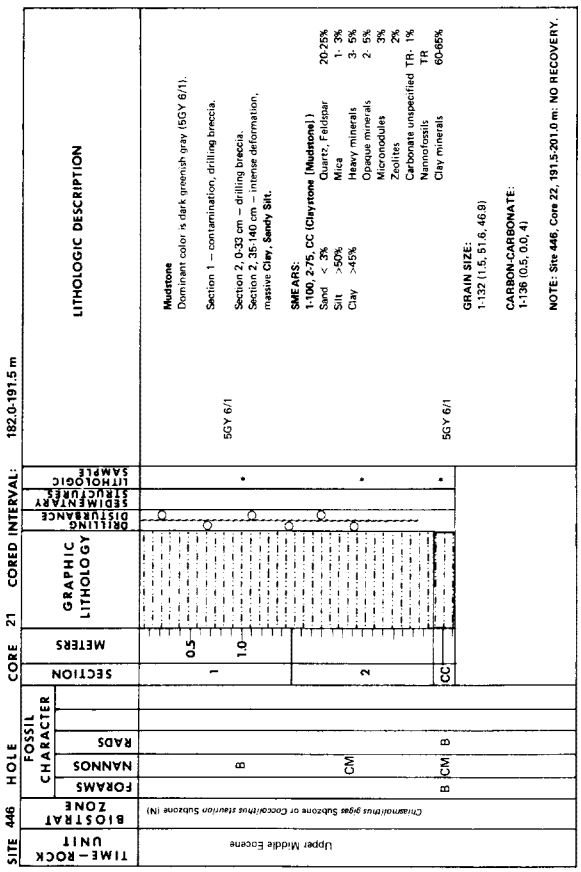
Sand 72%		Quartz, Feldspar	31%
Silt 20%		Mica	5%
Clay 8%		Heavy minerals	20%
		Opaques, Lithics	25%
		Volcanic glass	10%
		Clay minerals	3%

GRAIN SIZE:
CC-10 (71.9, 20.4, 7.8)
CC-34 (0.5, 65.7, 33.8)

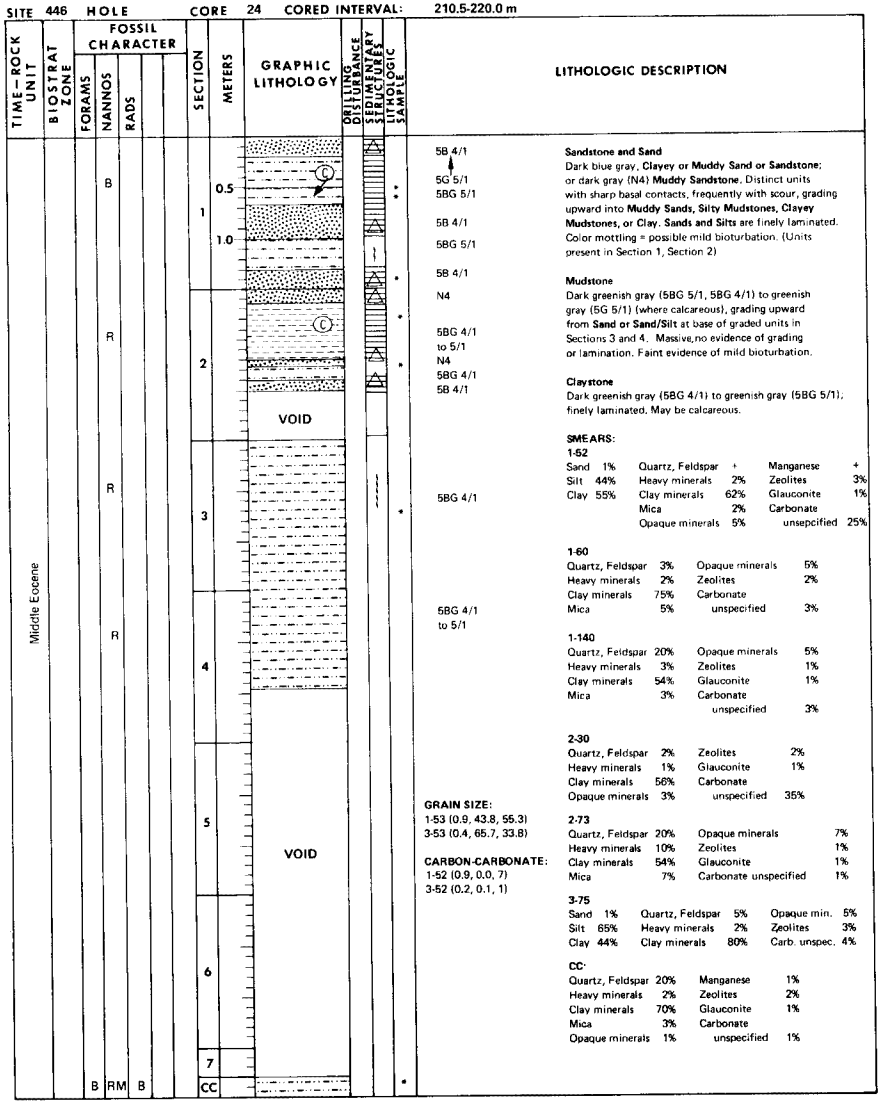
CARBON-CARBONATE:
1-6 (4.1, 0.1, 34)

5GY 4/1-5/1


SITE 446
HOLE
CORE 23
CORED INTERVAL: 201.0-210.5 m
TIME–ROCK UNIT
Upper Middle Eocene
BIOSTRAT ZONE
Chiasmolithus gigas Subzone or Coccolithus staurion Subzone (N)
P.13 Orbulina beckmanni Zone
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Mudstones
Section 1 – dark greenish gray (5BG 5/1) with sands at 21-41 cm, graded, interbedded Muds - Sands at 41-150 cm.
Section 2 – dark greenish gray (5BG 5/1) and greenish gray (5GY 5/1) sandy layers, graded, scoured within Mudstones.
SMEARS:
1-107, 1-124, 2-80, CC (Clayey Mudstone)
Sand 1%
Silt 60%
Clay 39%
Quartz, Feldspar 15-20%
Mica 1- 2%
Heavy minerals 2- 3%
Opaque minerals 3- 5%
Glauconite 3- 5%
Micronodules 3-10%
Zeolites 1- 5%
Carbonate unspecified TR
Clay minerals 63-64%
2-117 (Muddy Sand – Minor)
Sand 40%
Silt 30%
Clay 30%
Quartz, Feldspar 30%
Mica 2%
Heavy minerals 25%
Clay minerals 29%
Opaque minerals 5%
Lithics 1%
Glauconite 3%
Micronodules 5%
GRAIN SIZE:
1-73 (1.1, 60.7, 38.2)
CARBON-CARBONATE:
1-77 (0.1, 0.0, 0)
5G 5/1
5BG 5/1
5GY 5/1
VOID


SITE 446
HOLE
CORE 21
CORED INTERVAL: 182.0-191.5 m
TIME–ROCK UNIT
Upper Middle Eocene
BIOSTRAT ZONE
Chiasmolithus gigas Subzone or Coccolithus staurion Subzone (N)
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
Mudstone
Dominant color is dark greenish gray (5GY 6/1).
Section 1 – contamination, drilling breccia.
Section 2, 0-33 cm – drilling breccia.
Section 2, 35-140 cm – intense deformation, massive Clay, Sandy Silt.
SMEARS:
1-100, 2-75, CC (Claystone (Mudstone))
Sand < 5%
Silt >50%
Clay >45%
Quartz, Feldspar 20-25%
Mica 1- 3%
Heavy minerals 3- 5%
Opaque minerals 2- 5%
Micronodules 3%
Zeolites 2%
Carbonate unspecified TR- 1%
Nannofossils TR
Clay minerals 60-65%
GRAIN SIZE:
1-132 (1.5, 51.6, 46.9)
CARBON-CARBONATE:
1-136 (0.5, 0.0, 4)
NOTE: Site 446, Core 22, 191.5-201.0 m: NO RECOVERY.
5GY 6/1

SITE 446 HOLE CORE 24 CORED INTERVAL: 210.5-220.0 m



Sandstone and Sand
Dark blue gray, **Clayey or Muddy Sand or Sandstone**; or dark gray (N4) **Muddy Sandstone**. Distinct units with sharp basal contacts, frequently with scour, grading upward into **Muddy Sands, Silty Mudstones, Clayey Mudstones, or Clay. Sands and Silts** are finely laminated. Color mottling = possible mild bioturbation. (Units present in Section 1, Section 2)

Mudstone
Dark greenish gray (5BG 5/1, 5BG 4/1) to greenish gray (5G 5/1) (where calcareous), grading upward from **Sand or Sand/Silt** at base of graded units in Sections 3 and 4. Massive, no evidence of grading or lamination. Faint evidence of mild bioturbation.

Claystone
Dark greenish gray (5BG 4/1) to greenish gray (5BG 5/1); finely laminated. May be calcareous.

SMEARS:

1-52

Sand	1%	Quartz, Feldspar	+	Manganese	+
Silt	44%	Heavy minerals	2%	Zeolites	3%
Clay	55%	Clay minerals	62%	Glauconite	1%
		Mica	2%	Carbonate unspecified	25%
		Opaque minerals	5%		

1-60

Quartz, Feldspar	3%	Opaque minerals	5%
Heavy minerals	2%	Zeolites	2%
Clay minerals	75%	Carbonate unspecified	3%
Mica	5%		

1-140

Quartz, Feldspar	20%	Opaque minerals	5%
Heavy minerals	3%	Zeolites	1%
Clay minerals	54%	Glauconite	1%
Mica	3%	Carbonate unspecified	3%

2-30

Quartz, Feldspar	2%	Zeolites	2%
Heavy minerals	1%	Glauconite	1%
Clay minerals	56%	Carbonate unspecified	35%
Opaque minerals	3%		

2-73

Quartz, Feldspar	20%	Opaque minerals	7%
Heavy minerals	10%	Zeolites	1%
Clay minerals	54%	Glauconite	1%
Mica	7%	Carbonate unspecified	1%

3-75

Sand	1%	Quartz, Feldspar	5%	Opaque min.	5%
Silt	65%	Heavy minerals	2%	Zeolites	3%
Clay	44%	Clay minerals	80%	Carb. unspec.	4%

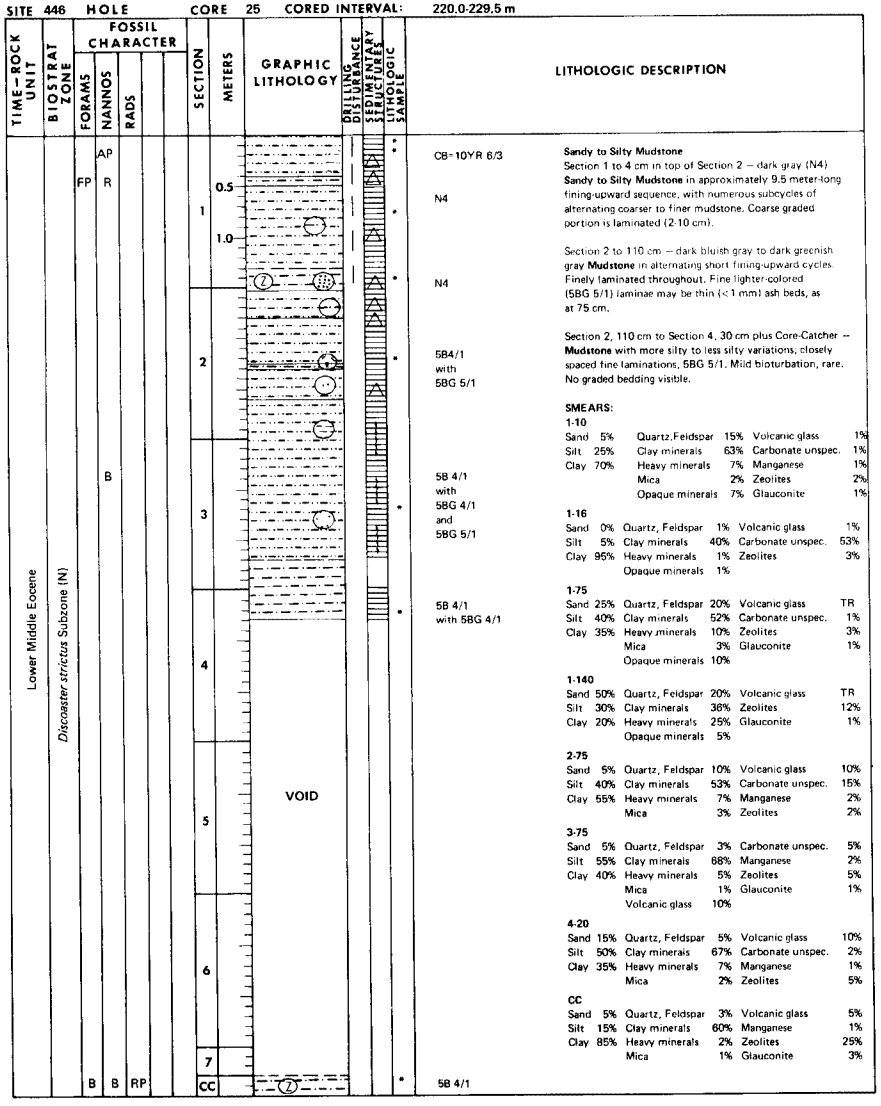
CC:

Quartz, Feldspar	20%	Manganese	1%
Heavy minerals	2%	Zeolites	2%
Clay minerals	70%	Glauconite	1%
Mica	3%	Carbonate unspecified	1%
Opaque minerals	1%		

GRAIN SIZE:
1-53 (0.9, 43.8, 55.3)
3-53 (0.4, 65.7, 33.8)

CARBON-CARBONATE:
1-52 (0.9, 0.0, 7)
3-52 (0.2, 0.1, 1)

SITE 446 HOLE CORE 25 CORED INTERVAL: 220.0-229.5 m



Sandy to Silty Mudstone
Section 1 to 4 cm in top of Section 2 – dark gray (N4) **Sandy to Silty Mudstone** in approximately 9.5 meter-long fining-upward sequence, with numerous subcycles of alternating coarser to finer mudstone. Coarse graded portion is laminated (2-10 cm).

Section 2 to 110 cm – dark bluish gray to dark greenish gray **Mudstone** in alternating short fining-upward cycles. Finely laminated throughout. Fine lighter-colored (5BG 5/1) laminae may be thin (<1 mm) ash beds, as at 75 cm.

Section 2, 110 cm to Section 4, 30 cm plus Core-Catcher – **Mudstone** with more silty to less silty variations, closely spaced fine laminations, 5BG 5/1. Mild bioturbation, rare. No graded bedding visible.

SMEARS:

1-10

Sand	5%	Quartz, Feldspar	15%	Volcanic glass	1%
Silt	25%	Clay minerals	63%	Carbonate unspec.	1%
Clay	70%	Heavy minerals	7%	Manganese	1%
		Mica	2%	Zeolites	2%
		Opaque minerals	7%	Glauconite	1%

1-16

Sand	0%	Quartz, Feldspar	1%	Volcanic glass	1%
Silt	5%	Clay minerals	40%	Carbonate unspec.	53%
Clay	95%	Heavy minerals	1%	Zeolites	3%
		Opaque minerals	1%		

1-75

Sand	25%	Quartz, Feldspar	20%	Volcanic glass	TR
Silt	40%	Clay minerals	52%	Carbonate unspec.	1%
Clay	35%	Heavy minerals	10%	Zeolites	3%
		Mica	3%	Glauconite	1%
		Opaque minerals	10%		

1-140

Sand	50%	Quartz, Feldspar	20%	Volcanic glass	TR
Silt	30%	Clay minerals	36%	Zeolites	12%
Clay	20%	Heavy minerals	25%	Glauconite	1%
		Opaque minerals	5%		

2-75

Sand	5%	Quartz, Feldspar	10%	Volcanic glass	10%
Silt	40%	Clay minerals	53%	Carbonate unspec.	15%
Clay	55%	Heavy minerals	7%	Manganese	2%
		Mica	3%	Zeolites	2%

3-75

Sand	5%	Quartz, Feldspar	3%	Carbonate unspec.	5%
Silt	55%	Clay minerals	88%	Manganese	2%
Clay	40%	Heavy minerals	5%	Zeolites	5%
		Mica	1%	Glauconite	1%
		Volcanic glass	10%		

4-20

Sand	15%	Quartz, Feldspar	5%	Volcanic glass	10%
Silt	50%	Clay minerals	67%	Carbonate unspec.	2%
Clay	35%	Heavy minerals	7%	Manganese	1%
		Mica	2%	Zeolites	5%

CC

Sand	5%	Quartz, Feldspar	3%	Volcanic glass	5%
Silt	15%	Clay minerals	60%	Manganese	1%
Clay	85%	Heavy minerals	2%	Zeolites	25%
		Mica	1%	Glauconite	3%

SITE 446 HOLE CORE 26 CORED INTERVAL: 229.5-239.0 m

TIME–ROCK UNIT: Lower Middle Eocene

BIOSTRAT ZONE: *Discoaster strictus* Subzone (N)

FOSSIL CHARACTER: FORAMS B; NANNOS B; RADS RP

SECTION: 1 | 2 | 3 | 4 | 5 | 6 | 7 | CC

METERS: 0.5; 1.0

GRAPHIC LITHOLOGY: FP; B; B; VOID; VOID; GL

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE

5BG 4/1
5BG 5/1
5B 4/1

5Y 7/1

5BG 4/1
with
5G 4/1

5B 4/1
with
5BG 4/1

with
5G 4/1

5B 4/1

LITHOLOGIC DESCRIPTION

Glauconitic Mudstone

Section 1 – dark greenish gray, greenish gray, dark blue-gray massive **Mudstones** with 1 mm to 1 cm laminations. Bioturbated sandy-silty interbeds **(Glauconitic Muddy Sandstones, Sandy Mudstones)** 0.5 mm to approximately 1 cm have sharp bases, graded fining upward.

Section 2 – **Mudstones** interbedded with fining upward sandy silty (glauconitic) layers up to 3 cm. Bioturbation mild.

Section 3 – hard and soft **(Mudstone and Muddy Sandstone)** layers interbedded. Coarse layers graded(?). Coarse layers mushy and soft. Lamination-cross laminated.

Clayey Chalk

Section 1 – light gray (5Y 7/1) thin bed of chalk; also in base of Section 3, and in laminae in Core-Catcher.

SMEARS:

1-65

Sand	40%	Quartz, Feldspar	15%	Volcanic glass	5%
Silt	20%	Clay minerals	51%	Carbonate unspec.	5%
Clay	40%	Heavy minerals	5%	Zeolites	10%
		Opaque minerals	7%	Glaugonite	1%
		Mica	2%		

1-105

Sand	0%	Quartz, Feldspar	1%	Volcanic glass	2%
Silt	15%	Clay minerals	38%	Carbonate unspec.	50%
Clay	85%	Heavy minerals	1%	Zeolites	3%
		Opaque minerals	3%	Glauconite	1%
		Mica	1%		

1-135

Sand	5%	Quartz, Feldspar	3%	Volcanic glass	5%
Silt	15%	Clay minerals	67%	Carbonate unspec.	TR
Clay	80%	Heavy minerals	1%	Zeolites	3%
		Opaque minerals	5%	Glauconite	10%
		Mica	5%		

2-60

Sand	60%	Quartz, Feldspar	2%	Carbonate unspec.	1%
Silt	20%	Clay minerals	30%	Manganese	1%
Clay	20%	Heavy minerals	10%	Zeolites	3%
		Opaque minerals	3%	Glauconite	38%
		Mica	3%		
		Volcanic glass	1%		

2-135

Sand	0%	Quartz, Feldspar	3%	Volcanic glass	5%
Silt	15%	Clay minerals	72%	Carbonate unspec.	TR
Clay	85%	Heavy minerals	3%	Zeolites	5%
		Opaque minerals	10%	Glauconite	(cl)
		Mica	2%		

3-75

Sand	0%	Quartz, Feldspar	1%	Volcanic glass	1%
Silt	5%	Clay minerals	20%	Carbonate unspec.	73%
Clay	95%	Heavy minerals	1%	Zeolites	2%
		Mica	1%	Glauconite	1%

3-120

Sand	40%	Quartz, Feldspar	20%	Mica	3%
Silt	30%	Clay minerals	40%	Volcanic glass	3%
Clay	30%	Heavy minerals	2%	Zeolites	3%
		Opaque minerals	3%	Glauconite	26%

4-25

Sand	40%	Quartz, Feldspar	15%	Volcanic glass	5%
Silt	30%	Clay minerals	24%	Carbonate unspec.	TR
Clay	30%	Heavy minerals	15%	Zeolites	3%
		Mica	3%	Glauconite	25%
		Opaque minerals	10%		

CC

Sand	5%	Quartz, Feldspar	5%	Volcanic glass	15%
Silt	20%	Clay minerals	70%	Carbonate unspec.	1%
Clay	75%	Heavy minerals	2%	Zeolites	5%
		Opaque minerals	-	Glauconite	(cl)
		Mica	2%		

SITE 446 HOLE CORE 27 CORED INTERVAL: 239.0-248.5 m

TIME–ROCK UNIT: Lower Middle Eocene

BIOSTRAT ZONE: *Discoaster strictus* Subzone (N)

FOSSIL CHARACTER: FORAMS B; NANNOS CM; RADS FP

SECTION: 1 | 2 | 3 | 4 | 5 | 6 | 7 | CC

METERS: 0.5; 1.0

GRAPHIC LITHOLOGY: B; B; B; VOID

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE

5B 4/1
with
5BG 5/1
with black

5G 5/1

5B 4/1
with
5BG 5/1

5B 4/1
5G 5/1

N4

N4

N4

LITHOLOGIC DESCRIPTION

Mudstone (to Sandy Mudstone, Muddy Sand). Dark bluish gray **Mudstone** with lighter-colored layers (5BG 5/1) and laminae, and black laminae. Laminae = 0.5 mm to 1 cm. **Mudstones** form part of long fining upward sequence with **Muddy or Silty Sand** at base grading up into **Silty Mudstone to Calcareous Mudstone to Clayey Chalk;** chalk overlain by very fine grained **Mudstone.** Laminae and prominent except in coarsest portion. Sandy portion **Glauconitic** as in Core 26; sharp basal contacts. Also **Clayey Chalk,** light gray (5G 5/1 to 5B 4/1) interbeds toward top of fining upward sequence.

SMEARS:

1-20

Sand	5%	Quartz, Feldspar	3%	Opaque minerals	3%
Silt	20%	Volcanic glass	1%	Carbonate unspec.	35%
Clay	75%	Clay minerals	50%	Zeolites	1%
		Heavy minerals	5%	Glauconite	1%
		Mica	1%		

1-45

Sand	60%	Quartz, Feldspar	10%	Mica	1%
Silt	20%	Lithic Fragments	7%	Opaque minerals	10%
Clay	20%	Volcanic glass	1%	Carbonate unspec.	21%
		Clay minerals	20%	Zeolites	3%
		Heavy minerals	26%	Glauconite	2%

1-145

Sand	5%	Quartz, Feldspar	7!	Opaque minerals	10%
Silt	25%	Volcanic glass	1%	Carbonate unspec.	1%
Clay	70%	Clay minerals	70%	Zeolites	2%
		Heavy minerals	5%	Glauconite	2%
		Mica	2%		

2-5

Sand	5%	Quartz, Feldspar	1%	Carbonate unspec.	67%
Silt	5%	Clay minerals	30%	Glauconite	1%
Clay	90%	Heavy minerals	1%		

2-66

Sand	60%	Lithic Fragments	10%	Opaque minerals	7%
Silt	20%	Quartz, Feldspar	15%	Carbonate unspec.	8%
Clay	20%	Clay minerals	26%	Zeolites	1%
		Heavy minerals	25%	Glauconite	5%
		Mica	3%		

2-115

Sand	5%	Quartz, Feldspar	3%	Opaque minerals	10%
Silt	25%	Volcanic glass	5%	Carbonate unspec.	8%
Clay	70%	Clay minerals	70%	Zeolites	2%
		Heavy minerals	2%	Glauconite	2%
		Mica	3%		

CC

Sand	5%	Quartz, Feldspar	7%	Opaque minerals	15%
Silt	25%	Volcanic glass	1%	Carbonate unspec.	6%
Clay	70%	Clay minerals	68%	Zeolites	3%
		Heavy minerals	2%	Glauconite	5%
		Mica	2%		

SITE 446 HOLE CORE 28 CORED INTERVAL: 248.5-258.0 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Lower Middle Eocene	*Discoaster strictus* Subzone (N)	B	R R	B	1 CC	0.5 1.0				*	N4

Mudstone
Firm, brecciated by drilling, dark gray (N4) massive, no structures; laminations.

SMEARS:
1-75, CC (Mudstone)

Sand	3- 5%	Quartz, Feldspar	3- 5%
Silt	25-27%	Mica	2%
Clay	70%	Heavy minerals	3- 4%
		Clay minerals	66-71%
		Opaque minerals	10%
		Volcanic glass	1-20%
		Lithics	5%
		Glauconite	1- 2%
		Zeolites	1%
		Carbonate unspecified	1- 5%
		Nannofossils	1-TR%

SITE 446 HOLE CORE 29 CORED INTERVAL: 258.0-267.5 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Lower Middle Eocene	*Discoaster strictus* Subzone (N)	B	CM B	RP	1 2 CC	0.5 1.0				*	5G 4/1 N4 N4 5G 4/1 N4 5BG 4/1 N4

Mudstones, Claystones, Sandy Mudstones
Series of turbidite sequences of **Silty Sands, Mudstones, Claystones, Sandy Mudstones.**

Section 1 – **Silty Sand** – massive; **Mudstones** – bioturbated, laminated; **Mudstones** – massive, gray; **Sandy Mud** – coarse laminae; and **Clayey Sand** – glauconitic.

Section 2 – **Claystone** – laminated, bioturbated; **Sandy Mudstone** – laminated, cross-bedded; **Clay** – lamination, bioturbated; **Silt** – massive; **Clay Mudstone** – laminae.

Core-Catcher – Clayey Sand.

SMEARS:
1-10 (Silty Sand)
1-35 (Claystone)
1-85 (Mudstone)
1-145 (Glauconitic Silty Clayey Sand)
2-40 (Calcareous Sandy Mudstone)
2-60 (Clayey Sandy Mudstone)
2-125 (Mudstone)
CC (Clayey Sand)

SITE 446 HOLE CORE 30 CORED INTERVAL: 267.5-277.0 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Lower Middle Eocene	*Rhabdosphaera inflata* Subzone (N)	B	FP R R R R	B	1 2 3 4 5 6 7 CC	0.5 1.0	VOID VOID			*	N4 5G 4/1 5Y 4/1 5GY 4/1 5GY 4/1 5GY 4/1 5G 4/1 5GY 4/1 5G 4/1 5GY 5/1 5GY 4/1

Mudstones, Sandy Mudstones and Sandstones
Probable turbidite sequence:
Section 1 – Massive, dark gray (N4) to dark greenish gray (5G 4/1 - 5GY 4/1) **Mudstone.**

Section 2 – Massive, homogeneous **Mudstone.**

Section 3 – Dark greenish gray (5GY 4/1) massive graded **Sandy Mudstone.**

Section 4 – Clayey **Sandstone** parallel laminae in upper, homogeneous.

Section 5 – Dark greenish gray, medium to coarse graded **Muddy Sandstone,** some parallel laminae. Graded section upwards Section 5 to Section 2.

Section 6 – **Mudstone to Sandstone and Clayey Sandstone.**

Core-Catcher – **Mudstone to Sandstone.**

SMEARS:
1-75, 2-75, 6-17, CC (Mudstone)

Sand	5%	Quartz, Feldspar	3- 5%
Silt	10-15%	Mica	1%
Clay	80-85%	Heavy minerals	1- 3%
		Clay minerals	76-88%
		Opaque minerals	7-10%
		Volcanic glass	1%
		Zeolites	1%
		Carbonate unspecified	1%

3-75 (Sandy Mudstone)
4-75 (Clayey Sand)
5-50 (Muddy Sandstone)

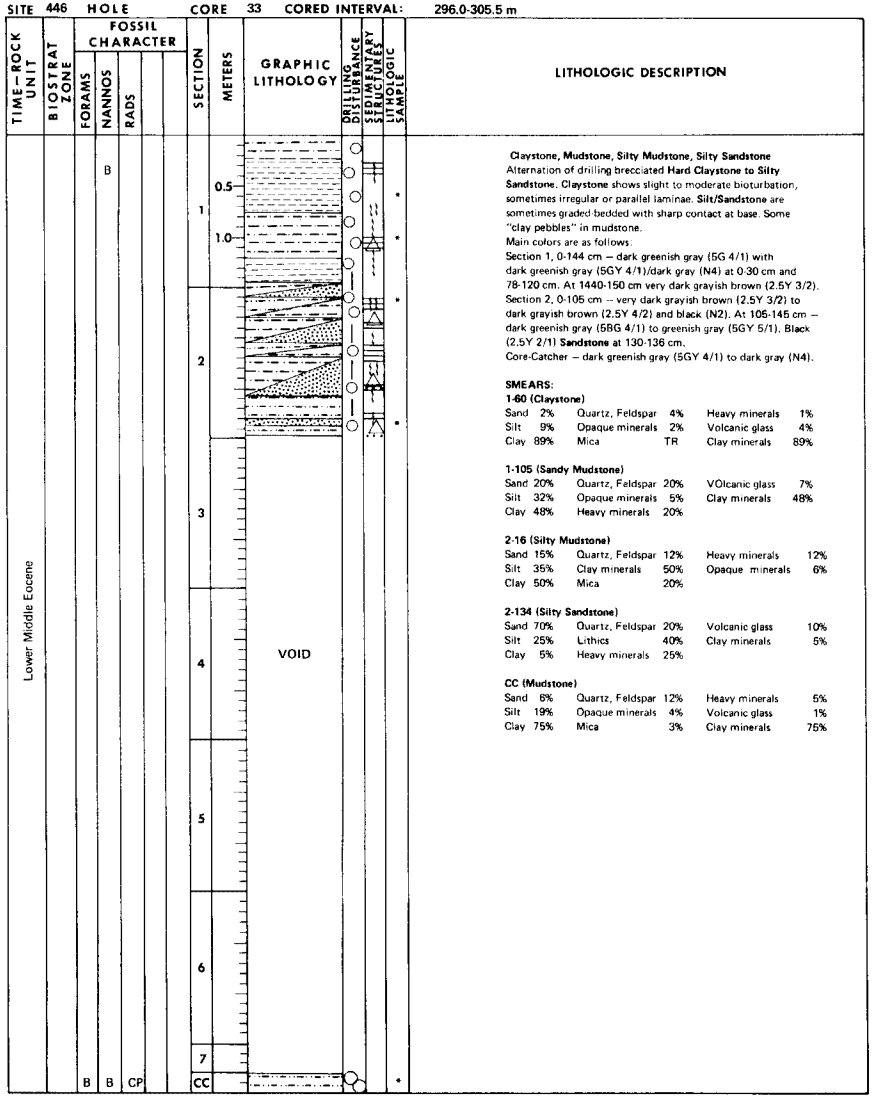
SITE 446 HOLE CORE 31 CORED INTERVAL: 277.0-286.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Lower Middle Eocene			B		1	0.5				*	**Mudstones** Section 1 -- drilling breccia of **Mudstone, Silty Mudstone, Siltstone, Mudstone, Conglomerates, Mudstone.**
						1.0					5GY 4/1 with variations Section 2 -- as per Section 1.
											Section 3 -- as per Section 1.
					2					*	Sections consist of highly distrubed brecciated turbidite series.
			B								5Y 4/1
					3					*	**SMEARS:** **1-140, 2-90, CC (Silty Mudstones)** Sand 15% Quartz, Feldspar 7-10% Silt 25-30% Mica 3- 5% Clay 45-60% Heavy minerals 3-15% Clay minerals 48% Opaque minerals 5-15% Lithics 15% Zeolites 2% Carbonate unspecified 2%
			B								**3-44 (Mudstone)** 5GY 4/1 5GY 5/1 Sand 5% Quartz, Feldspar 2% Silt 25% Mica 2% Clay 70% Heavy minerals 1% Clay minerals 85% Opaque minerals 5% Volcanic glass 1% Lithics 3% Zeolites 1%
		B	B	CP	CC					*	

SITE 446 HOLE CORE 32 CORED INTERVAL: 286.5-296.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Lower Middle Eocene			B		1	0.5				*	**Claystone Mudstone, Silty Mudstone** Drilling blocks throughout.
						1.0					Section 1, Section 2, 0-100 cm -- dark greenish gray (5Y 4/1, 5GY 4/1) and greenish gray (5Y 5/1) firm to hard, sometimes laminated and bioturbated **Claystone to Mudstone.**
					2					*	Section 2, 100 cm to bottom -- dark greenish gray (5G 4/1) to greenish gray (5G 5/1) (equals greener) **Claystone and Mudstone,** with local patches of **Calcareous Ooze. Claystones** have laminae and moderate/minor bioturbation evidence and contain irregularly silty sandy stringers. Signs of soft sediment deformation.
			B								**SMEARS:** **1-60 (Mudstone)** Sand 3% Quartz, Feldspar 12% Heavy minerals 6% Silt 22% Clay minerals 77% Opaque minerals 2% Clay 75% Mica 1% Volcanic glass 2%
					3					*	**1-115 (Claystone)** Sand 5% Quartz, Feldspar 7% Clay minerals 83% Silt 9% Mica, Chlorite 2% Volcanic glass TR Clay 86% Heavy minerals 5% Glauconite 3%
			B								**2-130 (Claystone)** Sand 3% Clay minerals 86% Silt 9% Quartz, Feldspar 7% Clay 88% Heavy minerals 3%
											4-94 (Silty Mudstone) Sand 12% Quartz, Feldspar 20% Volcanic glass 8% Silt 48% Clay minerals 48% Mica 2% Clay 40% Heavy minerals 17% Glauconite 1% Opaque minerals 4%
			B		4					*	**5-19 (Calcareous Ooze -- Minor)** Sand 1% Quartz, Feldspar 2% Carbonate unspecified 97% Silt 30% Heavy minerals 1% Clay 69%
											5-120 (Silty Mudstone) Sand 13% Quartz, Feldspar 12% Silt 44% Heavy minerals 18% Clay 53% Opaque minerals 5%
			B		5					*	**CC (Mudstone)** Sand 15% Quartz, Feldspar 12% Silt 17% Heavy minerals 5% Clay 78% Clay minerals 78%
							VOID				
					6					*	
					7						
		B	B	CP	CC					*	

SITE 446 HOLE CORE 33 CORED INTERVAL: 296.0-305.5 m



Claystone, Mudstone, Silty Mudstone, Silty Sandstone
Alternation of drilling brecciated **Hard Claystone to Silty Sandstone. Claystone** shows slight to moderate bioturbation, sometimes irregular or parallel laminae. **Silt/Sandstone** are sometimes graded-bedded with sharp contact at base. Some "clay pebbles" in mudstone.
Main colors are as follows:
Section 1, 0-144 cm – dark greenish gray (5G 4/1) with dark greenish gray (5GY 4/1)/dark gray (N4) at 0-30 cm and 78-120 cm. At 1440-150 cm very dark grayish brown (2.5Y 3/2).
Section 2, 0-105 cm – very dark grayish brown (2.5Y 3/2) to dark grayish brown (2.5Y 4/2) and black (N2). At 105-145 cm – dark greenish gray (5BG 4/1) to greenish gray (5GY 5/1). Black (2.5Y 2/1) **Sandstone** at 130-136 cm.
Core-Catcher – dark greenish gray (5GY 4/1) to dark gray (N4).

SMEARS:

1-60 (Claystone)

Sand	2%	Quartz, Feldspar	4%	Heavy minerals	1%
Silt	9%	Opaque minerals	2%	Volcanic glass	4%
Clay	89%	Mica	TR	Clay minerals	89%

1-105 (Sandy Mudstone)

Sand	20%	Quartz, Feldspar	20%	VOlcanic glass	7%
Silt	32%	Opaque minerals	5%	Clay minerals	48%
Clay	48%	Heavy minerals	20%		

2-16 (Silty Mudstone)

Sand	15%	Quartz, Feldspar	12%	Heavy minerals	12%
Silt	35%	Clay minerals	50%	Opaque minerals	6%
Clay	50%	Mica	20%		

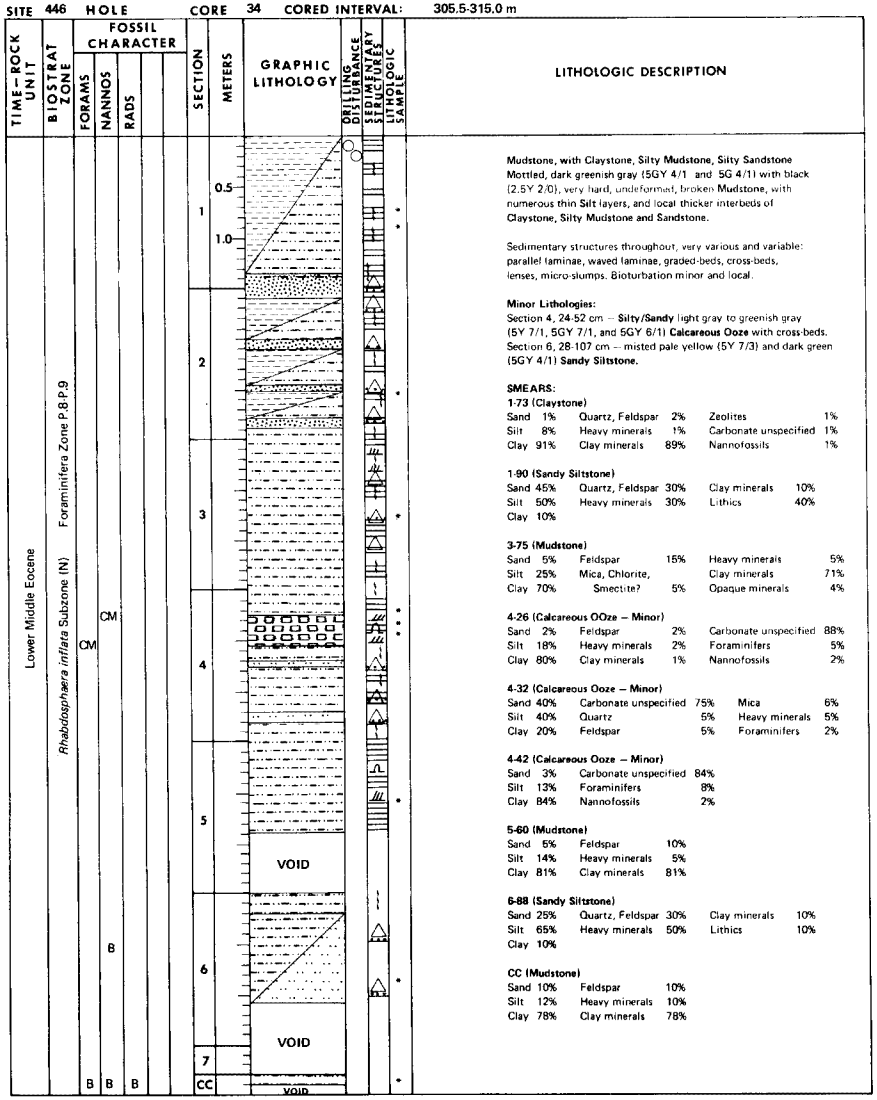
2-134 (Silty Sandstone)

Sand	70%	Quartz, Feldspar	20%	Volcanic glass	10%
Silt	25%	Lithics	40%	Clay minerals	5%
Clay	5%	Heavy minerals	25%		

CC (Mudstone)

Sand	6%	Quartz, Feldspar	12%	Heavy minerals	5%
Silt	19%	Opaque minerals	4%	Volcanic glass	1%
Clay	75%	Mica	3%	Clay minerals	75%

SITE 446 HOLE CORE 34 CORED INTERVAL: 305.5-315.0 m



Mudstone, with Claystone, Silty Mudstone, Silty Sandstone Mottled, dark greenish gray (5GY 4/1 and 5G 4/1) with black (2.5Y 2/0), very hard, undeformed, broken Mudstone, with numerous thin Silt layers, and local thicker interbeds of Claystone, Silty Mudstone and Sandstone.

Sedimentary structures throughout, very various and variable: parallel laminae, waved laminae, graded-beds, cross-beds, lenses, micro-slumps. Bioturbation minor and local.

Minor Lithologies:
Section 4, 24-52 cm – **Silty/Sandy** light gray to greenish gray (5Y 7/1, 5GY 7/1, and 5GY 6/1) **Calcareous Ooze** with cross-beds.
Section 6, 28-107 cm – misted pale yellow (5Y 7/3) and dark green (5GY 4/1) **Sandy Siltstone.**

SMEARS:

1-73 (Claystone)

Sand	1%	Quartz, Feldspar	2%	Zeolites	1%
Silt	8%	Heavy minerals	1%	Carbonate unspecified	1%
Clay	91%	Clay minerals	89%	Nannofossils	1%

1-90 (Sandy Siltstone)

Sand	45%	Quartz, Feldspar	30%	Clay minerals	10%
Silt	50%	Heavy minerals	30%	Lithics	40%
Clay	10%				

3-75 (Mudstone)

Sand	5%	Feldspar	15%	Heavy minerals	5%
Silt	25%	Mica, Chlorite,		Clay minerals	71%
Clay	70%	Smectite?	5%	Opaque minerals	4%

4-26 (Calcareous OOze – Minor)

Sand	2%	Feldspar	2%	Carbonate unspecified	88%
Silt	18%	Heavy minerals	2%	Foraminifers	5%
Clay	80%	Clay minerals	1%	Nannofossils	2%

4-32 (Calcareous Ooze – Minor)

Sand	40%	Carbonate unspecified	75%	Mica	6%
Silt	40%	Quartz	5%	Heavy minerals	5%
Clay	20%	Feldspar	5%	Foraminifers	2%

4-42 (Calcareous Ooze – Minor)

Sand	3%	Carbonate unspecified	84%
Silt	13%	Foraminifers	8%
Clay	84%	Nannofossils	2%

5-60 (Mudstone)

Sand	5%	Feldspar	10%
Silt	14%	Heavy minerals	5%
Clay	81%	Clay minerals	81%

6-88 (Sandy Siltstone)

Sand	25%	Quartz, Feldspar	30%	Clay minerals	10%
Silt	65%	Heavy minerals	50%	Lithics	10%
Clay	10%				

CC (Mudstone)

Sand	10%	Feldspar	10%
Silt	12%	Heavy minerals	10%
Clay	78%	Clay minerals	78%

SITE 446 HOLE CORE 35 CORED INTERVAL: 315.0-324.5 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Eocene		B	B	RP	CC						Among drilling contamination breccias, one piece of misted dark greenish gray (5BG 4/1) **Mudstone** and black (5Y 2/1) **Sandy Siltstone.**

SMEAR:
CC (Mudstone)

Sand 50%	Quartz, Feldspar 15%	Clay minerals 75%	
Silt 20%	Mica 1%	Opaque minerals 3%	
Clay 75%	Heavy minerals 5%		

SITE 446 HOLE CORE 36 CORED INTERVAL: 324.5-334.0 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Eocene			B		1	0.5					5Y 4/1 5GY 4/1
						1.0					
					2						5Y 4/1 5GY 4/1
			B		3						5Y 4/1 5GY 4/1 with 5Y 6/1 10R 4/2
					4						5Y 4/1 5GY 5/1
			B	B	5						5YR 5/3
	B	B	AP		CC						5GY 5/1

Mudstone – Claystones
Sections 1 and 2 – Alternation of **Mudstones, Claystones** with variable laminae, minor bioturbation.
Section 3 – variable colored **Mudstones, Claystones, Siltstones.**
Section 4 – dark gray (5Y 4/1), greenish gray (5GY 5/1) with weak red (10R 4/2) cycles of interbedded **Claystones,** coarser units.
Section 5 – thin laminated, reddish brown (5YR 5/3) **Mudstone.**

SMEARS:
1-39, 1-49, 1-63, 3-30, 5-25 (Claystone)

Sand 0-3%	Quartz, Feldspar	3-5%	
Silt 2-8%	Mica	1-3%	
Clay 90-98%	Heavy minerals	0-3%	
	Clay minerals	90-98%	
	Carbonate unspecified	0-5%	
	Zeolites	TR-1%	

1-144, 3-104, 5-25, CC (Mudstone)

Sand 5-10%	Quartz, Feldspar	10-15%	
Silt 4-18%	Mica	0-3%	
Clay 79-86%	Heavy minerals	0-8%	
	Clay minerals	79-86%	
	Opaque minerals	1-6%	
	Radiolarians	0-10%	
	Volcanic glass	0-1%	

SITE 446 HOLE CORE 37 CORED INTERVAL: 334.0-343.5 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Eocene			B		1	0.5	VOID				7.5YR 5/4 7.5YR 4/4
						1.0					

Mudstones/Claystones
Brown (7.5YR 5/4) to dark brown (7.5YR 4/4), laminated, minor bioturbation.

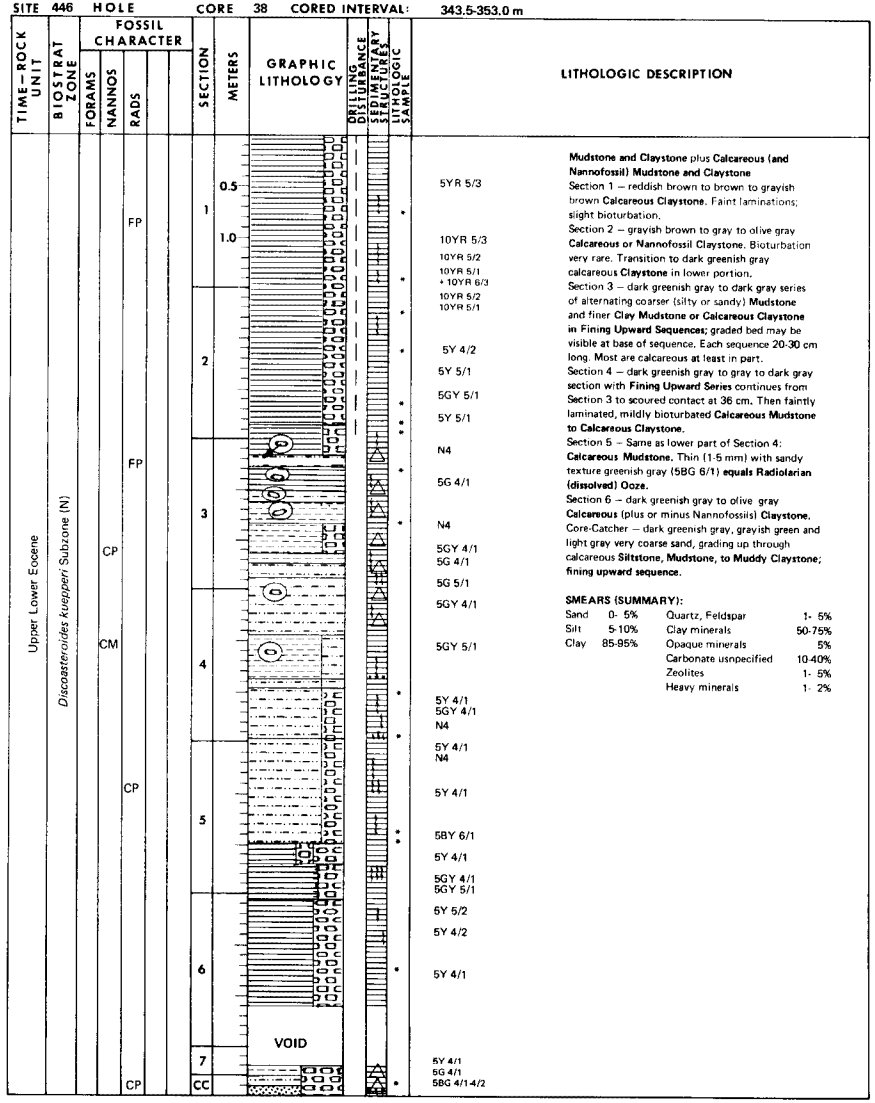
SMEARS:
1-110, 1-132 (Claystones)

Sand 5-15%	Quartz, Feldspar	2-3%	
Silt 4-10%	Clay minerals	81-85%	
Clay 81-85%	Micronodules	2%	
	Zeolites	TR	
	Radiolarians	10-15%	
	Nannofossils	TR	

1-135 (Mudstones)

Sand 15%	Quartz, Feldspar	5%	
Silt 10%	Clay minerals	15%	
Clay 75%	Opaque minerals	40%	
	Micronodules	20%	
	Zeolites	25%	

SITE 446 HOLE CORE 38 CORED INTERVAL: 343.5-353.0 m

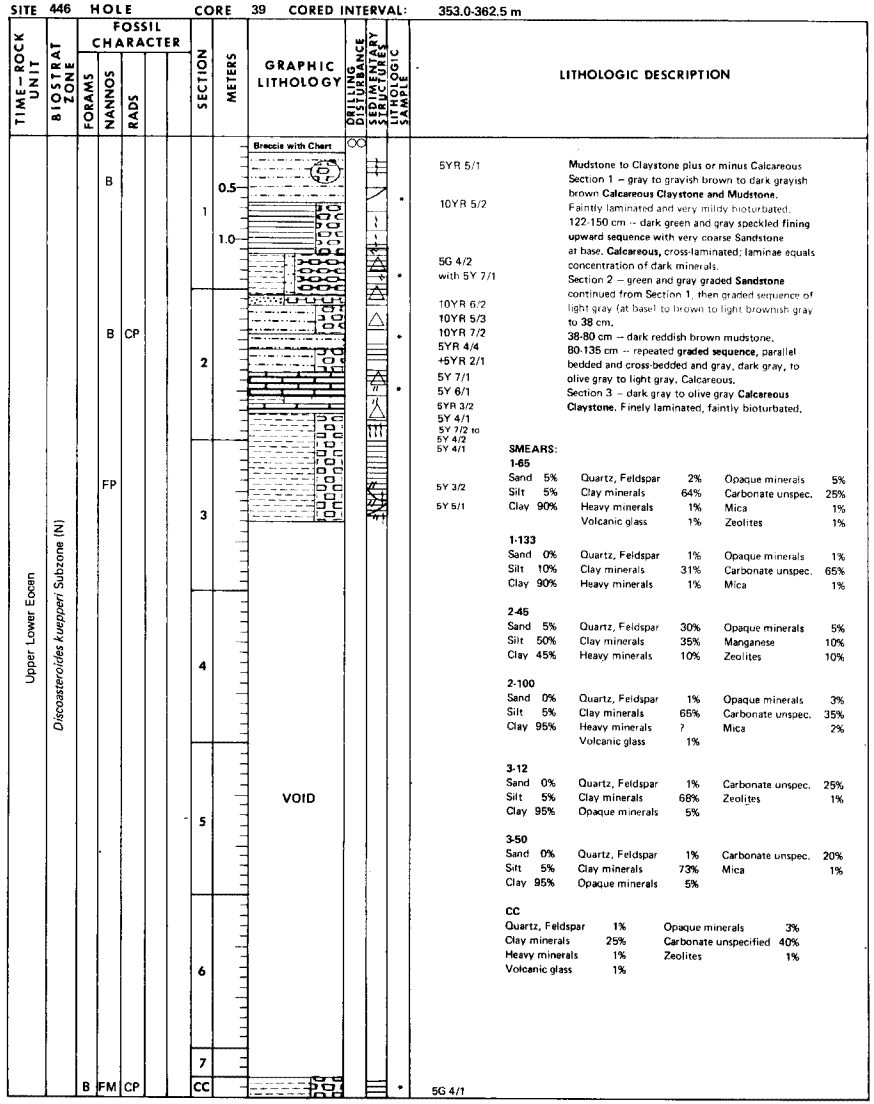


Mudstone and Claystone plus **Calcareous (and Nannofossil) Mudstone and Claystone**
Section 1 – reddish brown to brown to grayish brown **Calcareous Claystone.** Faint laminations; slight bioturbation.
Section 2 – grayish brown to gray to olive gray **Calcareous or Nannofossil Claystone.** Bioturbation very rare. Transition to dark greenish gray calcareous **Claystone** in lower portion.
Section 3 – dark greenish gray to dark gray series of alternating coarser (silty or sandy) **Mudstone** and finer **Clay Mudstone or Calcareous Claystone in Fining Upward Sequences;** graded bed may be visible at base of sequence. Each sequence 20-30 cm long. Most are calcareous at least in part.
Section 4 – dark greenish gray to gray to dark gray section with **Fining Upward Series** continues from Section 3 to scoured contact at 36 cm. Then faintly laminated, mildly bioturbated **Calcareous Mudstone to Calcareous Claystone.**
Section 5 – Same as lower part of Section 4: **Calcareous Mudstone.** Thin (1-5 mm) with sandy texture greenish gray (5BG 6/1) **equals Radiolarian (dissolved) Ooze.**
Section 6 – dark greenish gray to olive gray **Calcareous** (plus or minus Nannofossils) **Claystone.**
Core-Catcher – dark greenish gray, grayish green and light gray very coarse sand, grading up through calcareous **Siltstone, Mudstone, to Muddy Claystone; fining upward sequence.**

SMEARS (SUMMARY):

Sand	0- 5%	Quartz, Feldspar	1- 5%
Silt	5-10%	Clay minerals	50-75%
Clay	85-95%	Opaque minerals	5%
		Carbonate unspecified	10-40%
		Zeolites	1- 5%
		Heavy minerals	1- 2%

SITE 446 HOLE CORE 39 CORED INTERVAL: 353.0-362.5 m



Mudstone to Claystone plus or minus Calcareous
Section 1 – gray to grayish brown to dark grayish brown **Calcareous Claystone and Mudstone.** Faintly laminated and very mildly bioturbated.
122-150 cm – dark green and gray speckled **fining upward sequence** with very coarse Sandstone at base. **Calcareous,** cross-laminated; laminae equals concentration of dark minerals.
Section 2 – green and gray graded **Sandstone** continued from Section 1, then graded sequence of light gray (at base) to brown to light brownish gray to 38 cm.
38-80 cm – dark reddish brown mudstone.
80-135 cm – repeated **graded sequence,** parallel bedded and cross-bedded and gray, dark gray, to olive gray to light gray. Calcareous.
Section 3 – dark gray to olive gray **Calcareous Claystone.** Finely laminated, faintly bioturbated.

SMEARS:

1-65

Sand	5%	Quartz, Feldspar	2%	Opaque minerals	5%
Silt	5%	Clay minerals	64%	Carbonate unspec.	25%
Clay	90%	Heavy minerals	1%	Mica	1%
		Volcanic glass	1%	Zeolites	1%

1-133

Sand	0%	Quartz, Feldspar	1%	Opaque minerals	1%
Silt	10%	Clay minerals	31%	Carbonate unspec.	65%
Clay	90%	Heavy minerals	1%	Mica	1%

2-45

Sand	5%	Quartz, Feldspar	30%	Opaque minerals	5%
Silt	50%	Clay minerals	35%	Manganese	10%
Clay	45%	Heavy minerals	10%	Zeolites	10%

2-100

Sand	0%	Quartz, Feldspar	1%	Opaque minerals	3%
Silt	5%	Clay minerals	65%	Carbonate unspec.	35%
Clay	95%	Heavy minerals	?	Mica	2%
		Volcanic glass	1%		

3-12

Sand	0%	Quartz, Feldspar	1%	Carbonate unspec.	25%
Silt	5%	Clay minerals	68%	Zeolites	1%
Clay	95%	Opaque minerals	5%		

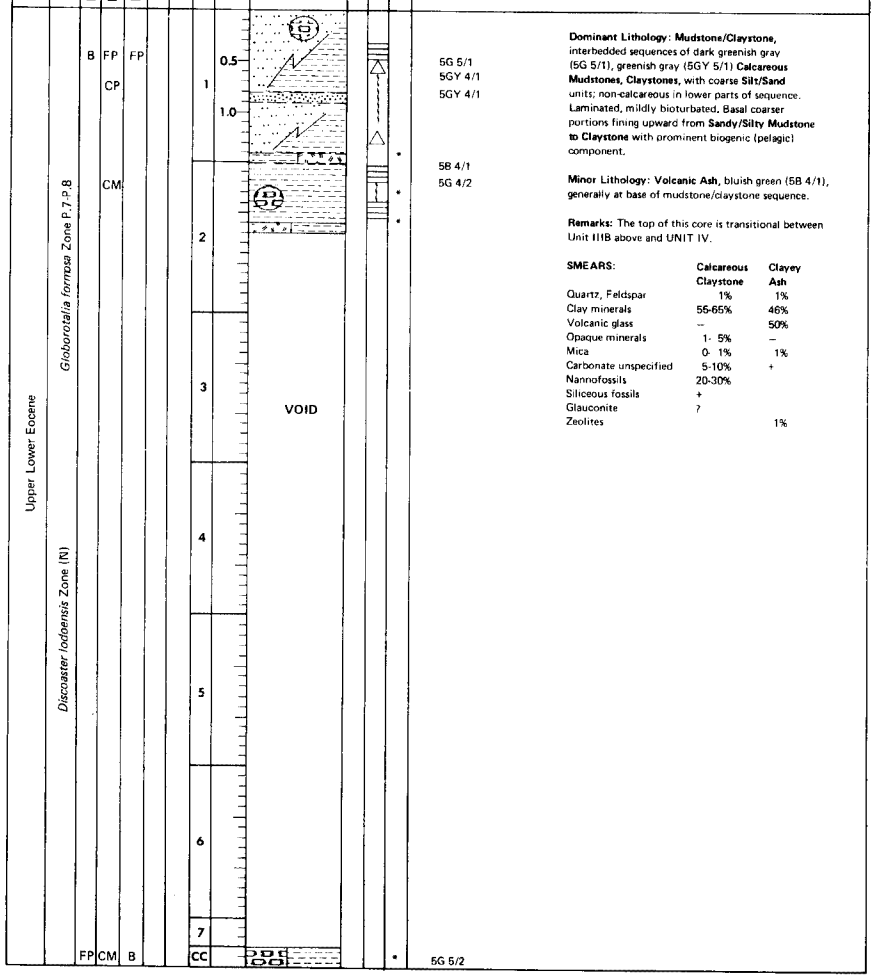
3-50

Sand	0%	Quartz, Feldspar	1%	Carbonate unspec.	20%
Silt	5%	Clay minerals	73%	Mica	1%
Clay	95%	Opaque minerals	5%		

CC

Quartz, Feldspar	1%	Opaque minerals	3%
Clay minerals	25%	Carbonate unspecified	40%
Heavy minerals	1%	Zeolites	1%
Volcanic glass	1%		

SITE 446 HOLE CORE 40 CORED INTERVAL: 362.5-372.0 m



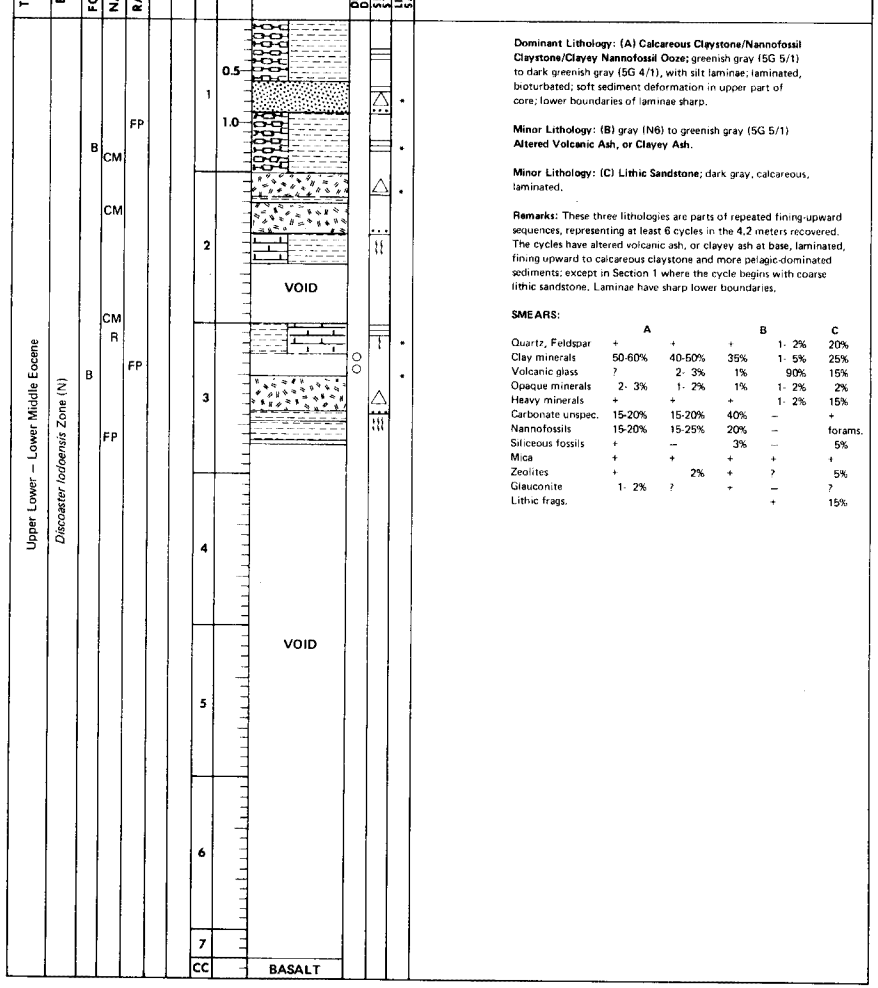
Dominant Lithology: Mudstone/Claystone, interbedded sequences of dark greenish gray (5G 5/1), greenish gray (5GY 5/1) **Calcareous Mudstones, Claystones,** with coarse **Silt/Sand** units; non-calcareous in lower parts of sequence. Laminated, mildly bioturbated. Basal coarser portions fining upward from **Sandy/Silty Mudstone to Claystone** with prominent biogenic (pelagic) component.

Minor Lithology: Volcanic Ash, bluish green (5B 4/1), generally at base of mudstone/claystone sequence.

Remarks: The top of this core is transitional between Unit IIIB above and UNIT IV.

SMEARS:	Calcareous Claystone	Clayey Ash
Quartz, Feldspar	1%	1%
Clay minerals	55-65%	46%
Volcanic glass	–	50%
Opaque minerals	1- 5%	–
Mica	0- 1%	1%
Carbonate unspecified	5-10%	+
Nannofossils	20-30%	
Siliceous fossils	+	
Glauconite	?	
Zeolites		1%

SITE 446 HOLE CORE 41 CORED INTERVAL: 372.0-381.5 m



Dominant Lithology: (A) Calcareous Claystone/Nannofossil Claystone/Clayey Nannofossil Ooze; greenish gray (5G 5/1) to dark greenish gray (5G 4/1), with silt laminae; laminated, bioturbated; soft sediment deformation in upper part of core; lower boundaries of laminae sharp.

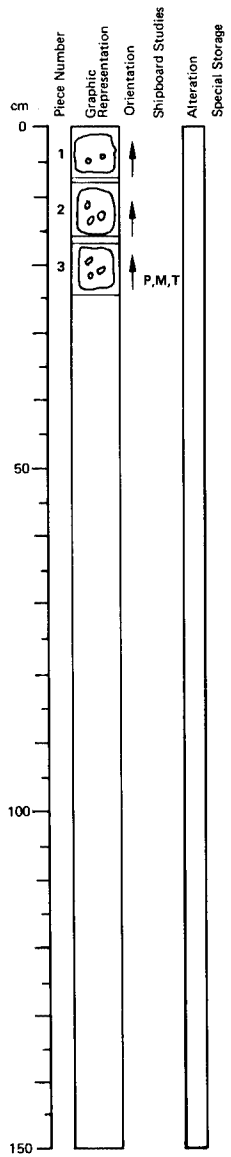
Minor Lithology: (B) gray (N6) to greenish gray (5G 5/1) **Altered Volcanic Ash, or Clayey Ash.**

Minor Lithology: (C) Lithic Sandstone; dark gray, calcareous, laminated.

Remarks: These three lithologies are parts of repeated fining-upward sequences, representing at least 6 cycles in the 4.2 meters recovered. The cycles have altered volcanic ash, or clayey ash at base, laminated, fining upward to calcareous claystone and more pelagic-dominated sediments; except in Section 1 where the cycle begins with coarse lithic sandstone. Laminae have sharp lower boundaries.

SMEARS:

	A		B		C
Quartz, Feldspar	+	+	+	1- 2%	20%
Clay minerals	50-60%	40-50%	35%	1- 5%	25%
Volcanic glass	?	2- 3%	1%	90%	15%
Opaque minerals	2- 3%	1- 2%	1%	1- 2%	2%
Heavy minerals	+	+	+	1- 2%	15%
Carbonate unspec.	15-20%	15-20%	40%	–	+
Nannofossils	15-20%	15-25%	20%	–	forams.
Siliceous fossils	+	–	3%	–	5%
Mica	+	+	+	+	+
Zeolites	+	2%	+	?	5%
Glauconite	1- 2%	?	+	–	?
Lithic frags.				+	15%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446		41	CC

Depth: 376.2 to 376.4 m

Visual Description

Light gray, vesicular, aphyric aphanitic basalt.
Vesicles lined by calcite, zeolites (tabular-heulandite? and acicular) and pyrite (possibly some pyrrohotite).
Piece 1: 5% vesicles (< 1 mm), occasional vesicle (1-2 mm).
Pieces 2 and 3: 10% vesicles (< 1 mm), 2% vesicles (1-10 mm), often pipe-like, perpendicular to hole orientation).

Thin Section Description — 19 cm

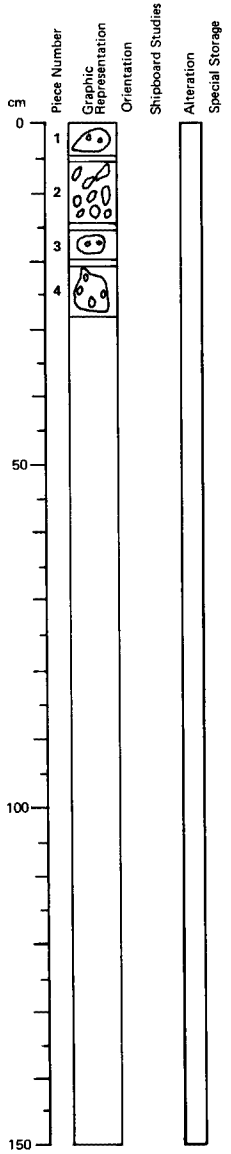
Phenocrysts: clinopyroxene < 1%, 0.2 x 0.5 mm, rare microphenocryst, only 1 found.
Groundmass: plagioclase 25%, 0.1-0.75 mm, An_{70}, carlsbad-An content; clinopyroxene 25%, 0.02-0.1 mm, granules and hair-like, crystals in plagioclase; magnetite 20%, 0.02-0.1 mm; other basaltic hornblende 10%, 0.02-0.1 mm.
Vesicles: 20%, 0.1-1.0 mm, calcite (~6%), irregular.
Texture: intergranular.
Alteration: 3% carbonate in vesicles, often euhedral.

Shipboard Data

Bulk Analysis:	20 cm
SiO_2	47.76
Al_2O_3	13.62
Fe_2O_3	1.21
FeO	7.99
MgO	4.64
CaO	11.46
Na_2O	3.23
K_2O	2.65
TiO_2	3.58
P_2O_5	0.36
MnO	0.32
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	39.00
Ni	28.00
Sr	693.00
Zr	210.00

Magnetic Data:	19 cm
Intensity (emu/cc)	86.6
Inclination before demag.	–55.7
Stable Inclination	–47.1

Physical Properties:	22 cm
$\overline{V}p$ (km/s)	4.54
Porosity (%)	18.42
Wet Bulk Density	2.62
Grain Density	2.99



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446		42	CC

Depth: 381.5 to 381.78 m

Visual Description

Light gray, vesicular, aphyric, aphanitic basalt.
Piece 1: 5-10% vesicles (< 1 mm).
Piece 3: 8% vesicles (< 1 mm), 2% vesicles (1-2 mm).
Piece 4: 7.5% vesicles (< 1 mm), 7.5% vesicles (1-2 mm).
Vesicles lined by pyrite, calcite and zeolites.
Similar to previous section.

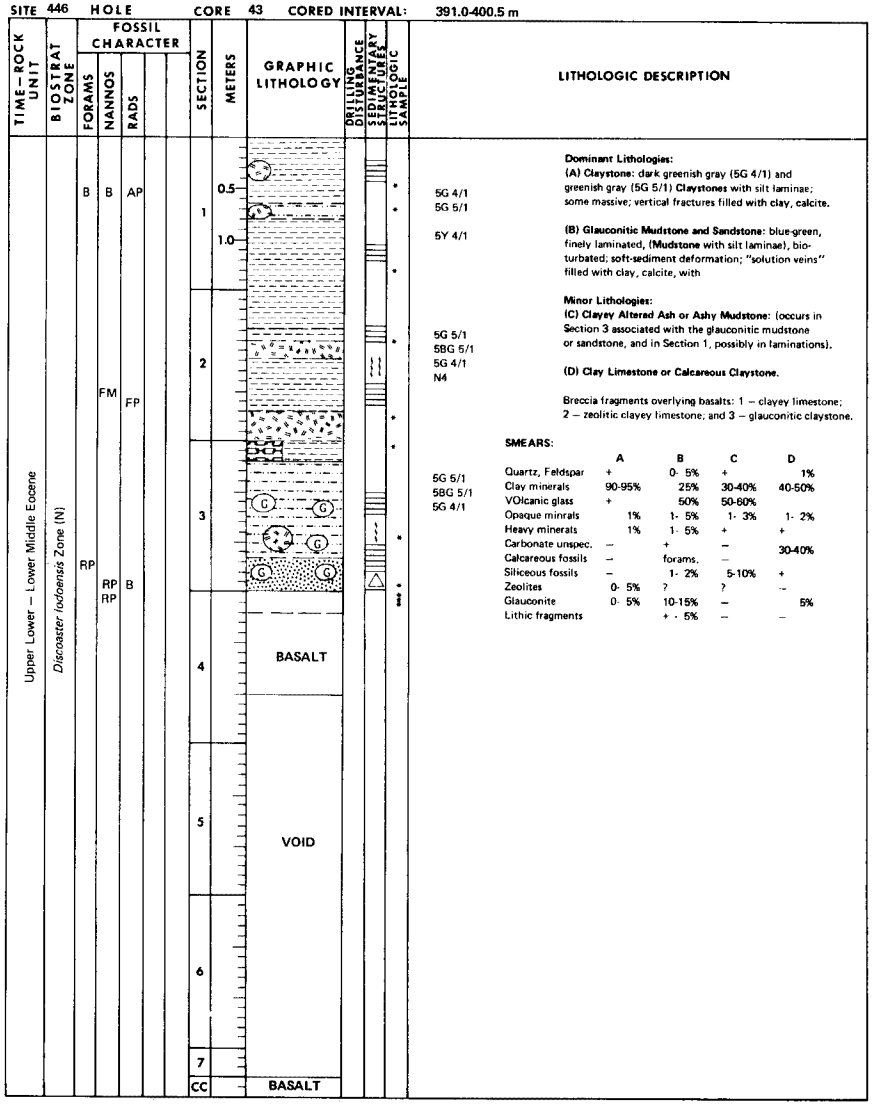
Thin Section Description — 17 cm

Groundmass: plagioclase 30%, average 0.5 mm, An_{70}, albite and carlsbad An determination; clinopyroxene 18%, 0.1-0.05 mm, quite pink, rare microphenocryst up to 0.75 mm; magnetite 15%, 0.01-0.15 mm; other basaltic hornblende 12%, 0.1-0.6 mm, primary-reaction-relation with pyroxene; other apatite < 1%.
Vesicles: 25%
Texture: intergranular
Alteration: 1% carbonate in vesicles; other chlorite 2%, in groundmass.

Shipboard Data

Bulk Analysis:	24 cm
SiO_2	46.97
Al_2O_3	13.32
Fe_2O_3	1.30
FeO	8.59
MgO	4.85
CaO	11.21
Na_2O	3.69
K_2O	2.28
TiO_2	3.54
P_2O_5	0.35
MnO	0.34
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	18.00
Ni	29.00
Sr	689.00
Zr	206.00

SITE 446 HOLE CORE 43 CORED INTERVAL: 391.0-400.5 m



Dominant Lithologies:

(A) Claystone: dark greenish gray (5G 4/1) and greenish gray (5G 5/1) **Claystones** with silt laminae; some massive; vertical fractures filled with clay, calcite.

(B) Glauconitic Mudstone and Sandstone: blue-green, finely laminated, (**Mudstone** with silt laminae), bioturbated; soft-sediment deformation; "solution veins" filled with clay, calcite, with

Minor Lithologies:

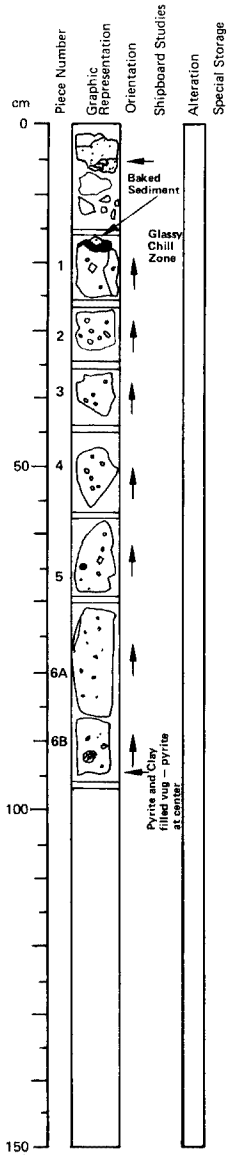
(C) Clayey Altered Ash or Ashy Mudstone: (occurs in Section 3 associated with the glauconitic mudstone or sandstone, and in Section 1, possibly in laminations).

(D) Clay Limestone or Calcareous Claystone.

Breccia fragments overlying basalts: 1 – clayey limestone; 2 – zeolitic clayey limestone; and 3 – glauconitic claystone.

SMEARS:

	A	B	C	D
Quartz, Feldspar	+	0- 5%	+	1%
Clay minerals	90-95%	25%	30-40%	40-50%
VOlcanic glass	+	50%	50-60%	
Opaque minrals	1%	1- 5%	1- 3%	1- 2%
Heavy minerals	1%	1- 5%	+	+
Carbonate unspec.	–	+	–	30-40%
Calcareous fossils	–	forams.	–	
Siliceous fossils	–	1- 2%	5-10%	+
Zeolites	0- 5%	?	?	–
Glauconite	0- 5%	10-15%	–	5%
Lithic fragments		+ - 5%	–	–



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6		4 3	4

Depth: 395.5 to 396.5 m

Visual Description

0-16 cm: baked green to brown clay and sandstone, hard and indurated compared to sediment higher in core.

17-97 cm: very sparsely plagioclase phyric vesicular basalt. Plagioclase phenocrysts <1%, 1.0-3.0 mm long typically 0.75 x 2 mm. Aphanitic to very fine-grained groundmass with felty plagioclase laths 1.0 mm and less (acicular), randomly oriented as incipient groundmass crystallization. Alteration occurs largely in vesicles which are largely clay and pyrite filled amygdules. Amygdules 5-10%, 0.5 to 3.0 mm across. Clay minerals and pyrites often concentrically zoned in vesicles. Grain size progressively coarsens from glassy chill zone at top to fine-grained basalt at base of this section.

17-26 cm: glassy chill zone grading from baked clay microconglomerate to 1 cm of glass (partially devitrified) to aphanitic to fine-grained basalt. Glass is filled with 1 mm acicular plagioclase laths.

Thin Section Description – 4-21 cm

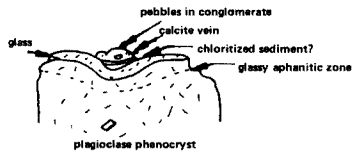
Groundmass: plagioclase 35%, 0.5-2.0 mm, An_{65}, carlsbad twin; clinopyroxene 25%, 0.1-1.0 mm, clear, little color; magnetite 15%, 0.05-1.0 mm, granules and laths; other = grundage 25%, mixture of clay and cryptocrystalline material.
Alteration: clays in groundmass.

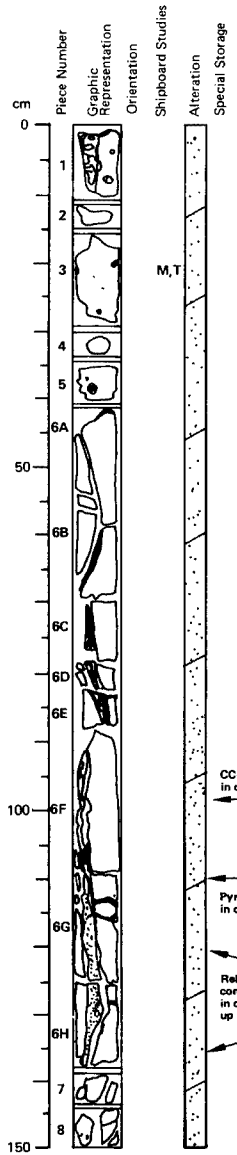
Thin Section Description – 4-81 cm

Phenocrysts: plagioclase 1%, 1-2.5 mm crystal.
Groundmass: plagioclase 30%, .05-1.0 mm, lathes; clinopyroxene 16%, .05-1.0 mm, granules and lathes; magnetite 20%, .05-1.0 mm, plates and skeletal crystals; other = grundage 33%, mixture of smectite, chlorite(?) and clay minerals and cryptocrystalline material.
Vesicles: 7%, 0.5-4.0 mm, clay filling, round.
Texture: intersertal.
Alteration: clays in groundmass and vesicles.

Shipboard Data

Bulk Analysis:	77 cm
SiO_2	48.28
Al_2O_3	12.64
Fe_2O_3	1.62
FeO	10.72
MgO	5.95
CaO	9.81
Na_2O	2.92
K_2O	0.94
TiO_2	4.17
P_2O_5	0.52
MnO	0.24
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	124.00
Ni	77.00
Sr	396.00
Zr	296.00





VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6		4 4	1

Depth: 400.5 to 402.0 m

Visual Description

Aphyric basalt 0-150 cm: fine-grained, light to moderate alteration. Amygdaloidal with clay, calcite and pyrite fillings, 0 to 3% amygdules 0.5-5.0 mm.

0-10 cm: clastic dike – glauconitic clay matrix with clay fragments up to 1 cm across.

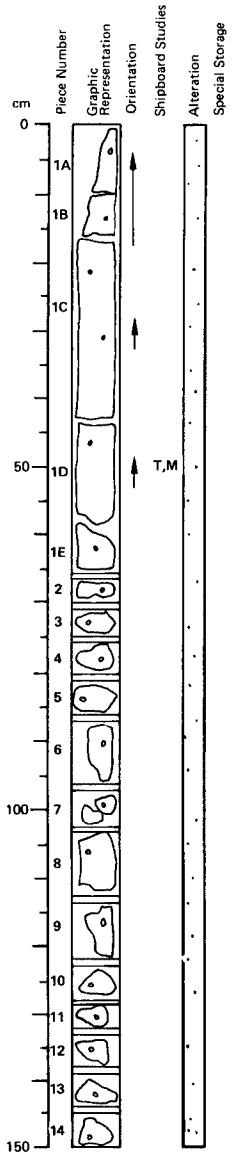
44-137 cm: continuous clastic dike. Upper portion of dike is chloritized and heavily altered with calcite replacing sediment. Lower portion has clastic breccia retaining its original appearance and texture with clay matrix.

Shipboard Data

Bulk Analysis:	19 cm
SiO_2	50.88
Al_2O_3	12.07
Fe_2O_3	1.57
FeO	10.37
MgO	6.12
CaO	9.40
Na_2O	3.16
K_2O	0.72
TiO_2	3.89
P_2O_5	0.43
MnO	0.21
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	122.00
Ni	73.00
Sr	359.00
Zr	275.00

Magnetic Data:	5 cm
Intensity (emu/cc)	793.1
Inclination before demag.	10.1
Stable Inclination	13.6

Physical Properties	6 cm
Porosity (%)	10.57
Wet Bulk Density	2.84
Grain Density	3.05



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6		4 4	2

Depth: 402.0 to 403.5 m

Visual Description

0-150 cm: basalt identical to that in Core 44, Section 1. Basalt aphyric, dark gray, fine-grained, fresh or lightly altered. About 0.5% dark spot (like crystals of pyroxene), often with pyrite, probably filled vesicles.

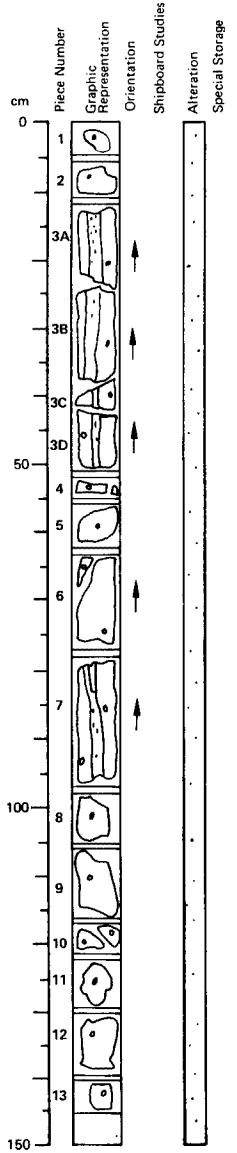
Shipboard Data

Bulk Analysis:	**53 cm**
SiO_2	52.04
Al_2O_3	12.77
Fe_2O_3	1.57
FeO	10.39
MgO	4.73
CaO	9.18
Na_2O	3.01
K_2O	0.95
TiO_2	3.86
P_2O_5	0.46
MnO	0.18
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	113.00
Ni	69.00
Sr	368.00
Zr	283.00

Magnetic Data:	**49 cm**
Intensity (emu/cc)	2004.7
Inclination before demag.	15.7
Stable Inclination	18.0

Physical Properties:	**45 cm**
$\bar{V}p$ (km/s)	5.25
Porosity (%)	4.66
Wet Bulk Density	2.90
Grain Density	2.99

Other Data:	**45 cm**
Therm. cond. (mcal/cm-s-°C)	4.47



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6		4 4	3

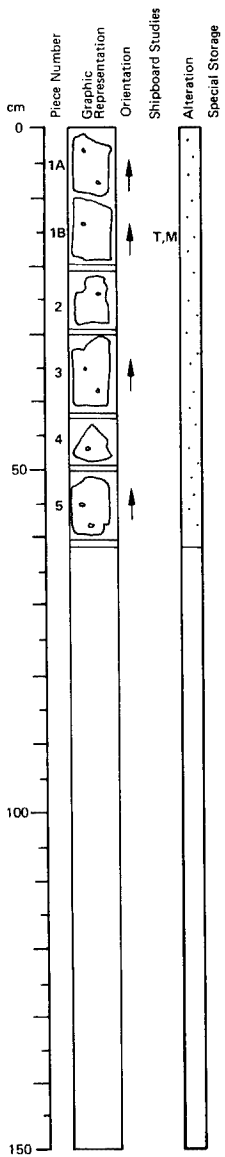
Depth: 403.5 to 405.0 m

Visual Description

0-145 cm: identical to basalt in Core 44, Section 1.

Basalt aphyric, fine-grained, dark gray, fresh or lightly altered. About 0.5% vesicles (1-2 mm up to 5 mm) with pyrite.

Pieces 3A, B, C, D, and 7: have a clastic dike-like that in Core 44, Section 1, but clastic breccia is fewer. In contact of dike is chlorite(?).



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	6			4	4		4

Depth: 405.0 to 405.6 m

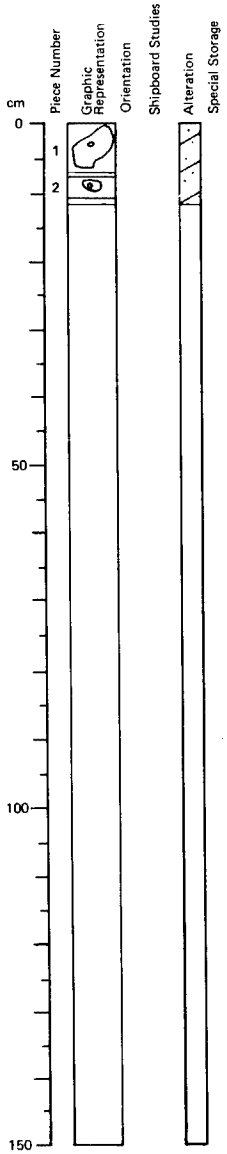
Visual Description
0-60 cm: identical to that (basalt) in Core 44, Section 2. Basalt aphyric, fine-grained, dark gray, fesh or lightly altered vesicles about 0.5%, filled with dark minerals and rare pyrite.

Shipboard Data

Bulk Analysis:	**56 cm**
SiO_2	50.13
Al_2O_3	12.84
Fe_2O_3	1.67
FeO	10.99
MgO	5.07
CaO	9.37
Na_2O	3.10
K_2O	0.60
TiO_2	3.95
P_2O_5	0.44
MnO	0.26
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	112.00
Ni	69.00
Sr	373.00
Zr	280.00

Magnetic Data:	**21 cm**
Intensity (emu/cc)	1084.1
Inclination before demag.	16.1
Stable Inclination	24.6

Physical Properties:	**48 cm**
$\overline{V}p$ (km/s)	5.38
Porosity (%)	4.17
Wet Bulk Density	2.96
Grain Density	3.04

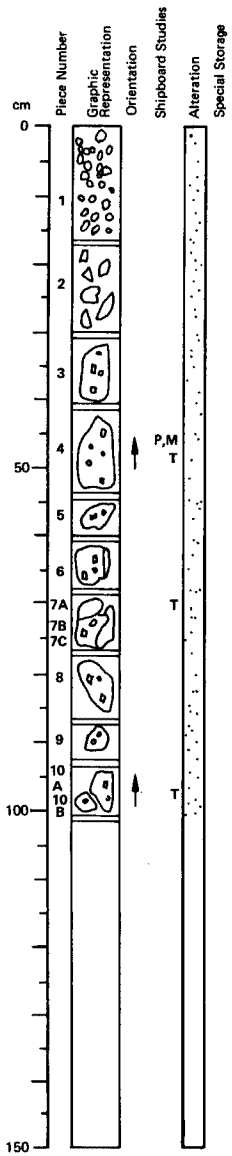


VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	6			4	5		1

Depth: 410.0 to 410.1 m

Visual Description
0-11 cm: basalt aphyric, fine-grained, dark gray. Vesicles < 0.5%, filled with calcite (size approximately 2 mm).



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	8	4	4	6			4	6		1

Depth: 419.5 to 420.5 m

Visual Description

0-16 cm: drilling breccia includes sediment pebbles and small pieces of basalt (uphole contamination).

16-30 cm: drilling fragments includes fragments of basalt and mudstone (green with calcite veins similar to that in Core 43), uphole contamination.

30-100 cm: light gray, plagioclase phyric aphanitic basalt.

Plagioclase phenocrysts 10-15%, 1-3 mm (generally about 1 mm). Some phenocrysts of olivine(?) and pyroxene.

Approximately 1% vesicles lined by dark, clay minerals, carbonate, zeolite, and odd pyrite or chalcopyrite grains.

Veins and fractures in Pieces 6, 7 and 10 lined by greenish chloritic material and fine, disseminated pyrite or pyrrhotite.

Thin Section Description – 70 cm

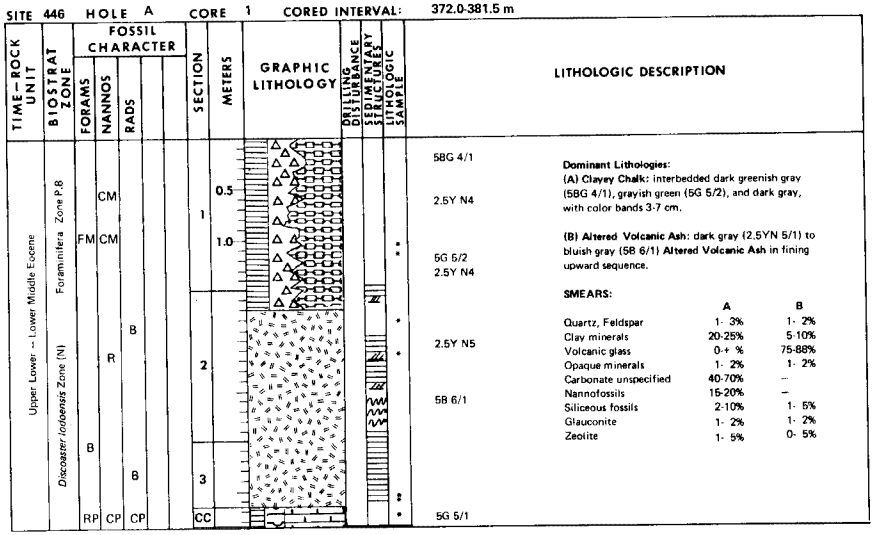
Phenocrysts: plagioclase 0.5-2.0 mm, An_{65}; clinopyroxene 0.5-2.0 mm.
Groundmass: plagioclase 2.5 mm, acicular laths; clinopyroxene .02-.1 mm, granules; magnetite 10%, .01-.1 mm, granules and plates.
Texture: intersertal.

Shipboard Data

Bulk Analysis:	**49 cm**
SiO_2	48.61
Al_2O_3	13.04
Fe_2O_3	1.62
FeO	10.72
MgO	5.85
CaO	9.86
Na_2O	2.78
K_2O	0.58
TiO_2	4.01
P_2O_5	0.47
MnO	0.17
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	53.00
Ni	40.00
Sr	424.00
Zr	290.00

Magnetic Data:	**47 cm**
Intensity (emu/cc)	1209.3
Inclination before demag.	–49.1
Stable Inclination	–51.3

SITE 446 HOLE A CORE 1 CORED INTERVAL: 372.0-381.5 m



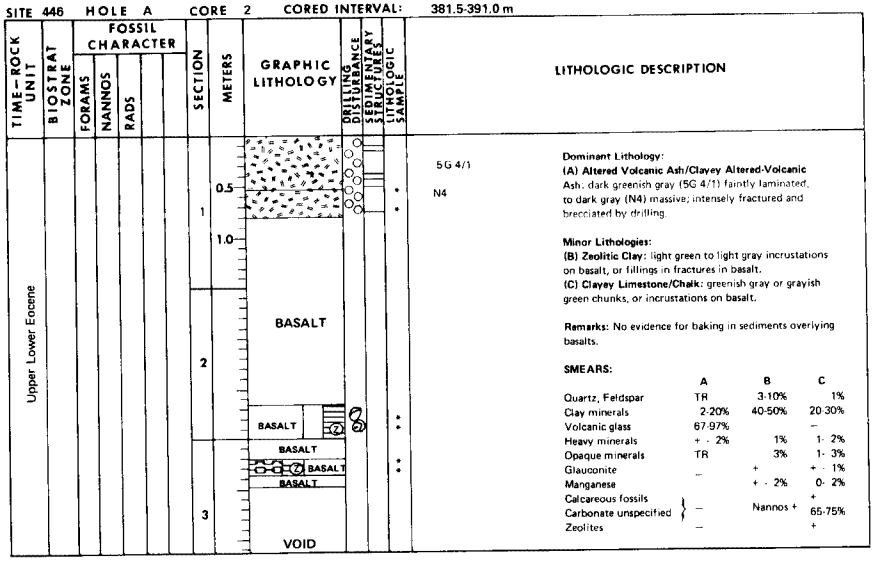
Dominant Lithologies:
(A) Clayey Chalk: interbedded dark greenish gray (5BG 4/1), grayish green (5G 5/2), and dark gray, with color bands 3-7 cm.

(B) Altered Volcanic Ash: dark gray (2.5YN 5/1) to bluish gray (5B 6/1) **Altered Volcanic Ash** in fining upward sequence.

SMEARS:

	A	B
Quartz, Feldspar	1- 3%	1- 2%
Clay minerals	20-25%	5-10%
Volcanic glass	0-+ %	75-88%
Opaque minerals	1- 2%	1- 2%
Carbonate unspecified	40-70%	–
Nannofossils	15-20%	–
Siliceous fossils	2-10%	1- 5%
Glauconite	1- 2%	1- 2%
Zeolite	1- 5%	0- 5%

SITE 446 HOLE A CORE 2 CORED INTERVAL: 381.5-391.0 m



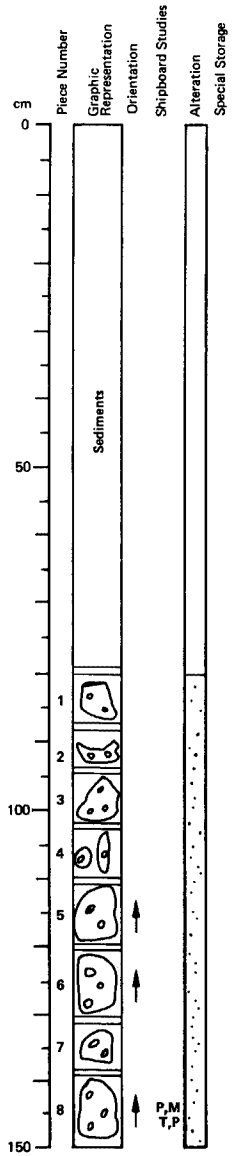
Dominant Lithology:
(A) Altered Volcanic Ash/Clayey Altered-Volcanic Ash: dark greenish gray (5G 4/1) faintly laminated, to dark gray (N4) massive; intensely fractured and brecciated by drilling.

Minor Lithologies:
(B) Zeolitic Clay: light green to light gray incrustations on basalt, or fillings in fractures in basalt.
(C) Clayey Limestone/Chalk: greenish gray or grayish green chunks, or incrustations on basalt.

Remarks: No evidence for baking in sediments overlying basalts.

SMEARS:

	A	B	C
Quartz, Feldspar	TR	3-10%	1%
Clay minerals	2-20%	40-50%	20-30%
Volcanic glass	67-97%		–
Heavy minerals	+ - 2%	1%	1- 2%
Opaque minerals	TR	3%	1- 3%
Glauconite	–	+	+ - 1%
Manganese		+ - 2%	0- 2%
Calcareous fossils	–	Nannos +	+
Carbonate unspecified			65-75%
Zeolites	–		+



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	6	A		2		1

Depth: 381.5 to 383.0 m

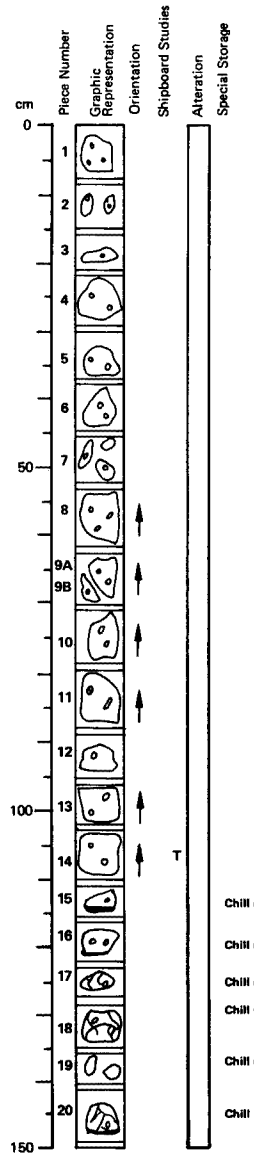
Visual Description

0-8 cm: altered ash (sediment).
80-150 cm: gray, aphyric, fine-grained vesicular basalt.
Vesicles: 5-10% <1 mm, 2-10% 1 mm-10 mm, lined by pyrite, calcite and zeolites.
Some larger vesicles are pipe vesicles.
Piece 1, 80-87 cm: shows glassy margin and chill zone (about 1 cm thick).
Piece 5, 111-119 cm: partially covered by carbonate-clay vein material; also on one side of Piece 7 (122-127 cm). Vesicle-poor zone at top of piece. May be slightly finer grained.

Shipboard Data

Magnetic Data:	**145 cm**
Intensity (emu/cc)	348.7
Inclination before demag.	−35.6
Stable Inclination	−25.7

Physical Properties:	**145 cm**
$\overline{V}p$ (km/s)	4.46
Porosity (%)	13.40
Wet Bulk Density	2.70
Grain Density	2.96



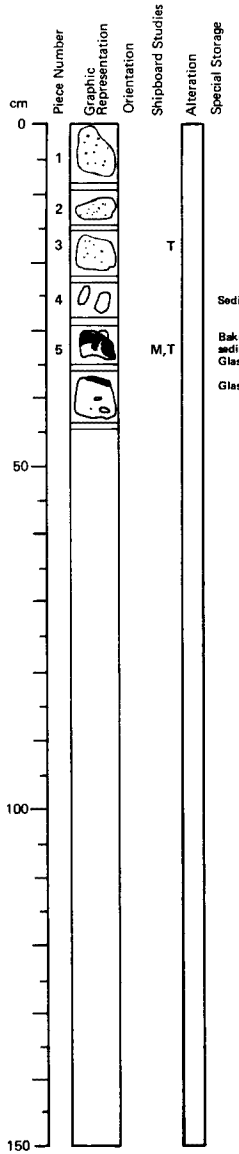
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	6	A		2		2

Depth: 383.0 to 384.5 m

Visual Description

0-116 cm: gray, aphyric, fine-grained vesicular basalt, similar to last section.
Vesicles: 5-15% <1 mm, 2-15% 1 mm-5 mm, lined by carbonate, pyrite, zeolites, and occasionally a whitish green clay (smectite).
White, fine laths of plagioclase are visible in hand specimen and under binocular microscope a platy brown mineral.
Piece 5, 111-116 cm: chill zone and glassy margin.
116-150 cm: aphanitic, gray, basalt. Many glassy zones and sediment infilled fractures (suggests sub-sediment pillows). Vesicles <1% <1 mm.
Pyrite and carbonate lining.
Odd plagioclase phenocryst.
Some carbonate veins.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	6	A		2		3

Depth: 384.5 to 384.95 m

Visual Description

0-21 cm: very fresh highly vesicular gray basalt, aphyric, approximately 25% vesicles. A little calcite in some vesicles.

23-78 cm: two lumps of hard indurated baked sediment. Green, glauconitic.

30-36 cm: glassy chill zone with baked ash on contact and filling veins , criss-crossing chill margin.

36-45 cm: aphyric vesicular basalt 10% fine approximately .1 to .5 mm vesicles in upper half, partially filled with calcite, 3-4 vugs up to 5 mm in lower half have calcite crystals in cavities.

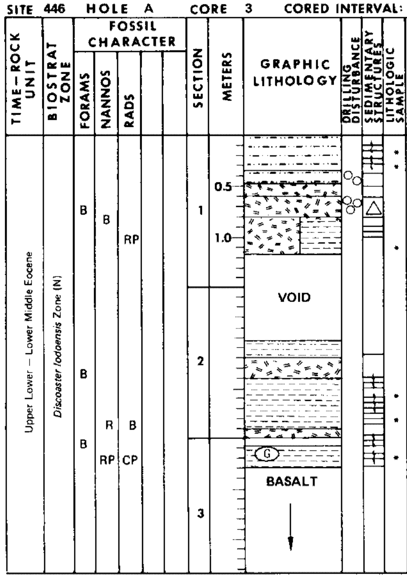
May be pillows but baked sediment suggests intrusion under sediment cover.

Shipboard Data

Magnetic Data:	**41 cm**
Intensity (emu/cc)	5234.3
Inclination before demag.	−24.1
Stable Inclination	−25.2

Physical Properties:	**41 cm**
$\bar{V}p$ (km/s)	4.44
Porosity (%)	15.76
Wet Bulk Density	2.70
Grain Density	3.01

SITE 446 **HOLE** A **CORE** 3 **CORED INTERVAL:** 391.0-400.5 m



LITHOLOGIC DESCRIPTION

N4, +5GY 4/1
and 5B 4/1
5BG 4/1
2.5Y N3
2.5Y N3
5B 4/1
5GY 4/1
N4

5GY 4/1 with
5GY 6/1 and 5B 4/1

N4 to 2.5Y N3

N4 to 5BG 4/1
and 5B 4/1

N4 to 2.5Y N3

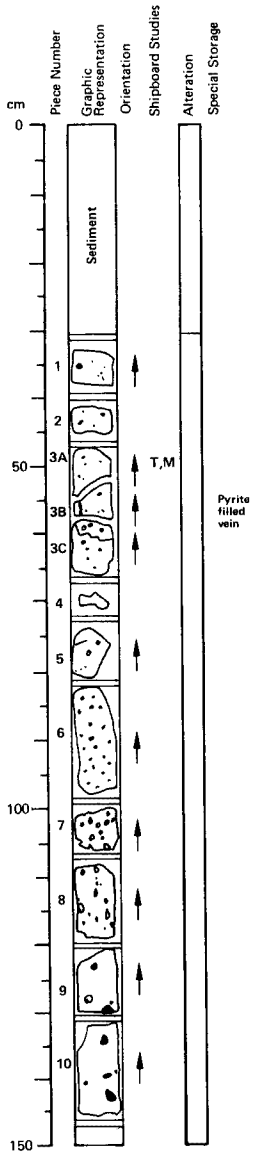
2.5Y N3 with
5B 4/1 +?

Dominant Lithologies:
(A) Mudstone and Claystone, dark greenish gray, dark gray, to dark bluish gray and greenish blue; mild bioturbation; faintly laminated with irregularly spaced 1 mm laminae in Sections 1 and 2. In Section 3 broader **(Calcareous Claystone)** color bands; higher **Calcareous** content; glauconitic. No evidence of baking above basalt.

(B) Volcanic Ash, dark gray to black, massive, no sedimentary structures.

SMEARS:

	A		B
Quartz, Feldspar	3- 5%	3%	5-10%
Clay minerals	73-86%	68%	7-30%
Volcanic glass	0- 1%	–	50-80%
Opaque minerals	2- 5%	5%	2- 5%
Heavy minerals	–	–	
Carbonate unspecified	2- 5%	20%	+ forams?
Siliceous fossils	1- 5%	–	0- 5%
Manganese	1- 2%	2%	1- 2%
Zeolites	1%	1%	+ - 1%
Glauconite	5-10%	5%	–



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	3	3

Depth: 392.6 to 394.0 m

Visual Description

Fine- to medium-grained aphyric basalt.

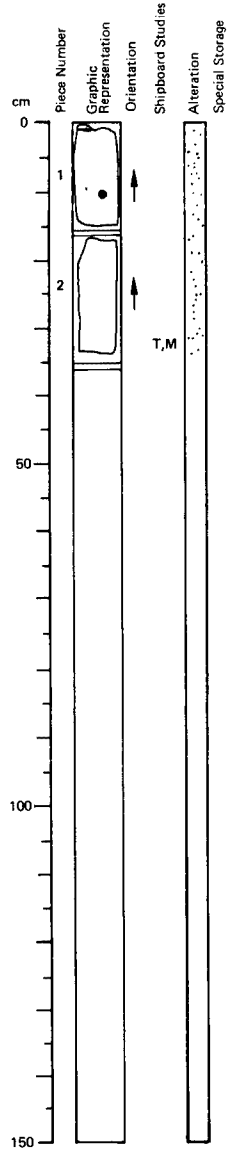
Vesicles 3-10%, from 0.5-7.0 mm approximately 50% of which are filled with clay, calcite, pyrrhotite.

No phenocrysts. A few veins filled with clay/chlorite and pyrrhotite or pyrite.

Shipboard Data

Magnetic Data:	**50 cm**
Intensity (emu/cc)	744.9
Inclination before demag.	−4.6
Stable Inclination	5.2

Physical Properties:	**50 cm**
$\overline{V}p$ (km/s)	4.84
Porosity (%)	13.56
Wet Bulk Density	2.82
Grain Density	3.10



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	3	4

Depth: 394.0 to 394.4 m

Visual Description

Aphyric gray basalt.

Amygdules 1%, filled with calcite and clay.

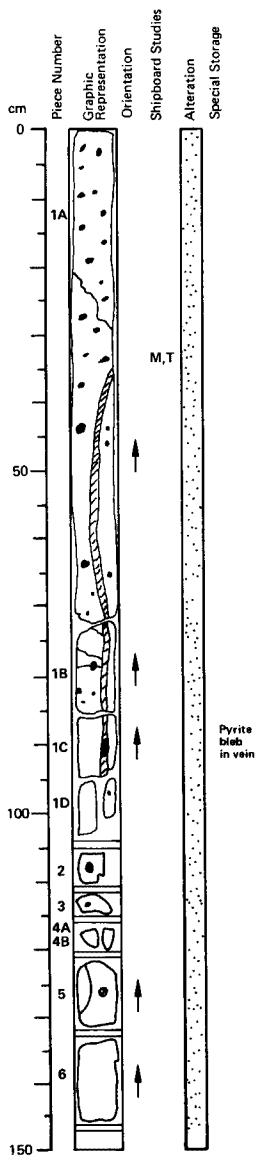
Massive, light alteration.

Shipboard Data

Bulk Analysis:	**33 cm**
SiO_2	51.91
Al_2O_3	12.64
Fe_2O_3	1.64
FeO	10.80
MgO	5.07
CaO	8.98
Na_2O	2.84
K_2O	0.93
TiO_2	3.74
P_2O_5	0.45
MnO	0.19
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	115.00
Ni	72.00
Sr	359.00
Zr	271.00

Magnetic Data:	**34 cm**
Intensity (emu/cc)	81.6
Inclination before demag.	2.3
Stable Inclination	13.5

Physical Properties:	**34 cm**
$\overline{V}p$ (km/s)	5.49
Porosity (%)	3.73
Wet Bulk Density	2.97
Grain Density	3.05



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	4	1

Depth: 400.5 to 402.0 m

Visual Description

Aphyric gray amygdaloidal basalt, 0-12% amygdules with clay, calcite and pyrite fillings 0.5-8.0 mm across; 12% at top of section, none at bottom.

35-95 cm: 3-5 mm thick vein filled with clay, carbonate, pyrite, and quartz. Some zeolites may also be present.

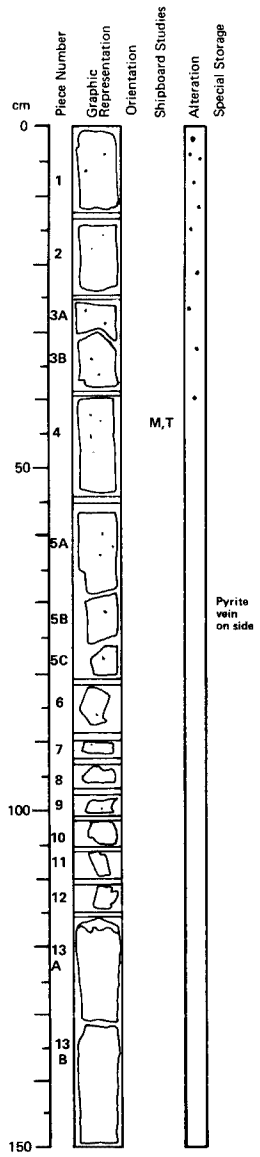
Shipboard Data

Bulk Analysis:	39 cm	139 cm
SiO_2	51.89	51.93
Al_2O_3	12.71	12.72
Fe_2O_3	1.64	1.62
FeO	10.81	10.70
MgO	4.96	5.10
CaO	9.09	9.18
Na_2O	2.90	2.95
K_2O	0.90	0.89
TiO_2	3.89	3.82
P_2O_5	0.44	0.48
MnO	0.17	0.21
LOI	—	—
H_2O^+	—	—
H_2O^-	—	—
CO_2	—	—
Cr	105.00	111.00
Ni	67.00	62.00
Sr	365.00	361.00
Zr	275.00	279.00

Magnetic Data:	32 cm
Intensity (emu/cc)	668.0
Inclination before demag.	7.1
Stable Inclination	15.5

Physical Properties:	32 cm
$\overline{V}p$ (km/s)	5.26
Porosity (%)	5.26
Wet Bulk Density	2.90
Grain Density	3.01

Other Data:	32 cm
Therm. cond. (mcal/cm-s-°C)	4.16



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	4	2

Depth: 402.0 to 403.4 m

Visual Description

Aphyric gray massive basalt.

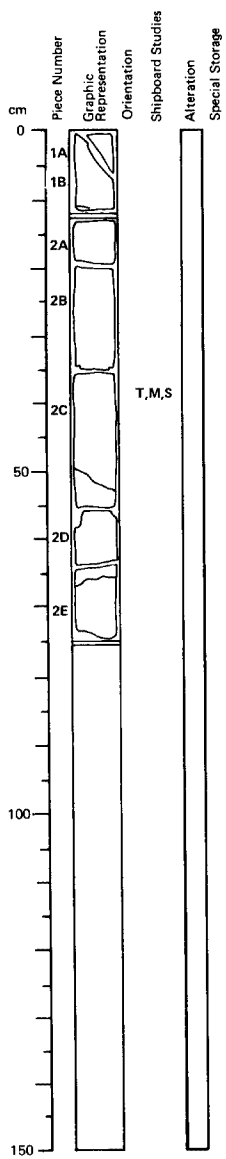
Clay filled amygdules 0-3%, fine-grained. Same as last section.

Pyrite vein fragment adhering to Piece 5B. Fresh.

Shipboard Data

Magnetic Data:	44 cm
Intensity (emu/cc)	399.2
Inclination before demag.	5.4
Stable Inclination	23.1

Physical Properties:	44 cm
$\overline{V}p$ (km/s)	5.89
Porosity (%)	2.76
Wet Bulk Density	2.92
Grain Density	2.98



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	6	A	4	3

Depth: 403.5 to 404.2 m

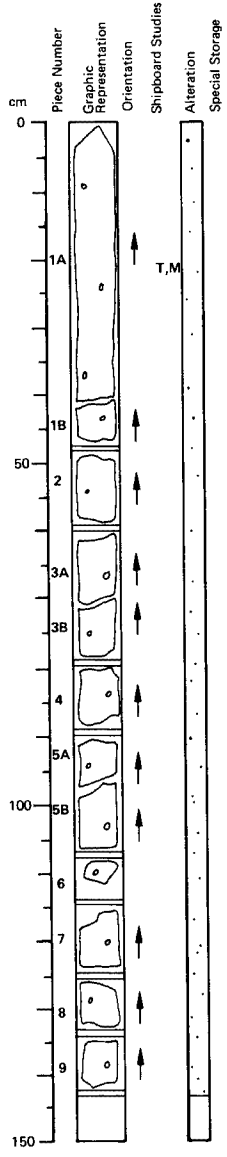
Visual Description
Aphyric gray basalt, 1-2% clay-filled vesicles, fresh, fine-grained, with a few clay and carbonate filled veins.

Shipboard Data

Magnetic Data:	**43 cm**
Intensity (emu/cc)	1157.0
Inclination before demag.	14.2
Stable Inclination	17.6

Physical Properties:	**43 cm**
$\bar{V}p$ (km/s)	5.55
Porosity (%)	2.36
Wet Bulk Density	3.02
Grain Density	3.05

Other Data:	**43 cm**
Therm. cond. (mcal/cm-s-°C)	4.21



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	6	A	5	1

Depth: 405.5 to 407.0 m

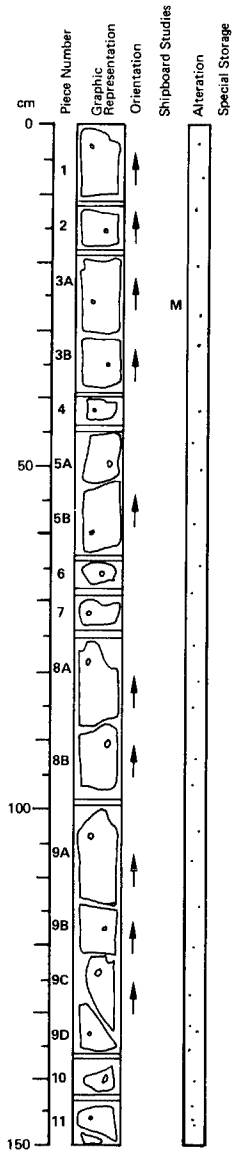
Visual Description
0-142 cm: basalt identical to that in Core 4, Section 3.
Basalt aphyric, fine-grained, dark gray, lightly vesicular.
Vesicles < 1%, filled with clay and aggregates of dark minerals.

Shipboard Data

Magnetic Data:	**16 cm**
Intensity (emu/cc)	550.7
Inclination before demag.	9.0
Stable Inclination	21.2

Physical Properties:	**16 cm**
$\bar{V}p$ (km/s)	5.74
Porosity (%)	2.73
Wet Bulk Density	2.99
Grain Density	3.05

Other Data:	**16 cm**
Therm. cond. (mcal/cm-s-°C)	4.23



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	5	2

Depth: 407.0 to 408.4 m

Visual Description

0-150 cm: basalt identical to that in Core 5, Section 1, but coarser grained.
Aphyric, dark gray, vesicles, < 1%, filled with calcite and aggregate of dark minerals.
Between Pieces 9C and 9D a chlorite vein occurs with pyrite.

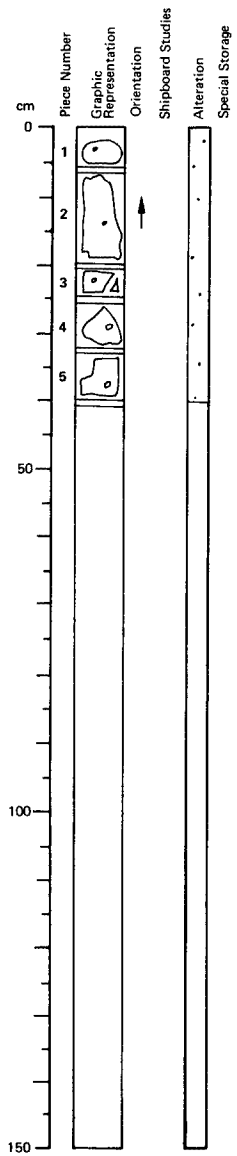
Shipboard Data

Bulk Analysis:	**26 cm**
SiO_2	50.74
Al_2O_3	13.00
Fe_2O_3	1.64
FeO	10.84
MgO	3.41
CaO	9.48
Na_2O	3.01
K_2O	0.63
TiO_2	3.78
P_2O_5	0.50
MnO	0.22
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	114.00
Ni	65.00
Sr	375.00
Zr	269.00

Magnetic Data:	**24 cm**
Intensity (emu/cc)	590.1
Inclination before demag.	-2.1
Stable Inclination	17.6

Physical Properties:	**24 cm**
$\bar{V}p$ (km/s)	5.59
Porosity (%)	3.34
Wet Bulk Density	3.03
Grain Density	3.10

Other Data:	**24 cm**
Therm. cond. (mcal/cm-s-°C)	4.24



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	5	3

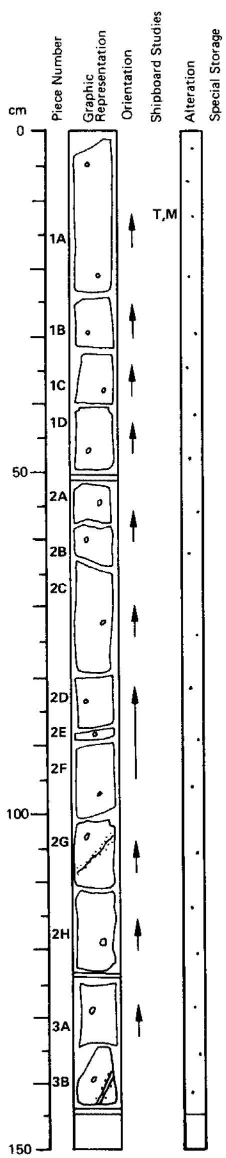
DEPTH: 408.4 to 409.0 m

Visual Description

0-40 cm: basalt identical to that in Core 5, Section 2 (coarser grained than in Core 5, Section 1).
Aphyric, dark gray, vesicles < 1% (1 mm and less), filled with calcite and dark minerals(?).

SITE 446 HOLE A CORE 6 CORED INTERVAL: 410.0-419.5 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS		SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
						1	0.5 1.0	BASALT			•	**Basalt/Claystones** Section 2— greenish gray (5G 5/1), **Calcareous Claystone** on basalt. Section 3 — laminated **Claystone**, dark greenish gray (5G 4/1), greenish gray (5G 6/1), and greenish gray (5G 5/1). **SMEARS:** **2-70 (Calcareous Claystone)** Sand <1% Feldspar 1% Silt <1% Heavy minerals 1% Clay 98% Clay minerals 93% Carbonate unspecified 6% **SMEARS:** **3-25 (Claystones)** Feldspar 5%, Clay minerals 75%, Zeolites 20%
						2		BASALT			***	**3-25 (Claystones)** Feldspar 15%, Clay minerals 75-80%, Zeolites 5-10%
						3		BASALT				**3-25 (Claystones)** Feldspar 20%, Clay minerals 80% (Note: all have rare heavy minerals).



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	6	A		6	1

Depth: 410.0 to 411.4 m

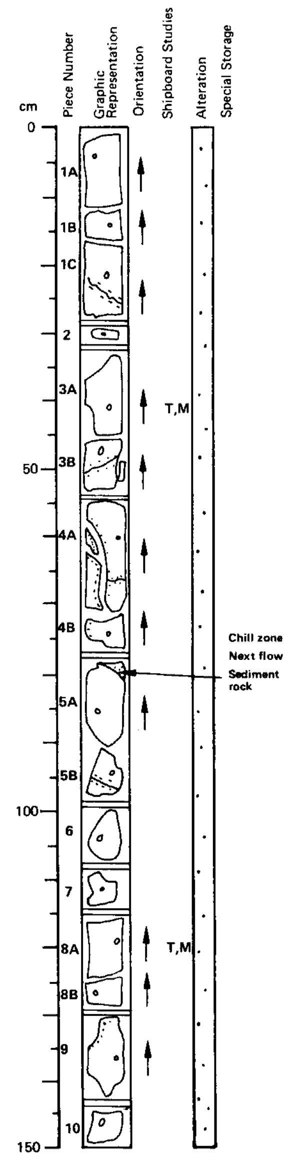
Visual Description

0-142 cm: basalt, aphyric fine-grained, dark gray. Vesicles < 1%, < 2 mm filled with calcite and chlorite(?).

0-20 cm: basalt coarser grained, similar to Core 5, Section 3.

Shipboard Data

Magnetic Data:	**10 cm**
Intensity (emu/cc)	474.4
Inclination before demag.	−17.8
Stable Inclination	3.6
Physical Properties:	**10 cm**
$\overline{V}p$ (km/s)	5.84
Porosity (%)	4.38
Wet Bulk Density	3.00
Grain Density	3.09
Other Data:	**10 cm**
Therm. cond. (mcal/cm-s-°C)	4.23



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	6	A		6	2

Depth: 411.4 to 413.0 m

Visual Description

0-78 cm: basalt identical to that described at the base of Core 6, Section 1. Basalt aphyric, fine-grained, dark gray, vesicular. Vesicles < 1%, < 2 mm, filled with calcite and chlorite.

78-150 cm: next lava flow.

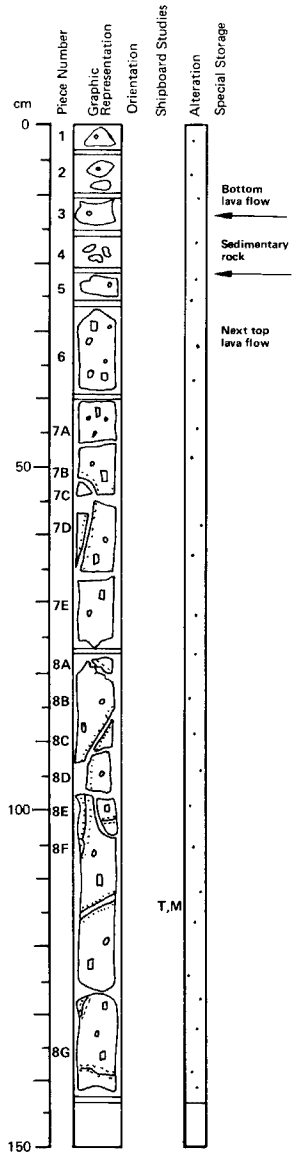
78-90 cm: chill zone of basalt. Basalt close to aphanitic, dark gray, vesicular. Vesicles about 1%, < 2 mm, filled with calcite, chlorite and pyrite.

In Pieces 1C, 3B, 4A, 4B, 5B, 9 are veins with calcite, chlorite and pyrite.

Shipboard Data

Bulk Analysis:	**34 cm**
SiO_2	52.55
Al_2O_3	12.98
Fe_2O_3	1.62
FeO	10.68
MgO	4.83
CaO	8.94
Na_2O	2.94
K_2O	1.03
TiO_2	3.77
P_2O_5	0.46
MnO	0.17
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	115.00
Ni	69.00
Sr	357.00
Zr	277.00

Magnetic Data:	**38 cm**	**118 cm**
Intensity (emu/cc)	970.4	2917.3
Inclination before demag.	10.6	−5.2
Stable Inclination	16.0	1.7
Physical Properties:	**119 cm**	**38 cm**
$\overline{V}p$ (km/s)	—	5.58
Porosity (%)	13.23	3.36
Wet Bulk Density	2.87	3.02
Grain Density	3.25	3.08
Other Data:	**3 cm**	
Therm. cond. (mcal/cm-s-°C)	4.46	



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	6	3

Depth: 413.0 to 414.4 m

Visual Description

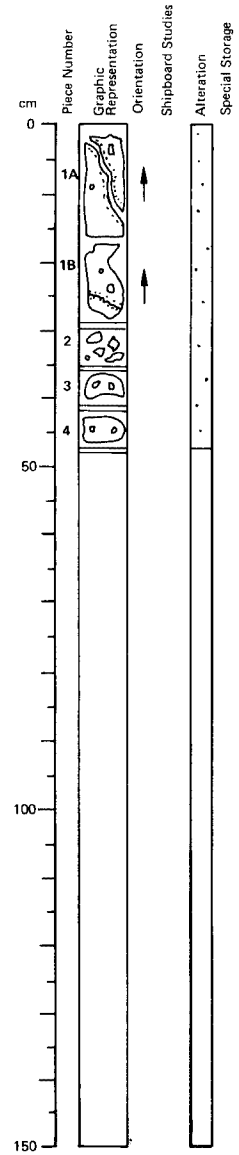
0-15 cm: basalt identical to that described at the base of Core 6, Section 2. Basalt aphyric, fine-grained, dark gray. Vesicles 1%, <2 mm, filled with calcite and chlorite.
15-25 cm: sedimentary rock.
27-142 cm: next lava flow. Basalt phyric, fine-grained, (27-40 cm to aphanitic), dark gray, vesicular. Phenocrysts of plagioclase 5%, 2-5 mm.
17-54 cm: vesicles 3-5%, <3 mm (one up to 5 mm).
54-142 cm: vesicles 1%, <2 mm. Vesicles filled with calcite and chlorite, and pyrite.
Calcite vein (Pieces 7B, 7D, 8A thru 8G) with chlorite and pyrite.

Shipboard Data

Magnetic Data:	**109 cm**
Intensity (emu/cc)	154.7
Inclination before demag.	−44.3
Stable Inclination	−43.1

Physical Properties	**109 cm**
$\overline{V}p$ (km/s)	4.88
Porosity (%)	16.96
Wet Bulk Density	2.64
Grain Density	2.97

Other Data:	**71 cm**	**115 cm**
Therm. cond. (mcal/cm-s-°C)	3.23	3.70



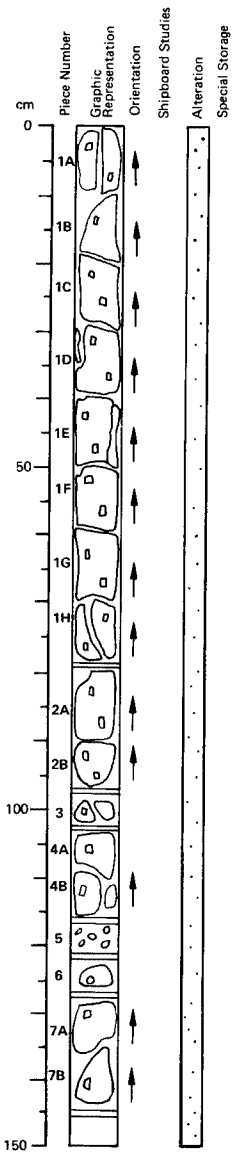
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	6	4

Depth: 414.4 to 415.0 m

Visual Description

0-47 cm: basalt identical to that described for Core 6, Section 3. Basalt phyric, fine-grained, dark gray, vesicular. Plagioclase phenocrysts 5%, 2 mm. Vesicles <1%, filled with chlorite.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	7	1

Depth: 419.5 to 421.0 m

Visual Description

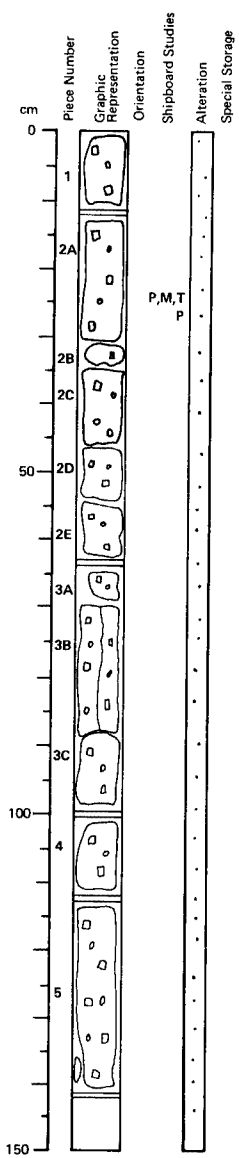
Gray, fine-grained plagioclase, olivine(?), phyric massive basalt. Odd olivine(?), phenocryst (approximately 1 mm), 3% plagioclase phenocrysts (2-4 mm). Odd pyroxene phenocryst (dark, acicular, 1-2 mm). Vesicles 3% (0.5-1 mm) lined or filled by dark clay material, carbonate and zeolites.

Piece 7A (128-136 cm): increase in number of vesicles to 5% (0.5-2 mm). Chloritic vein and fractures lined with pyrite throughout.

Piece 1 and Piece 3: similar to end of last core.

Shipboard Data

Bulk Analysis:	**48 cm**
SiO_2	52.18
Al_2O_3	12.16
Fe_2O_3	1.62
FeO	10.72
MgO	6.01
CaO	8.15
Na_2O	2.77
K_2O	0.96
TiO_2	3.65
P_2O_5	0.38
MnO	0.14
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	46.00
Ni	34.00
Sr	377.00
Zr	258.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	7	2

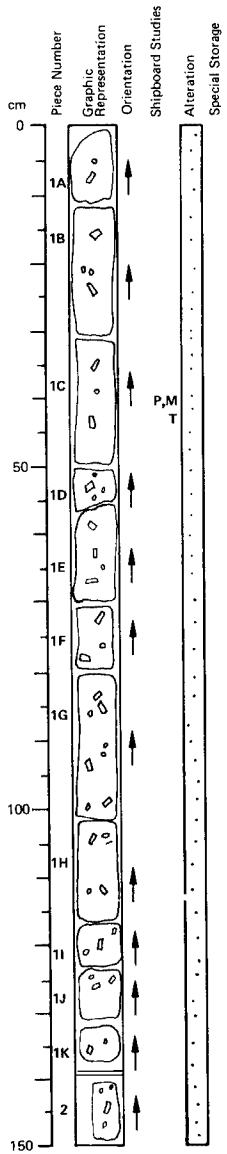
Depth: 421.0 to 422.4 m

Visual Description

Gray, fine-grained, massive plagioclase phyric basalt. Plagioclase phenocrysts 5% (2-4 mm).
Vesicles 2-6% usually filled by dark clay, zeolites and carbonates (generally 0.5-2 mm).
Some clayey alteration zones around some larger vesicles.
Veins and fractures lined by clay/chloritic material and weathered pyrite or chalcopyrite(?).
55-75 cm: more large vesicles (6% up to 4 mm actoss).
Similar to previous section.

Shipboard Data

Magnetic Data:	**24 cm**
Intensity (emu/cc)	447.5
Inclination before demag.	–43.7
Stable Inclination	–39.2
Physical Properties:	**23 cm**
$\bar{V}p$ (km/s)	4.63
Porosity (%)	13.92
Wet Bulk Density	2.74
Grain Density	3.02
Other Data:	**23 cm**
Therm. cond. (mcal/cm-s-°C)	4.63



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	6	A		7		3

Depth: 422.4 to 423.9 m

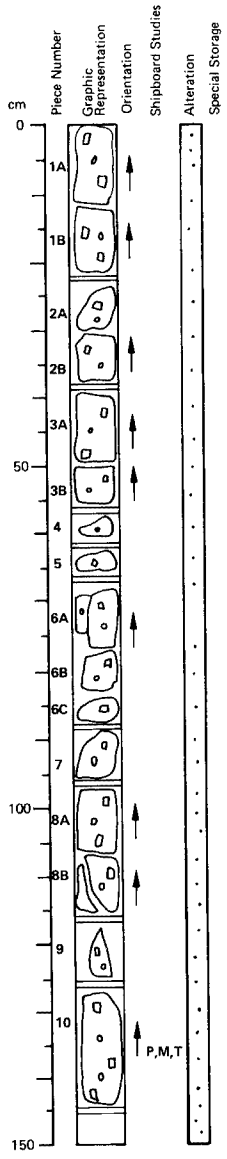
Visual Description

Gray, fine-grained, massive, plagioclase phyric basalt. Plagioclase phenocrysts 5% (2-4 mm). Vesicles 2-6% (0.5-2 mm), lined by dark clay, carbonate and zeolites.
Chloritic/clayey lining to fracture surface on Piece 2 (140-150 cm).
Similar to previous section.

Shipboard Data

Bulk Analysis:	**97 cm**
SiO_2	52.08
Al_2O_3	12.58
Fe_2O_3	1.54
FeO	10.17
MgO	5.32
CaO	8.98
Na_2O	2.86
K_2O	0.90
TiO_2	3.80
P_2O_5	0.45
MnO	0.15
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	54.00
Ni	41.00
Sr	398.00
Zr	270.00

Magnetic Data:	**38 cm**
Intensity (emu/cc)	672.6
Inclination before demag.	-39.5
Stable Inclination	-45.3
Physical Properties:	**38 cm**
$\overline{V}p$ (km/s)	4.72
Porosity (%)	15.49
Wet Bulk Density	2.80
Grain Density	3.13
Other Data:	**38 cm**
Therm. cond. (mcal/cm-s-°C)	3.81



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	6	A		7		4

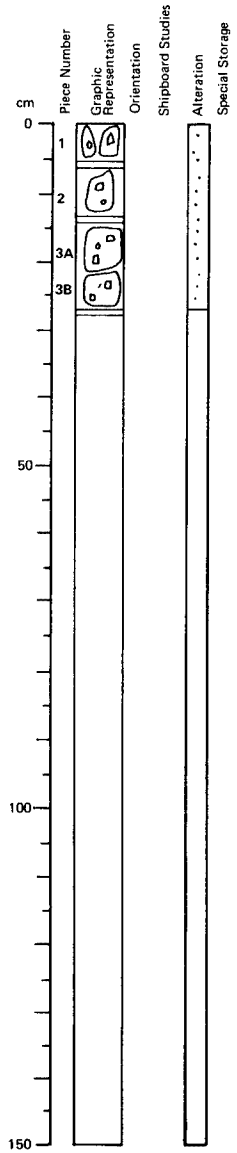
Depth: 423.9 to 425.3 m

Visual Description

Gray, fine-grained, massive, plagioclase phyric basalt. Plagioclase phenocrysts 5% (2-4 mm). Vesicles 2-6% (0.5-2 mm) lined by dark clay, carbonate and zeolites. Whitish green clay lining to fracture surfaces, some chalcopyrite.
66-80 cm: Pieces 6A and 6B thicker vein (3 mm across) filled by zeolite(?).
Large cluster of chalcopyrite on Piece 1A (5-6 cm).
Similar to previous section.

Shipboard Data

Magnetic Data:	**138 cm**	
Intensity (emu/cc)	833.8	
Inclination before demag.	-48.8	
Stable Inclination	-49.1	
Physical Properties:	**75 cm**	**138 cm**
$\overline{V}p$ (km/s)	--	4.69
Porosity (%)	8.71	
Wet Bulk Density	2.83	--
Grain Density	3.01	--
Other Data:	**138 cm**	
Therm. cond. (mcal/cm-s-°C)	3.95	



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	7	5

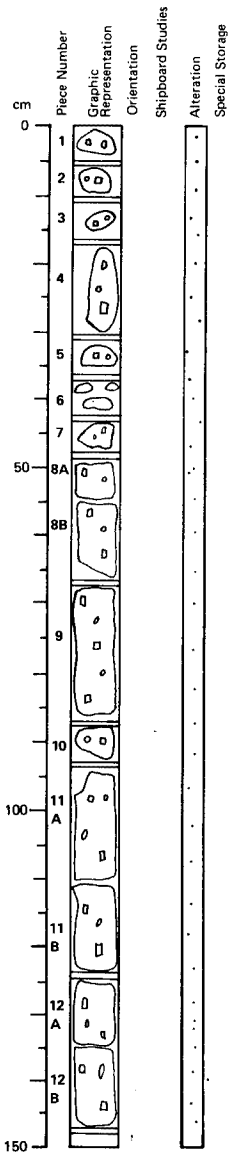
Depth: 425.3 to 425.6 m

Visual Description

Gray, fine-grained, massive, plagioclase phyric basalt. Plagioclase phenocrysts 5% (2-4 mm). Vesicles 2% (0.5-1 mm), lined by dark clay, carbonate.

Greenish chloritic lining to fracture in Piece 1. Olive greenish fracture lining with pyrite on Pieces 3A and 3B.

Simlar to previous section.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	8	1

Depth: 429.0 to 430.5 m

Visual Description

Gray, massive, fine-grained, plagioclase phyric basalt. Plagioclase phenocrysts 5% (2-4 mm). Vesicles lined by dark brown clay and carbonate. Vesicles 1-5% (0.5-2 mm).

Fractures lined by whitish green clay.

Occasional larger pyroxene around plagioclase laths observed under binocular microscope.

Similar to previous core.

Pieces 1, 2, 3, and 5 are finer grained but may be due to uphole contamination (from top of unit).

Shipboard Data

Bulk Analysis:	**66 cm**
SiO_2	52.56
Al_2O_3	12.67
Fe_2O_3	1.53
FeO	10.07
MgO	5.38
CaO	8.74
Na_2O	3.21
K_2O	0.71
TiO_2	3.55
P_2O_5	0.44
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	81.00
Ni	46.00
Sr	388.00
Zr	258.00

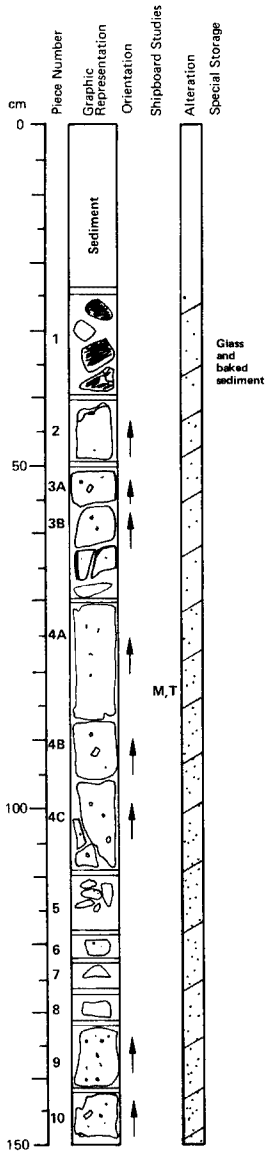
Magnetic Data:	**75 cm**
Intensity (emu/cc)	820.5
Inclination before demag.	−40.9
Stable Inclination	−44.5
Physical Properties:	**74 cm**
$\bar{V}p$ (km/s)	4.42
Porosity (%)	13.02
Wet Bulk Density	2.74
Grain Density	3.00

SITE 446 HOLE A CORE 9 CORED INTERVAL: 438.5-448.0 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Upper Lower Eocene	*T. orthostylus* Zone (N)	B	CP		1	0.5 1.0	BASALT				**Calcareous Mudstone**, greenish gray (5BG 5/1) calcareous mudstone with **Altered Volcanic Ash** (dark gray colored), laminated, with microfaults. 18-22 cm interval is the same **Calcareous Mudstone** baked by basalt intrusion.
					2						

SMEARS:

	1-10	1-17
Quartz, Feldspar	1- 3%	1%
Clay minerals	65-75%	60%
Volcanic glass	--	30%
Opaque minerals, Heavy minerals	+1%	1%
Micronodules	2- 3%	1%
Carbonate unspecified (including nannofossils)	20-25%	+ with forams.
Siliceous fossils	1%	–
Glauconite	2- 3%	3%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	9	1

Depth: 438.5 to 440.0 m

Visual Description

0-24 cm: gray to green mudstones. Very indurated near basalt with color change to white and brick red in last 6-7 cm.

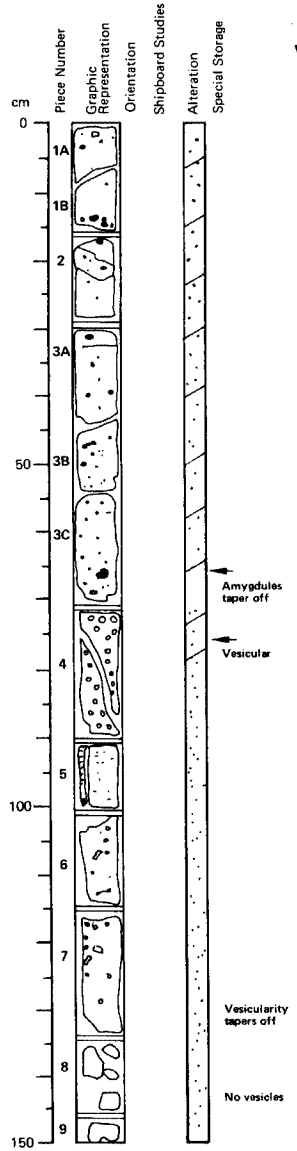
25-40 cm: assorted fragments of glassy aphanitic basalt and baked sediment. Sediment is white to green and is baked onto the glassy basalt.

41-150 cm: very sparsely plagioclase phyric gray massive basalt. Grades down section from aphanitic to fine-grained basalt. About 3%, 0.5-3.0 mm calcite and clay filled amygdules. Plagioclase phenocrysts ≪1%, approximately 1 x 2 mm.

Shipboard Data

Bulk Analysis:	**79 cm**
SiO_2	51.93
Al_2O_3	11.78
Fe_2O_3	1.56
FeO	10.30
MgO	5.08
CaO	9.32
Na_2O	2.83
K_2O	1.01
TiO_2	3.60
P_2O_5	0.46
MnO	0.23
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	39.00
Ni	33.00
Sr	390.00
Zr	286.00

Magnetic Data:	**82 cm**
Intensity (emu/cc)	619.8
Inclination before demag.	−53.8
Stable Inclination	−53.2
Physical Properties:	**82 cm**
$\bar{V}p$ (km/s)	4.64



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	9	2

Depth: 440.0 to 441.5 m

Visual Description

0-150 cm: sparsely plagioclase phyric basalt, vesicles 1-10%.

0-70 cm: amygduloidal with calcite and clay fillings 0.5-<1 mm.

70-150 cm: vesicular 0.1-2.0 mm

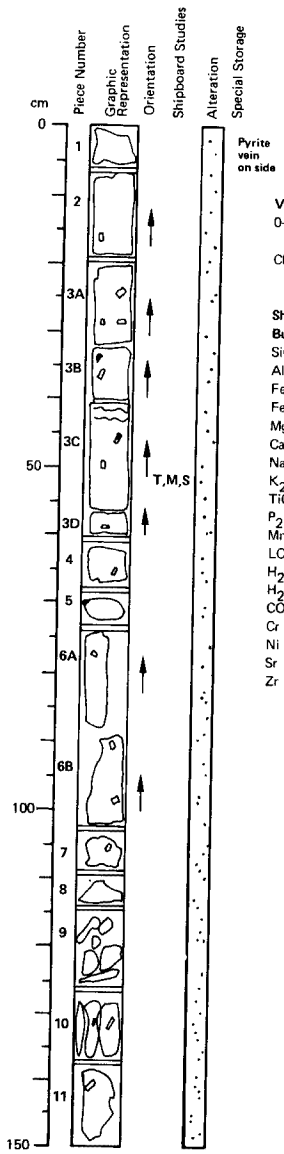
Phenocrysts 3.0 x 2.0 mm to 1 x .5 mm, <1%, but slightly more abundant than in Section 1.

Ranges from fine-grained to fine to medium at end of section.

Shipboard Data

Bulk Analysis:	**120 cm**
SiO_2	52.23
Al_2O_3	12.47
Fe_2O_3	1.54
FeO	10.16
MgO	5.32
CaO	8.26
Na_2O	3.09
K_2O	1.04
TiO_2	4.03
P_2O_5	0.53
MnO	0.20
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	40.00
Ni	38.00
Sr	405.00
Zr	305.00

Magnetic Data:	**54 cm**
Intensity (emu/cc)	352.8
Inclination before demag.	−60.9
Stable Inclination	−49.2
Physical Properties:	**54 cm**
$\bar{V}p$ (km/s)	4.38



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	8	4	4	6	A		9		3

Depth: 441.5 to 443.0 m

Visual Description

0-150 cm: very sparsely plagioclase phyric basalt. Plagioclase 1.5 x .5 to approximately 2 x 3 mm <1%, fine- to medium-grained.

Chloritic or clay alteration of groundmass visible. Few alterationveins present with dark green clay or chlorite filling.

Shipboard Data

Bulk Analysis:	**97 cm**
SiO_2	49.02
Al_2O_3	12.24
Fe_2O_3	1.73
FeO	11.40
MgO	5.76
CaO	9.37
Na_2O	2.69
K_2O	0.63
TiO_2	4.04
P_2O_5	0.53
MnO	0.21
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	40.00
Ni	39.00
Sr	409.00
Zr	281.00

Magnetic Data:	**51 cm**
Intensity (emu/cc)	446.1
Inclination before demag.	56.7
Stable Inclination	53.6

Physical Properties:	**51 cm**
$\bar{V}p$ (km/s)	4.64

SITE 446 HOLE A CORE 10 CORED INTERVAL: 448.0-457.5 m

TIME–ROCK UNIT: Upper Lower Eocene

BIOSTRAT ZONE

FOSSIL CHARACTER: FORAMS, NANNOS, RADS

METERS

SECTION: 1, 2, 3, 4, 5

GRAPHIC LITHOLOGY: ORG. SAMPLE; BASALT

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE

5G 4/1
N5
10R 3/4

N4

N5

N5

N5

N5

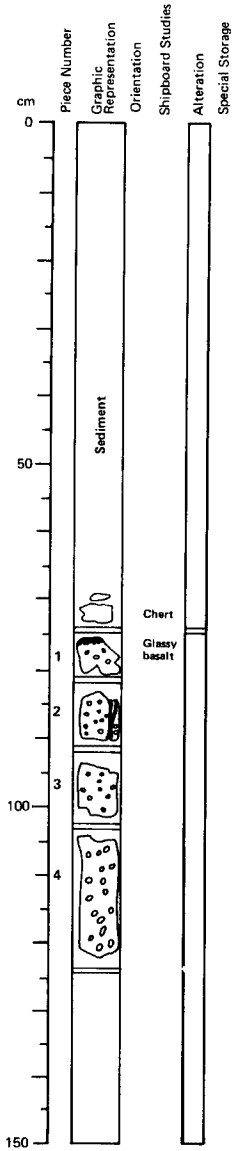
LITHOLOGIC DESCRIPTION

Dominant Lithology:
(A) Altered Ash: gray (N5) to dark gray (N4) with dusky red (10R 3/4) tinges; may be finely laminated, fining upward to massive, or massive with no lamination. In Section 5 black (5Y 2/1) massive isolated fining-upward silt laminae in Section 1, claystone laminae in Section 5; **Conglomeratic, Sandy or Silty Claystone** layers in Sections 3 and 4. Bioturbation rare.

Minor Lithologies:
(B) Clayey Zeolite (or Zeolitic Clay): gray (N5), occurs as drilling breccia fragments; in interbed between ash beds, as observed in Section 2. With decrease of zeolites, becomes **Claystone.**
(C) Pelagic Claystone: reddish black in bed of reddish black chert(?) overlying the basalt; or gray inter-laminae in volcanic ash.

SMEARS:

	A	B	C
Quartz, Feldspar	1- 5%	1%	+ - 5%
Clay minrals	10-30%	45%	85%
Volcanic glass	60-80%	–	–
Opaque minerals	1- 5%	1%	–
Micronodules	–	–	6-10%
Heavy minerals	+1%	1%	+ - 1%
Siliceous fossils	0- 2%	–	–
Glauconite	0- 5%	–	0- 1%
Lithic fragments	0-+ %	–	–
Zeolites	+1%	55%	+ - 2%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 0	5

Depth: 454.0 to 455.2 m

Visual Description

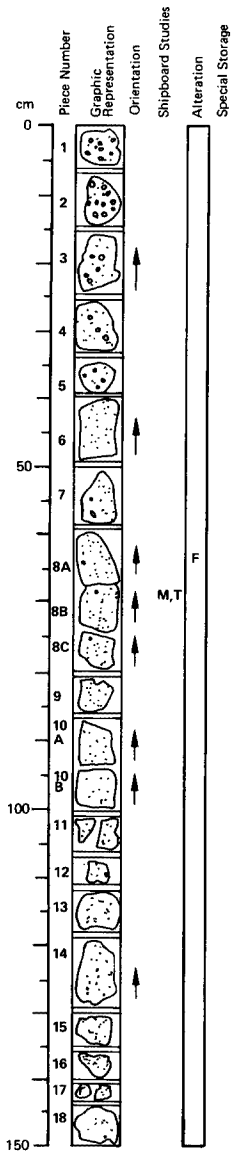
73-122 cm: fresh, highly vesicular aphyric basalt. Calcite crystals and pyrite octahedra common in vesicles. Vesicles 30-35%, 0.2-3.0 mm. Aphanitic to fine-grained. Glassy zone at top below sediment.

Shipboard Data

Bulk Analysis:	**107 cm**
SiO_2	46.94
Al_2O_3	12.51
Fe_2O_3	1.31
FeO	8.63
MgO	6.22
CaO	11.72
Na_2O	3.70
K_2O	1.74
TiO_2	4.27
P_2O_5	1.07
MnO	0.17
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	69.00
Ni	45.00
Sr	1088.00
Zr	188.00

Magnetic Data:	**110 cm**
Intensity (emu/cc)	163.8
Inclination before demag.	23.0
Stable Inclination	23.5

Physical Properties:	**110 cm**
$\bar{V}p$ (km/s)	4.52
Porosity (%)	21.76
Wet Bulk Density	2.64
Grain Density	3.09



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 1	1

Depth: 457.5 to 459.0 m

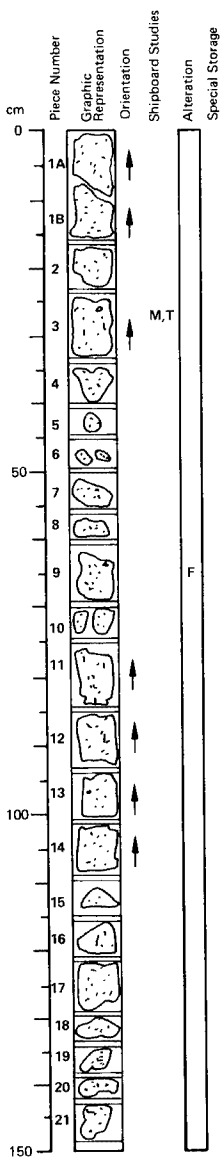
Visual Description

Aphyric highly vesicular basalt. Vesilces 30-40%, .1-1.5 mm, fine- to medium-grained, fresh.

Shipboard Data

Magnetic Data:	**69 cm**
Intensity (emu/cc)	354.9
Inclination before demag.	16.2
Stable Inclination	20.7

Physical Properties:	**69 cm**
$\bar{V}p$ (km/s)	4.56



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 1	2

Depth: 459.0 to 460.5 m

Visual Description

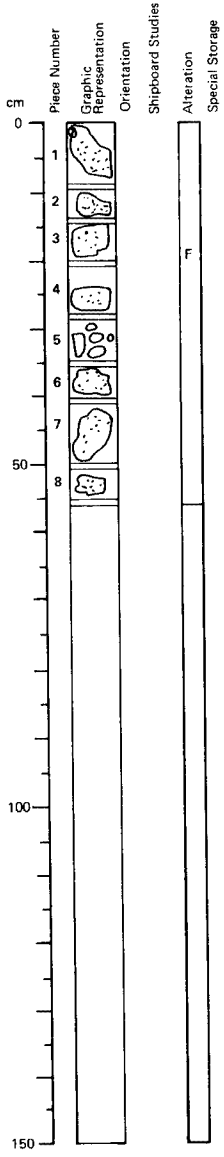
Aphyric, highly vesicular basalt, fine- to medium-grained, fresh. Pyrite and calcite visible in vesicles. Vesicles 25-40%, approximately 0.2-3.0 mm.

Shipboard Data

Bulk Analysis:	**27 cm**
SiO_2	48.68
Al_2O_3	14.24
Fe_2O_3	1.28
FeO	8.47
MgO	4.92
CaO	9.19
Na_2O	4.34
K_2O	2.20
TiO_2	2.84
P_2O_5	1.47
MnO	0.20
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	---
Ni	---
Sr	1553.00
Zr	229.00

Magnetic Data:	**23 cm**	
Intensity (emu/cc)	538.0	
Inclination before demag.	11.4	
Stable Inclination	12.8	
Physical Properties:	**23 cm**	**28 cm**
$\overline{V}p$ (km/s)	3.95	4.41*

*Horizontal direction



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

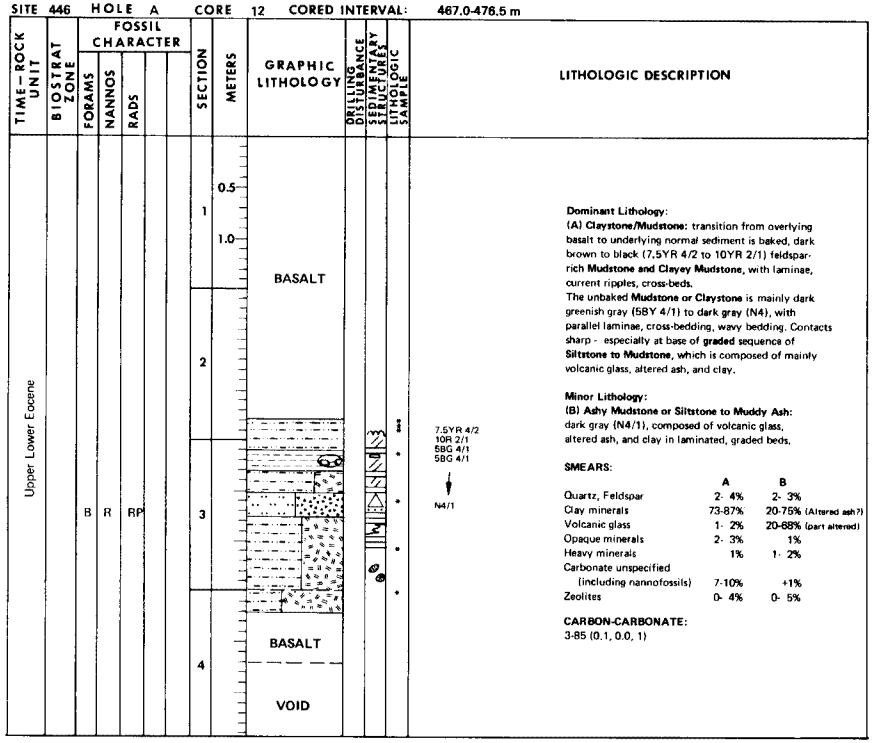
LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 1	3

Depth: 460.5 to 461.0 m

Visual Description

Aphyric, highly vesicular, fresh basalt. Vesicles 30%, 0.2-3.0 mm. Vesicles often have euhedral calcite and pyrite growing in them.

SITE 446 HOLE A CORE 12 CORED INTERVAL: 467.0-476.5 m



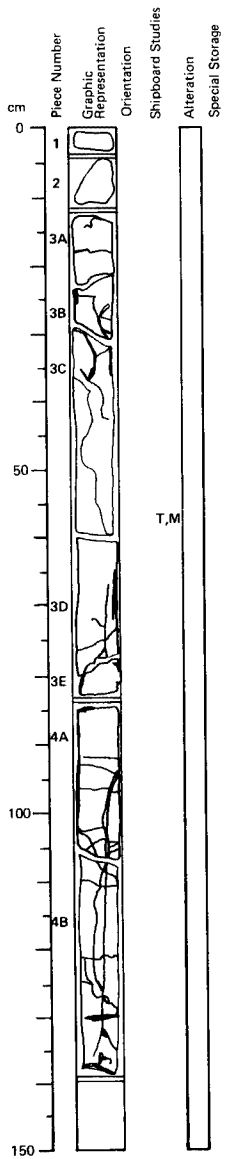
Dominant Lithology:
(A) Claystone/Mudstone: transition from overlying basalt to underlying normal sediment is baked, dark brown to black (7.5YR 4/2 to 10YR 2/1) feldspar-rich **Mudstone and Clayey Mudstone**, with laminae, current ripples, cross-beds.
The unbaked **Mudstone or Claystone** is mainly dark greenish gray (5BY 4/1) to dark gray (N4), with parallel laminae, cross-bedding, wavy bedding. Contacts sharp - especially at base of **graded** sequence of **Siltstone to Mudstone**, which is composed of mainly volcanic glass, altered ash, and clay.

Minor Lithology:
(B) Ashy Mudstone or Siltstone to Muddy Ash: dark gray (N4/1), composed of volcanic glass, altered ash, and clay in laminated, graded beds.

SMEARS:

	A	B
Quartz, Feldspar	2- 4%	2- 3%
Clay minerals	73-87%	20-75% (Altered ash?)
Volcanic glass	1- 2%	20-68% (part altered)
Opaque minerals	2- 3%	1%
Heavy minerals	1%	1- 2%
Carbonate unspecified (including nannofossils)	7-10%	+1%
Zeolites	0- 4%	0- 5%

CARBON-CARBONATE:
3-85 (0.1, 0.0, 1)



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 2	1

Depth: 467.0 to 468.4 m

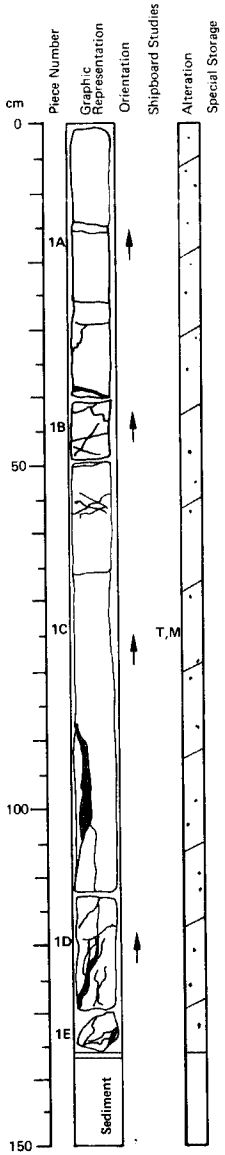
Visual Description

Amygdaloidal aphyric basalt. Vesicles 15%, green clay and calcite filled (0.2-1.5 mm).
Numerous criss-crossing calcite and clay filled veins.
Massive one chunk of fine-grained plagioclase microporphyritic basalt at top of section.

Shipboard Data

Bulk Analysis:	**59 cm**
SiO_2	45.43
Al_2O_3	9.05
Fe_2O_3	1.47
FeO	9.71
MgO	16.12
CaO	10.44
Na_2O	1.69
K_2O	0.91
TiO_2	3.59
P_2O_5	0.79
MnO	0.22
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	1137.00
Ni	293.00
Sr	480.00
Zr	150.00

Magnetic Data:	**53 cm**	**53 cm**
Intensity (emu/cc)	59.8	---
Inclination before demag.	-30.5	---
Stable Inclination	19.8	1.8
Physical Properties:	**50 cm**	
$\overline{V}p$ (km/s)	4.48	
Porosity (%)	14.27	
Wet Bulk Density	2.79	
Grain Density	3.09	
Other Data:	**50 cm**	**132 cm**
Therm. cond. (mcal/cm-s-°C)	4.38	3.96



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 2	2

Depth: 468.4 to 469.9 m

Visual Description

0-137 cm. basalt, aphyric, dark gray numerous calcite veins filled with chlorite. Thicknesses 1-2 mm (Piece 1C up to 20 mm).

Shipboard Data

Bulk Analysis:	**72 cm**
SiO_2	45.08
Al_2O_3	7.63
Fe_2O_3	1.59
FeO	10.46
MgO	20.55
CaO	8.34
Na_2O	1.07
K_2O	0.77
TiO_2	3.20
P_2O_5	0.65
MnO	0.28
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	1206.00
Ni	496.00
Sr	418.00
Zr	138.00

Magnetic Data:	**69 cm**	**69 cm**
Intensity (emu/cc)	180.64	---
Inclination before demag.	-8.1	---
Stable Inclination	11.5	14.8
Physical Properties:	**69 cm**	
$\overline{V}p$ (km/s)	5.25	
Porosity (%)	17.61	
Wet Bulk Density	2.73	
Grain Density	3.10	
Other Data:	**69 cm**	
Therm. cond. (mcal/cm-s-°C)	4.51	

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5	4 4 6	A	1 2	4

Depth: 471.4 to 472.1 m

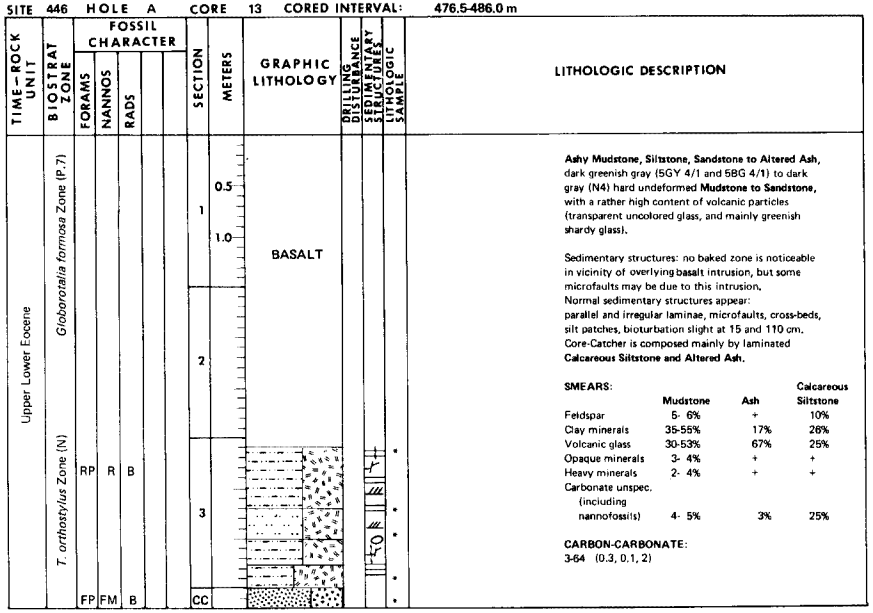
Visual Description

0-21 cm: sedimentary rocks.
21-78 cm: basalt, aphyric gray to dark gray, vesicular.
21-27 cm: chill zone, basalt aphanitic.
27-73 cm: basalt, fine-grained.
21-51 cm: basalt vesicular. Vesicles 15-20%, <2 mm.

Shipboard Data

Bulk Analysis:	**36 cm**	**69 cm**
SiO_2	46.76	45.30
Al_2O_3	11.24	7.83
Fe_2O_3	1.30	1.60
FeO	8.59	10.50
MgO	8.51	19.72
CaO	12.59	8.34
Na_2O	2.76	1.20
K_2O	1.34	0.67
TiO_2	3.58	2.80
P_2O_5	0.65	0.48
MnO	0.16	0.26
LOI	--	--
H_2O^+	--	--
H_2O^-	--	--
CO_2	--	--
Cr	305.00	1169.00
Ni	90.00	563.00
Sr	724.00	230.00
Zr	163.00	129.00

SITE 446 HOLE A CORE 13 CORED INTERVAL: 476.5-486.0 m



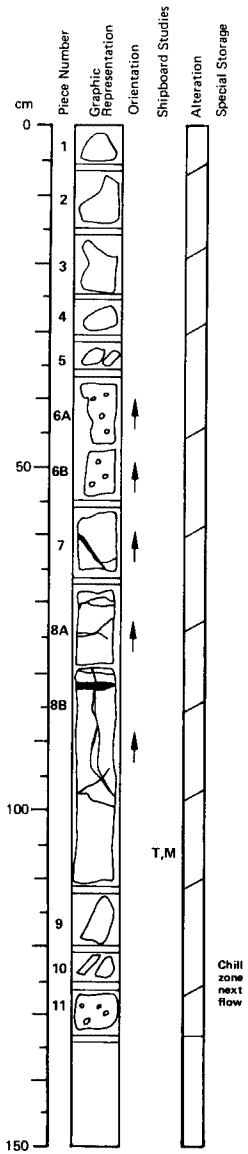
Ashy Mudstone, Siltstone, Sandstone to Altered Ash, dark greenish gray (5GY 4/1 and 5BG 4/1) to dark gray (N4) hard undeformed **Mudstone to Sandstone,** with a rather high content of volcanic particles (transparent uncolored glass, and mainly greenish shardy glass).

Sedimentary structures: no baked zone is noticeable in vicinity of overlying basalt intrusion, but some microfaults may be due to this intrusion.
Normal sedimentary structures appear: parallel and irregular laminae, microfaults, cross-beds, silt patches, bioturbation slight at 15 and 110 cm.
Core-Catcher is composed mainly by laminated **Calcareous Siltstone and Altered Ash.**

SMEARS:

	Mudstone	Ash	Calcareous Siltstone
Feldspar	5- 6%	+	10%
Clay minerals	35-55%	17%	26%
Volcanic glass	30-53%	67%	25%
Opaque minerals	3- 4%	+	+
Heavy minerals	2- 4%	+	+
Carbonate unspec. (incluiding nannofossils)	4- 5%	3%	25%

CARBON-CARBONATE:
3-64 (0.3, 0.1, 2)



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 3	1

Depth: 476.5 to 477.8 m

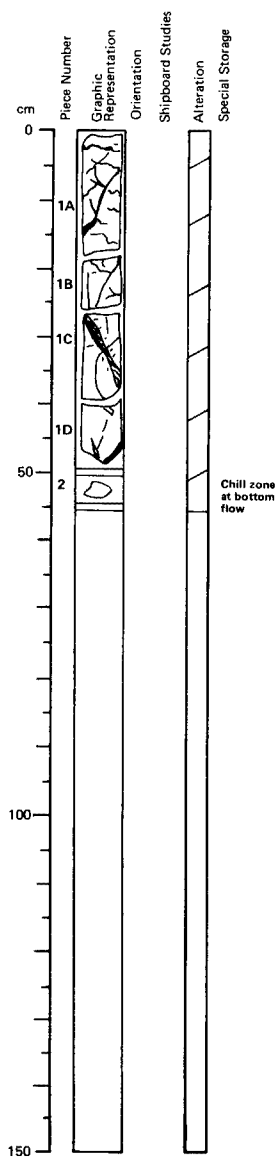
Visual Description

0-120 cm: basalt aphyric, fine-grained (to aphanitic), vesicular (partly), dark.
Vesicles 5%, <1 cm filled with calcite and smectite, partly unfilled.
120-133 cm: chill zone at top of next lava flow.
Basalt aphyric, fine-grained to aphanitic.
126-133 cm: vesicles 5%, unfilled.

Shipboard Data

Bulk Analysis:	**109 cm**
SiO_2	44.71
Al_2O_3	6.59
Fe_2O_3	1.69
FeO	11.14
MgO	22.71
CaO	7.09
Na_2O	0.94
K_2O	0.32
TiO_2	2.00
P_2O_5	0.33
MnO	0.39
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	1070.00
Ni	627.00
Sr	233.00
Zr	134.00

Magnetic Data:	**107 cm**
Intensity (emu/cc)	228.1
Inclination before demag.	-3.0
Stable Inclination	4.8
Physical Properties:	**105 cm**
$\bar{V}p$ (km/s)	4.26
Other Data:	**105 cm**
Therm. cond. (mcal/cm-s-°C)	3.78



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 3	2

Depth: 477.8 to 478.4 m

Visual Description

0-54 cm: basalt aphyric, fine-grained, dark gray, vesicular. Vesicles 15-20%, <1-2 mm, filled with calcite and clay. Numerous calcite veins with thicknesses up to 15 mm.
45-54 cm: top of chill zone.

SITE 446 HOLE A CORE 14 CORED INTERVAL: 486.0-495.5 m

TIME–ROCK UNIT: Upper Lower Eocene

BIOSTRAT ZONE: *T. orthostylus* Zone (N)

FOSSIL CHARACTER: FORAMS B; NANNOS FM; RADS RP

SECTION: 1, 2, 3, 4

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: BASALT

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE: 10-12 cm (1); 14-16 cm (2) (A) (2) (B)

LITHOLOGIC DESCRIPTION

Two very thin beds of sediment were recovered between basalt layers.

(1) Black Powdery Mudstone

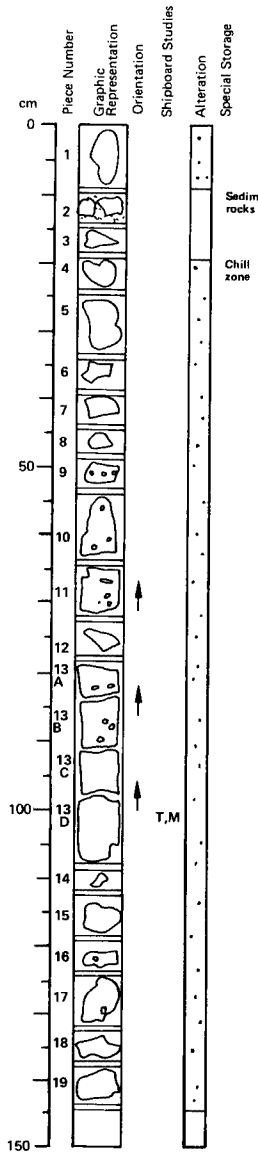
(2) Greenish gray (5G 5/1, 5G 6/1) to bluish gray (5BG 5/1, 5B 6/1), very hard laminated **Mudstone** with pellet of coarser mudstone enclosed, both glauconitic.

(A) Glauconitic Mudstone.

(B) Glauconitic Sandy Mudstone

SMEARS:	1	2A	2B
Feldspar	5%	50%	35%
Clay minerals	65%	10%	15%
Volcanic glass	–	–	–
Opaques	5%	5%	5%
Pyrite	10%	–	–
Micronodules	5%	–	–
Heavy minerals	–	10%	5%
Carbonate unspec.	+	–	10% (forams?)*
Siliceous fossils	+	–	–
Glauconite	7%	15%	15%
Lithic fragments	–	10%	10%

*altered to or replaced by glauconite?



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	14	1

Depth: 486.0 to 487.4 m

Visual Description

0-9 cm: basalt, aphyric, fine-grained, dark gray.
9-18 cm: sedimentary rocks.
18-144 cm: basalt flow, very fine-grained (in distance 20-24 cm glass) gray, vesicles rare, but up to 7 mm, filled with calcite and zeolite. There are zones (2-10 mm) of vesicular basalt. Alteration is light.

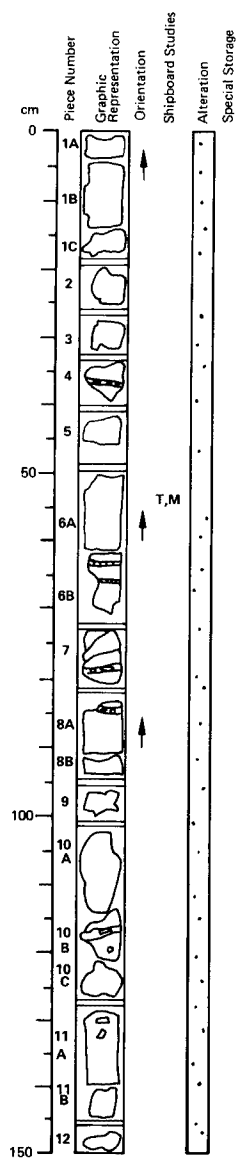
Shipboard Data

Bulk Analysis:	**92 cm**
SiO_2	48.83
Al_2O_3	13.40
Fe_2O_3	1.57
FeO	10.34
MgO	7.42
CaO	10.24
Na_2O	2.99
K_2O	0.62
TiO_2	3.48
P_2O_5	0.35
MnO	0.19
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	144.00
Ni	77.00
Sr	379.00
Zr	198.00

Magentic Data:	**102 cm**	**102 cm**
Intensity (emu/cc)	41.4	—
Inclination before demag.	50.4	—
Stable Inclination	−38.7	19.0

Physical Properties:	**100 cm**
$\bar{V}p$ (km/s)	4.06
Porosity (%)	16.86
Wet Bulk Density	2.71
Grain Density	3.05

Other Data:	**100 cm**
Therm. cond. (mcal/cm-s-°C)	3.69



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	14	2

Depth: 487.4 to 489.0 m

Visual Description

0-150 cm: basalt identical to that described for Core 14, Section 1. Aphyric, very fine-grained, gray, with rare, but big vesicles (up to 10 mm), filled with calcite, zeolite, and pyrite.

Shipboard Data

Magnetic Data:	**44 cm**	
Intensity (emu/cc)	469.4	
Inclination before demag.	−9.8	
Stable Inclination	−5.6	

Physical Properties:	**44 cm**	**53 cm**
$\bar{V}p$ (km/s)	4.43	4.21
Porosity (%)	13.11	—
Wet Bulk Density	2.76	—
Grain Density	3.03	—

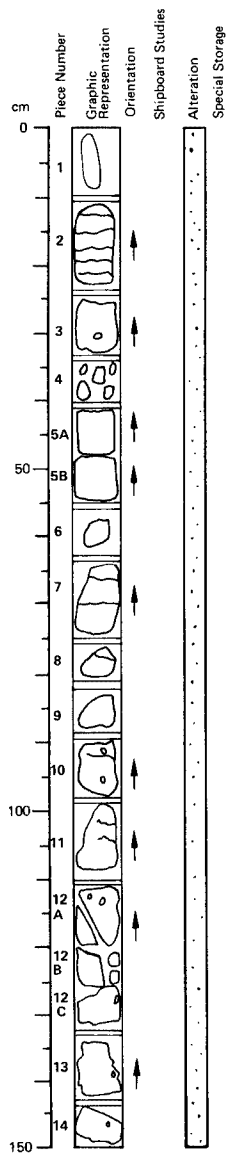
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 4	3

Depth: 488.9 to 490.3 m

Visual Description
0-138 cm: basalt identical to that described for Core 14, Section 2. Aphyric, fine-grained, gray.
Piece 8A has two big vesicles (up to 25 x 8 mm), filled with calcite, zeolite and pyrite.

Shipboard Data			
Bulk Analysis:	**64 cm**	**Magnetic Data:**	**66 cm**
SiO_2	51.54	Intensity (emu/cc)	361.1
Al_2O_3	12.89	Inclination before demag.	−13.5
Fe_2O_3	1.52	Stable Inclination	−10.5
FeO	10.06		
MgO	7.28		
CaO	9.77	**Physical Properties:**	**66 cm**
Na_2O	3.08	Vp (km/s)	4.35
K_2O	0.29	Porosity (%)	12.78
TiO_2	3.29	Wet Bulk Density	2.77
P_2O_5	0.35	Grain Density	3.02
MnO	0.16		
LOI	---		
H_2O^+	---		
H_2O^-	---		
CO_2	---		
Cr	141.00		
Ni	72.00		
Sr	367.00		
Zr	194.00		



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5	8 4 4 6	A	1 5	1

Depth: 495.5 to 497.0 m

Visual Description

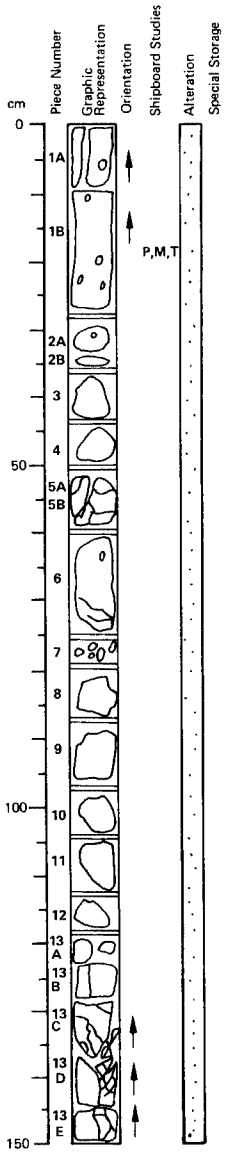
Dark gray, aphyric, very fine-grained basalt with occasional (≪1%) large amygdules (1-5 mm) filled by carbonate (calcite). Carbonate, cross-cutting, and clay-lined veins are common.

Fracture surfaces on Pieces 5, 10, 11, 12 and 13 lined by chloritic/clay material, carbonate, and pyrite.

Piece 1, 0-10 cm: one large olivine phenocryst (outer surface 5 x 3 mm).

Shipboard Data

Bulk Analysis:	**70 cm**
SiO_2	50.98
Al_2O_3	12.71
Fe_2O_3	1.56
FeO	10.28
MgO	6.95
CaO	9.77
Na_2O	2.89
TiO_2	3.50
P_2O_5	0.32
MnO	0.17
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	139.00
Ni	72.00
Sr	368.00
Zr	194.00



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5	8 4 4 6	A	1 5	2

Depth: 497.0 to 498.5 m

Visual Description

Dark gray, aphyric, very fine-grained basalt. Occasional large carbonate filled amygdules (≪1%, 1-5 mm); also strings of vesicles and amygdules in Piece 6 (60-74 cm).

Cross-cutting clay and carbonate veins.

Fractures lined by greenish chloritic/clay material, carbonate and some pyrite.

In Pieces 10 (99-104 cm) and 13B (123-127 cm): large vesicles (8-15 mm across) occur, lined by whitish green clay and pyrite.

Vesicle in Piece 13B has a surrounding gray clayey alteration zone.

Pieces 5 and 13 heavily veined, Piece 13 very broken up along veins (fractures).

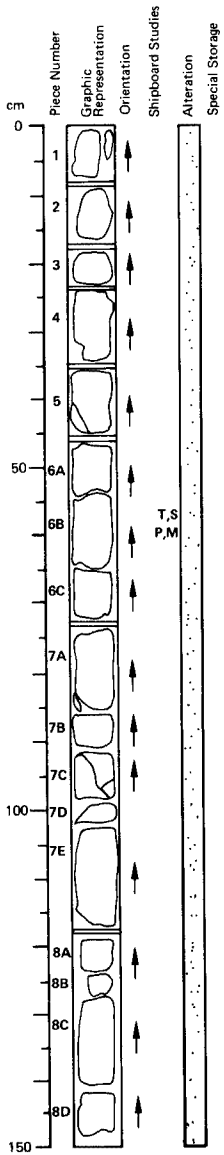
Similar to previous section.

Shipboard Data

Magnetic Data:	**16 cm**
Intensity (emu/cc)	751.04
Inclination before demag.	-10.1
Stable Inclination	-8.8

Physical Properties:	**16 cm**
$\bar{V}p$ (km/s)	4.29
Porosity (%)	14.26
Wet Bulk Density	2.80
Grain Density	3.10

Other Data:	**16 cm**
Therm. cond. (mcal/cm-s-°C)	3.93



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 5	3

Depth: 498.5 to 500.0 m

Visual Description

Dark gray, aphyric, very fine-grained basalt.
Cross-cutting carbonate filled veins.
Rows of fine vesicles in Pieces 5, 6B, 6C and 8. Some are carbonate filled, often with associated dark gray clayey alteration zone.
Fractures lined by dark green chloritic material and carbonate or light olive green clay and pyrite.
Occasional large vesicle (1-5 mm), thinly lined by grayish clay, carbonate and an odd one with pyrite.
Remnants of two large carbonate filled amygdules (at least 10-15 mm across) between Pieces 6A and 6B and 7C and 7D.
Similar to previous section.

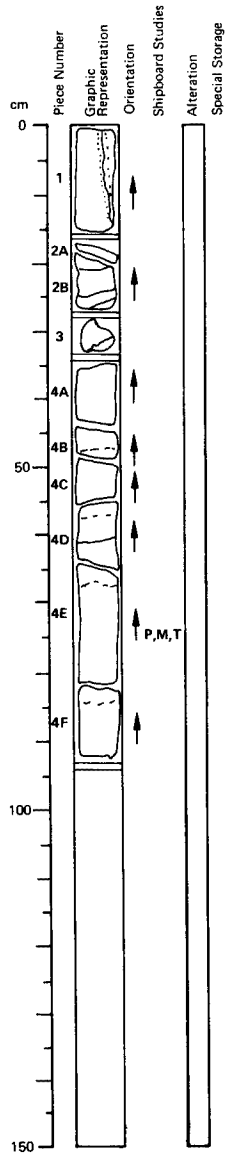
Shipboard Data

Bulk Analysis:	**75 cm**
SiO_2	50.87
Al_2O_3	13.30
Fe_2O_3	1.53
FeO	10.10
MgO	6.79
CaO	9.94
Na_2O	2.88
K_2O	0.46
TiO_2	3.32
P_2O_5	0.33
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	135.00
Ni	72.00
Sr	373.00
Zr	262.00

Magnetic Data:	**58 cm**
Intensity (emu/cc)	290.5
Inclination before demag.	−10.9
Stable Inclination	− 5.5

Physical Properties:	**58 cm**
$\bar{V}p$ (km/s)	4.52
Porosity (%)	14.04
Wet Bulk Density	2.75
Grain Density	3.03

Other Data:	**58 cm**
Therm. cond. (mcal/cm-s-° C)	4.03



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 5	4

Depth: 500.0 to 500.9 m

Visual Description

Dark gray, aphyric, very fine-grained, basat.
Cross cutting calcite veins and rows of vesicles (often carbonate filled and with alteration zone).
Occasional large vesicles (10-20 mm) present, lined by olive green clay and pyrite.
Piece 3, 28-33 cm: dark fracture surface covered by fine-grained pyrite. Similar occurrence on lower surface of Piece 4B, 48 cm.

– – – – = rows of vesicles.

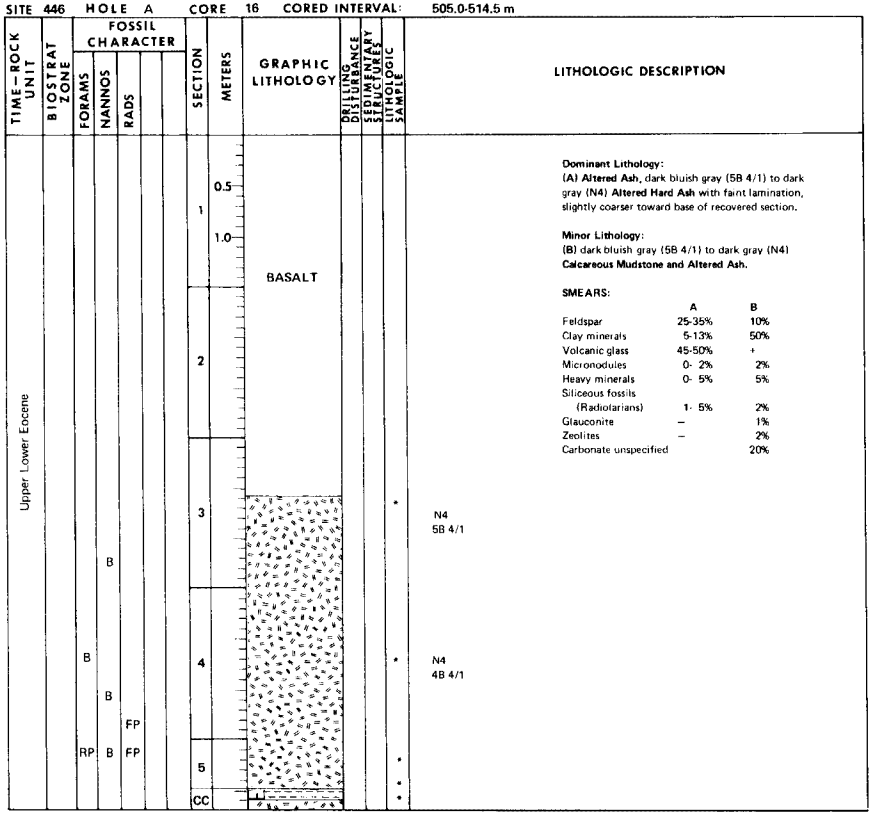
Shipboard Data

Magnetic Data:	**73 cm**
Intensity (emu/cc)	331.1
Inclination before demag.	−7.6
Stable Inclination	−7.8

Physical Properties:	**73 cm**
$\bar{V}p$ (km/s)	4.60
Porosity (%)	10.34
Wet Bulk Density	2.80
Grain Density	3.00

Other Data:	**73 cm**
Therm. cond. (mcal/cm-s-° C)	4.18

SITE 446 HOLE A CORE 16 CORED INTERVAL: 505.0-514.5 m

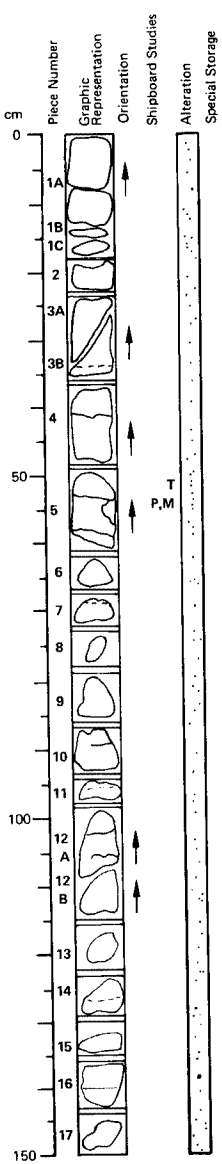


Dominant Lithology:
(A) Altered Ash, dark bluish gray (5B 4/1) to dark gray (N4) **Altered Hard Ash** with faint lamination, slightly coarser toward base of recovered section.

Minor Lithology:
(B) dark bluish gray (5B 4/1) to dark gray (N4) **Calcareous Mudstone and Altered Ash.**

SMEARS:

	A	B
Feldspar	25-35%	10%
Clay minerals	5-13%	50%
Volcanic glass	45-50%	+
Micronodules	0- 2%	2%
Heavy minerals	0- 5%	5%
Siliceous fossils (Radiolarians)	1- 5%	2%
Glauconite	–	1%
Zeolites	–	2%
Carbonate unspecified		20%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 6 6	A	1 6	1

Depth: 505.0 to 506.5 m

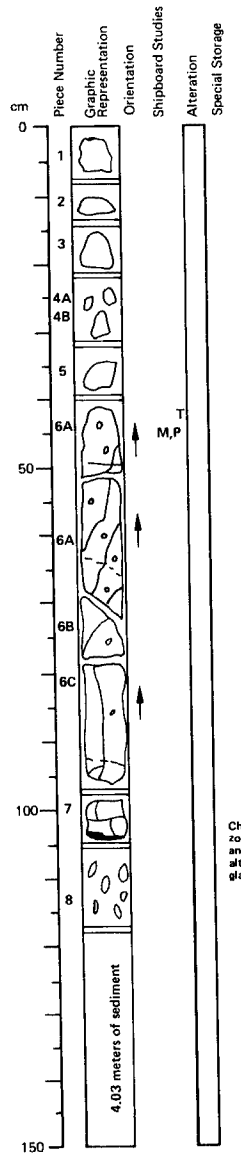
Visual Description

Dark gray, aphyric, fine-grained basalt.
Cross-cutting veins and fractures lined by dark green or light olive green clays, pyrite and carbonate.
Occasional large vesicles lined by light gray clay or light olive green clay.
Odd fine-grained pyrite and carbonate.
Similar to previous core.

Shipboard Data

Magnetic Data:	**53 cm**
Intensity (emu/cc)	260.8
Inclination before demag.	−26.4
Stable Inclination	−8.8

Physical Properties:	**53 cm**
$\overline{V}p$ (km/s)	4.76
Porosity (%)	10.64
Wet Bulk Density	2.78
Grain Density	2.99



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	1 6	2

Depth: 506.5 to 507.7 m

Visual Description

Dark gray, aphyric, fine-grained, basalt.
Cross-cutting calcite veins and dark clay filled veins (<0.5 mm wide).
Lines or zones of vesicles (<0.5 mm wide), cross-cut basalt, vesicles are carbonate filled.
Alteration zone of gray clayey material in zone.
Fracture surfaces covered by greenish clay material and dark (black) material, rare pyrite.
Similar to previous section.
Piece 7, chill zone and glassy margin, glass (98-103 cm) altered to bluish gray material.
Piece 8, drilling rubble (105-117 cm).

– – – = line of vesicles and alteration.

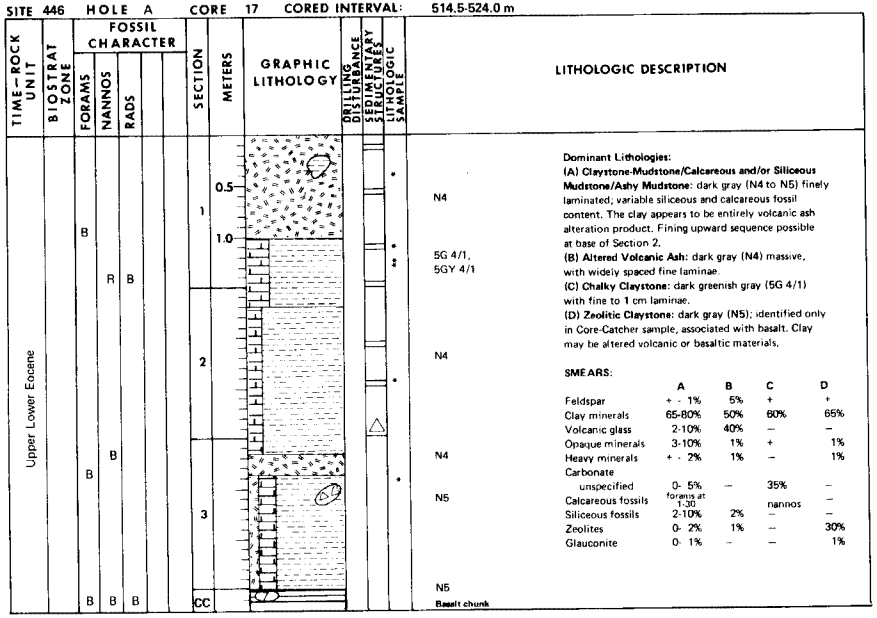
Shipboard Data

Bulk Analysis:	**72 cm**
SiO_2	51.72
Al_2O_3	13.02
Fe_2O_3	1.46
FeO	9.63
MgO	6.45
CaO	10.51
Na_2O	2.93
K_2O	0.45
TiO_2	3.40
P_2O_5	0.33
MnO	0.19
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	131.00
Ni	74.00
Sr	374.00
Zr	198.00

Magnetic Data:	**44 cm**
Intensity (emu/cc)	626.2
Inclination before demag.	−4.4
Stable Inclination	−2.0

Physical Properties:	**44 cm**
$\overline{V}p$ (km/s)	4.25
Porosity (%)	14.80
Wet Bulk Density	2.74
Grain Density	3.04

SITE 446 HOLE A CORE 17 CORED INTERVAL: 514.5-524.0 m



Dominant Lithologies:

(A) Claystone-Mudstone/Calcareous and/or Siliceous Mudstone/Ashy Mudstone: dark gray (N4 to N5) finely laminated; variable siliceous and calcareous fossil content. The clay appears to be entirely volcanic ash alteration product. Fining upward sequence possible at base of Section 2.

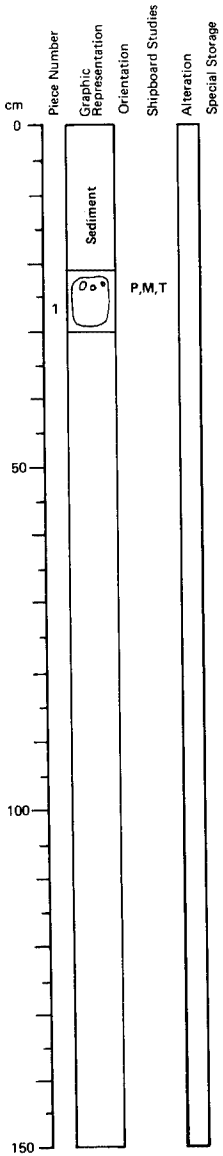
(B) Altered Volcanic Ash: dark gray (N4) massive, with widely spaced fine laminae.

(C) Chalky Claystone: dark greenish gray (5G 4/1) with fine to 1 cm laminae.

(D) Zeolitic Claystone: dark gray (N5); identified only in Core-Catcher sample, associated with basalt. Clay may be altered volcanic or basaltic materials.

SMEARS:

	A	B	C	D
Feldspar	+ - 1%	5%	+	+
Clay minerals	65-80%	50%	60%	65%
Volcanic glass	2-10%	40%	–	–
Opaque minerals	3-10%	1%	+	1%
Heavy minerals	+ - 2%	1%	–	1%
Carbonate unspecified	0- 5%	–	35%	–
Calcareous fossils	forams at 1-30		nannos	–
Siliceous fossils	2-10%	2%	–	–
Zeolites	0- 2%	1%	–	30%
Glauconite	0- 1%	–	–	1%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.
5	8	4	4	6	A		1	7	CC

Depth: 523.5 to 523.9 m

Visual Description

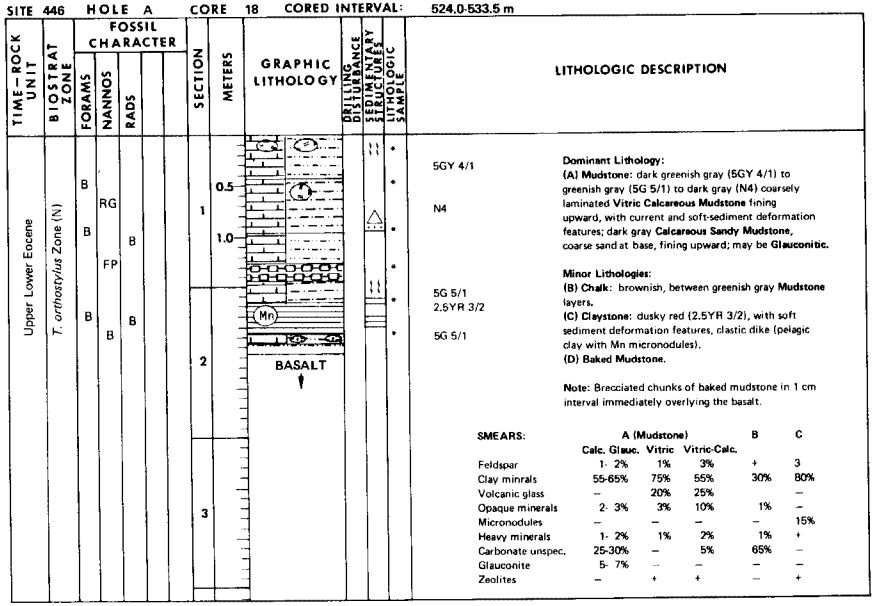
0-21 cm: sediment.

21-30 cm: dark gray, aphyric, fine-grained basalt. Several large vesicles at top of piece (often pipe-like). Rounded vesicles (10 mm across) and pipe vesicles (10-15 mm long, 2 mm across). Angular vesicles (triangular cross section) 10 x 8 mm. Vesicles often lined by gray clay material and carbonate. Light olive green clay on outer surface and some pyrite (also in some vesicles). Approximately 5% vesicles.

Shipboard Data

Physical Properties:	**26 cm**
$\overline{V}p$ (km/s)	3.84

SITE 446 HOLE A CORE 18 CORED INTERVAL: 524.0-533.5 m

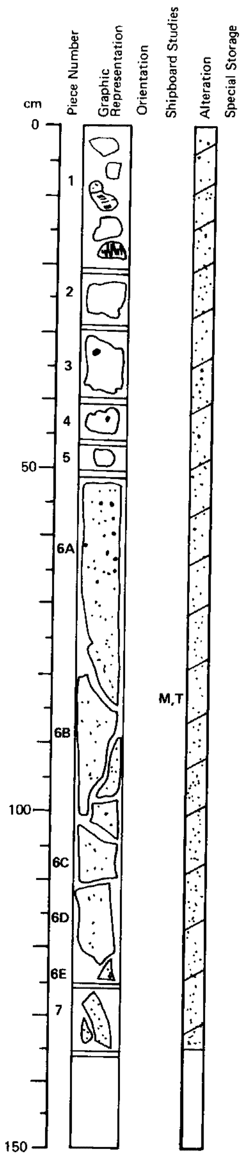


Dominant Lithology:
(A) Mudstone: dark greenish gray (5GY 4/1) to greenish gray (5G 5/1) to dark gray (N4) coarsely laminated **Vitric Calcareous Mudstone** fining upward, with current and soft-sediment deformation features; dark gray **Calcareous Sandy Mudstone,** coarse sand at base, fining upward; may be **Glauconitic.**

Minor Lithologies:
(B) Chalk: brownish, between greenish gray **Mudstone** layers.
(C) Claystone: dusky red (2.5YR 3/2), with soft sediment deformation features, clastic dike (pelagic clay with Mn micronodules).
(D) Baked Mudstone.

Note: Brecciated chunks of baked mudstone in 1 cm interval immediately overlying the basalt.

SMEARS:	A (Mudstone) Calc. Glauc.	A (Mudstone) Vitric	A (Mudstone) Vitric-Calc.	B	C
Feldspar	1- 2%	1%	3%	+	3
Clay minrals	55-65%	75%	55%	30%	80%
Volcanic glass	–	20%	25%		–
Opaque minerals	2- 3%	3%	10%	1%	–
Micronodules	–	–	–	–	15%
Heavy minerals	1- 2%	1%	2%	1%	+
Carbonate unspec.	25-30%	–	5%	65%	–
Glauconite	5- 7%	–	–	–	–
Zeolites	–	+	+	–	+



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	18	3

Depth: 526.1 to 527.4 m

Visual Description

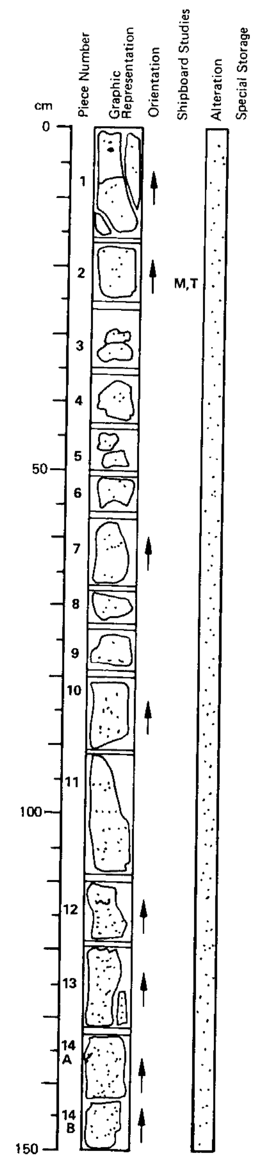
0-20 cm: bits of baked sediment and glassy basalt.

22-150 cm: aphyric vesicular massive basalt, 5-15% vesicles and amygdules (50-50), 0.2-3.0 mm. Calcite fillings, some aragonite needles visible in a few vugs.

Shipboard Data

Magnetic Data:	**83 cm**
Intensity (emu/cc)	381.21
Inclination before demag.	–10.9
Stable Inclination	–7.5

Physical Properties:	**83 cm**
$\overline{V}p$ (km/s)	4.04
Porosity (%)	19.80
Wet Bulk Density	2.61
Grain Density	2.98



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	18	4

Depth: 527.4 to 528.9 m

Visual Description

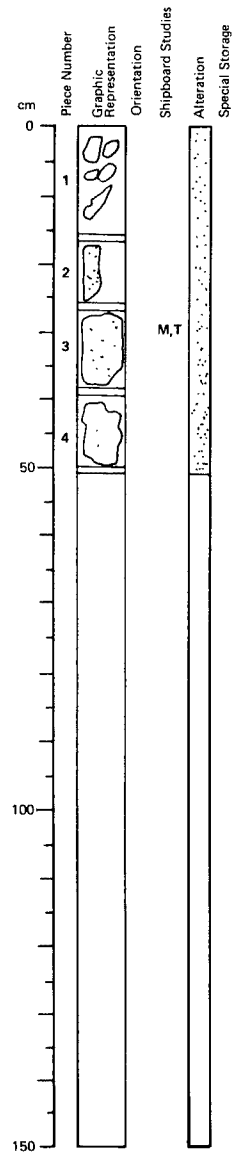
Aphyric massive basalt, similar to that in last section except for fewer vesicles (5-10%) and far less amygdules (calcite filled). Pyrites visible as free crystals in vesicles. Chains of vesicles oriented horizontally.

Shipboard Data

Bulk Analysis:	**85 cm**
SiO_2	48.93
Al_2O_3	12.95
Fe_2O_3	1.50
FeO	9.89
MgO	6.89
CaO	9.28
Na_2O	3.34
K_2O	1.42
TiO_2	3.74
P_2O_5	0.61
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	48.00
Ni	38.00
Sr	673.00
Zr	191.00

Magnetic Data:	**23 cm**
Intensity (emu/cc)	213.5
Inclination before demag.	1.8
Stable Inclination	–7.3

Physical Properties:	**23 cm**
$\overline{V}p$ (km/s)	3.80
Porosity (%)	21.92
Wet Bulk Density	2.57
Grain Density	3.01



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	6	A	1	8	5

Depth: 528.9 to 529.4 m

Visual Description

Aphyric massive basalt. Vesicles 0-7% approximately 0.2-1.0 mm, fine-grained. A little calcite, pyrite, and chlorite visible on vein surface.

Shipboard Data

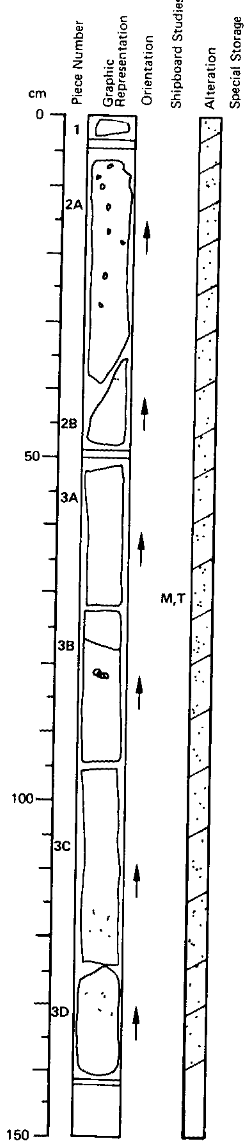
Bulk Analysis:	**32 cm**
SiO_2	48.06
Al_2O_3	12.83
Fe_2O_3	1.50
FeO	9.92
MgO	6.94
CaO	9.99
Na_2O	3.25
K_2O	1.16
TiO_2	3.78
P_2O_5	0.68
MnO	0.18
LOI	---
H_2O^+	---
H_2O^-	---
CO_2	---
Cr	52.00
Ni	49.00
Sr	720.00
Zr	200.00

Magnetic Data:	**29 cm**
Intensity (emu/cc)	224.6
Inclination before demag.	9.9
Stable Inclination	4.3

Physical Properties:	**29 cm**
$\bar{V}p$ (km/s)	3.74
Porosity (%)	20.53
Wet Bulk Density	2.57
Grain Density	2.97

SITE 446 HOLE A CORE 19 CORED INTERVAL: 533.5-543.0 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS		SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Upper Lower Eocene		B	B			1	0.5 1.0	BASALT				**Mudstone** Dark greenish gray (5G 4/1) laminated mudstone, and reddish brown **Mudstone**, finely laminated. Greenish gray is glauconitic; reddish brown is not. Recovered 0.2 meters under basalt. **SMEARS:** Quartz, Feldspar 1- 3% Clay minerals 70-75% Volcanic glass 0-10% Opaque minerals 5-10% Carbonate unspecified 0- 2% (nannos) Siliceous fossils 3% (sponge) Glauconite 6- 7% Zeolites 1%
						2						
						3						



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE				HOLE	CORE		SECT.
5	8	4	4	6		A	1	9	1

Depth: 533.5 to 534.4 m

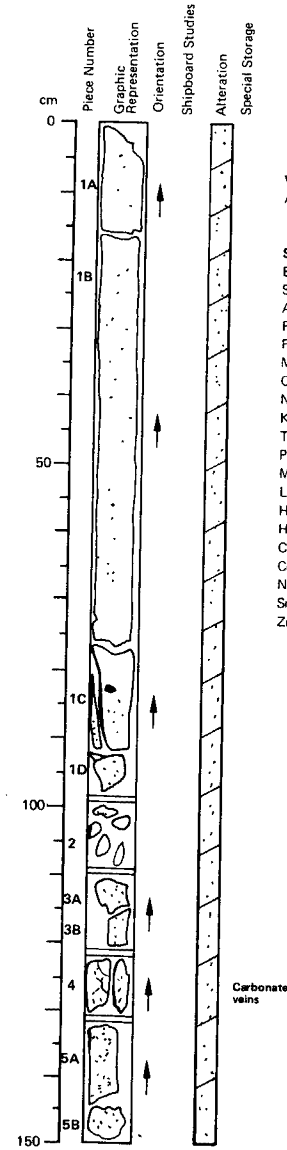
Visual Description

Aphyric massive basalt, fine-grained. Vesicles 0-3% – all calcite filled. A little green clay or chlorite on occasional fracture surfaces. No carbonate filled veins.

Shipboard Data

Magnetic Data:	**69 cm**
Intensity (emu/cc)	413.4
Inclination before demag.	−2.5
Stable Inclination	−3.0

Physical Properties:	**69 cm**
$\bar{V}p$ (km/s)	3.97
Porosity (%)	17.78
Wet Bulk Density	2.66
Grain Density	3.02



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE				HOLE	CORE		SECT.
5	8	4	4	6		A	1	9	2

Depth: 534.4 to 536.4 m

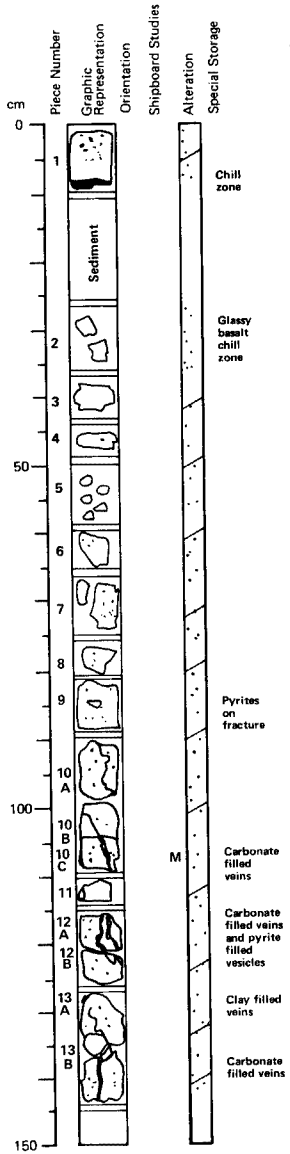
Visual Description

Aphyric gray massive basalt, 0-7%, 0.2-2.0 mm vesicles and calcite filled amygdules. A few carbonate filled veins, in Piece 4. Fine-grained light to moderate alteration.

Shipboard Data

Bulk Analysis:	**54 cm**
SiO_2	48.49
Al_2O_3	13.26
Fe_2O_3	1.52
FeO	10.00
MgO	6.78
CaO	9.73
Na_2O	3.29
K_2O	0.78
TiO_2	3.47
P_2O_5	0.43
MnO	0.19
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	147.00
Ni	76.00
Sr	385.00
Zr	243.00

Magnetic Data:	**14 cm**
Intensity (emu/cc)	414.6
Inclination before demag.	−5.9
Stable Inclination	−3.5



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	19	3

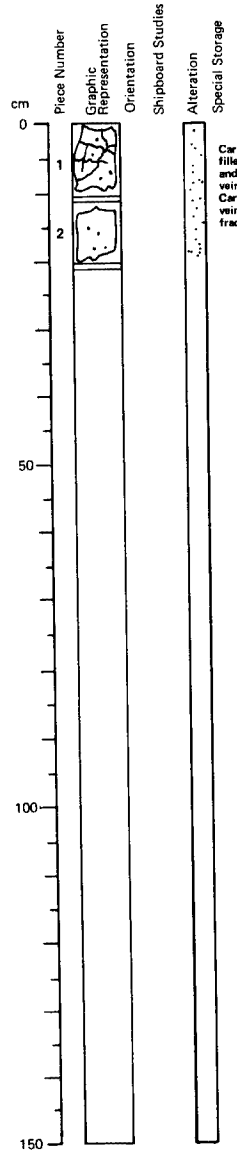
Depth: 536.4 to 537.8 m

Visual Description

0-10 cm: chill zone – vesicular aphyric basalt. Vesicles approximately 10%, 0.2-0.5 mm, absent from glassy zone.

10-25 cm: baked claystone.

27-143 cm: glassy to aphanitic and fine-grained massive basalt. Clay and sulphide filled vesicles (1-2%), approximately 0.5-1.0 mm. Carbonate filled veins common. Grain size increases downwards.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	19	4

Depth: 537.8 to 538.0 m

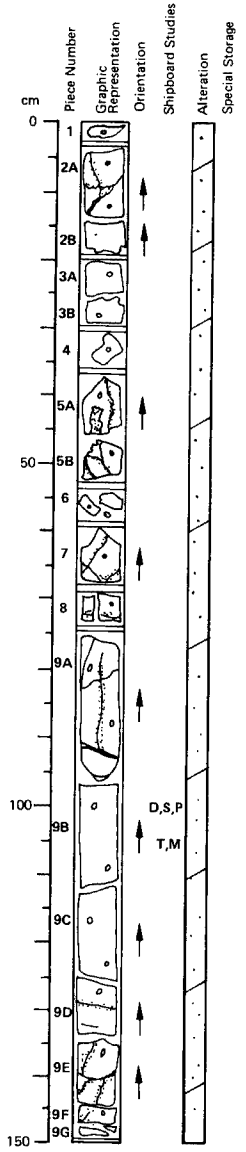
Visual Description

Massive aphyric fine-grained basalt. Clay filled amygdules 1%, approximately 0.5-1.0 mm.

Shipboard Data

Bulk Analysis:	7 cm
SiO_2	51.84
Al_2O_3	13.08
Fe_2O_3	1.58
FeO	10.44
MgO	5.38
CaO	9.16
Na_2O	3.12
K_2O	0.39
TiO_2	3.87
P_2O_5	0.43
MnO	0.20
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	13.00
Ni	31.00
Sr	446.00
Zr	302.00

Magnetic Data:	122 cm
Intensity (emu/cc)	834.0
Inclination before demag.	21.2
Stable Inclination	29.8



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 0	1

Depth: 543.0 to 544.5 m

Visual Description

0-150 cm: basalt aphyric, fine-grained,dark gray, vesicular. Vesicles 3-5%, <2 mm, filled with calcite, chlorite, and pyrite. Numerous calcite veins (1-2 mm) with chlorite and pyrite.

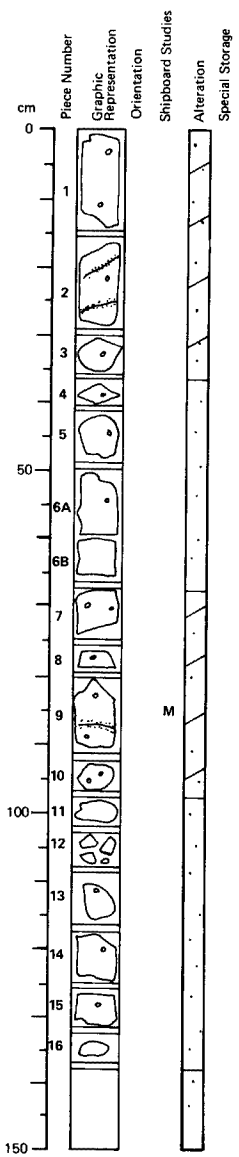
Shipboard Data

Bulk Analysis:	**97 cm**
SiO_2	49.73
Al_2O_3	13.01
Fe_2O_3	1.66
FeO	10.99
MgO	5.94
CaO	9.77
Na_2O	2.91
K_2O	0.22
TiO_2	4.04
P_2O_5	0.45
MnO	0.21
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	23.00
Ni	33.00
Sr	447.00
Zr	302.00

Magnetic Data:	**105 cm**
Intensity (emu/cc)	499.4
Inclination before demag.	30.7
Stable Inclination	44.2

Physical Properties:	**96 cm**	**105 cm**
$\bar{V}p$ (km/s)	--	4.75
Porosity (%)	15.41	
Wet Bulk Density	2.78	
Grain Density	3.10	

Other Data:	**105 cm**
Therm. cond. (mcal/cm-s-°C)	3.75



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 0	2

Depth: 544.5 to 545.9 m

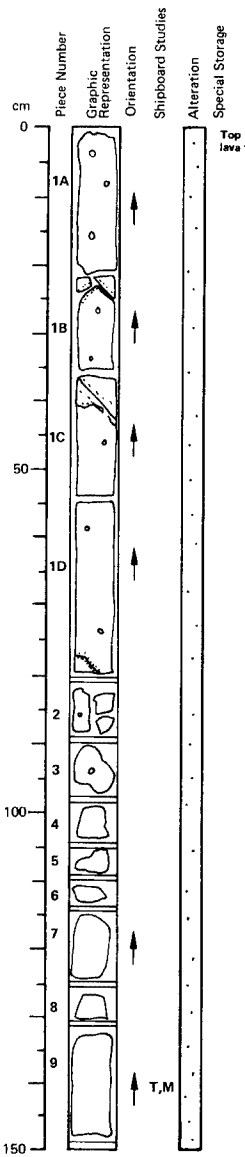
Visual Description

0-36 cm: basalt identical to that described at the base of Core 20, Section 1. Aphyric, fine-grained,dark gray. Vesicles approximately 3%, <1 mm, filled with chlorite, calcite, pyrite.
36-137 cm: fresh basalt, gray, fine-grained, vesicles less than 1%.

Shipboard Data

Magnetic Data:	**82 cm**
Intensity (emu/cc)	294.8
Inclination before demag.	43.9
Stable Inclination	44.7

Physical Properties:	**82 cm**
$\bar{V}p$ (km/s)	4.32



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 0	3

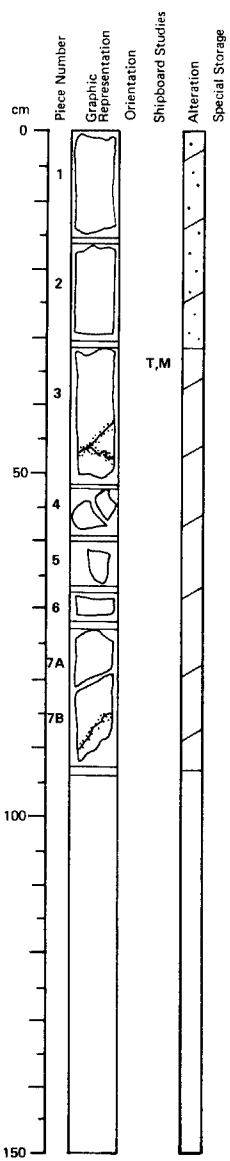
Depth: 545.9 to 547.4 m

Visual Description

0-150 cm: basalt, aphyric, fine-grained, dark gray (up to 80 cm) and gray (80-150 cm).
0-30 cm: vesicular. Vesicles 1%, <2 mm, filled with calcite and zeolite(?).
115-150 cm: lightly altered (chloritization). Calcite vein with chlorite and pyrite.

Shipboard Data

Physical Properties:	**140 cm**
$\overline{V}p$ (km/s)	3.71
Other Data:	**140 cm**
Therm. cond. (mcal/cm-s-° C)	3.62



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 0	4

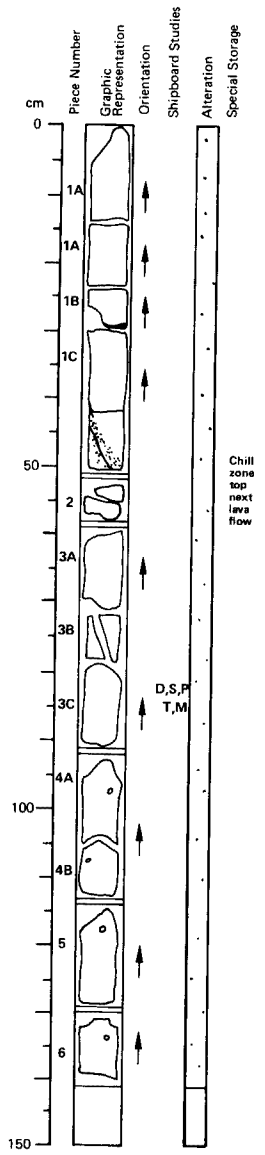
Depth: 547.4 to 548.3 m

Visual Description

0-93 cm: basalt identical to that described at the base of Core 20, Section 3, but more altered. Basalt aphyric, fine-grained, dark gray (greenish). Coarser-grained, then before. Alteration — chloritization.

Shipboard Data

Magnetic Data:	**35 cm**
Intensity (emu/cc)	58.1
Inclination before demag.	37.6
Stable Inclination	25.6
Physical Properties:	**34 cm**
$\overline{V}p$ (km/s)	4.62
Porosity (%)	20.89
Wet Bulk Density	2.66
Grain Density	3.09
Other Data:	**34 cm**
Therm. cond. (mcal/cm-s-° C)	3.03



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 1	1

Depth: 552.5 to 553.9 m

Visual Description

0-50 cm: basalt aphyric, fine-grained, altered moderate (identical to that described for Core 20, Section 4).

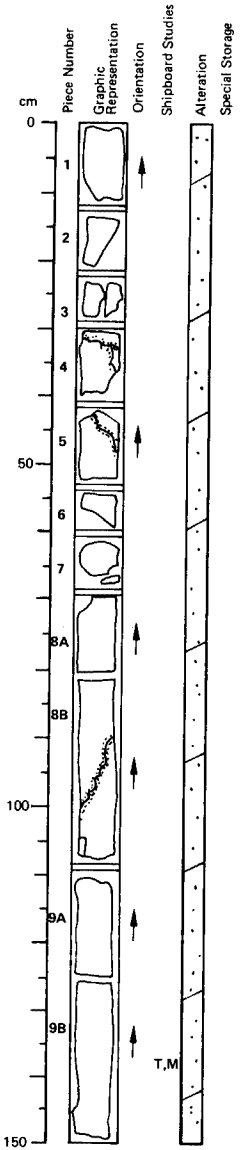
50-65 cm: chill zone (top of the next lava flow).

65-140 cm: basalt aphyric, fine-grained, altered. Vesicles < 1%, <0.5 mm, unfilled. Calcite vein with chlorite and pyrite.

Shipboard Data

Bulk Analysis:	**19 cm**
SiO_2	49.06
Al_2O_3	12.86
Fe_2O_3	1.65
FeO	10.92
MgO	6.76
CaO	9.96
Na_2O	2.72
K_2O	0.19
TiO_2	3.65
P_2O_5	0.42
MnO	0.18
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	28.00
Ni	36.00
Sr	439.00
Zr	274.00

Magnetic Data:	**82 cm**
Intensity (emu/cc)	607.3
Inclination before demag.	48.5
Stable Inclination	47.5
Physical Properties:	**82 cm**
$\bar{V}p$ (km/s)	4.13
Porosity (%)	17.38
Wet Bulk Density	2.71
Grain Density	3.06
Other Data:	**82 cm**
Therm. cond. (mcal/cm-s-°C)	3.51



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 1	2

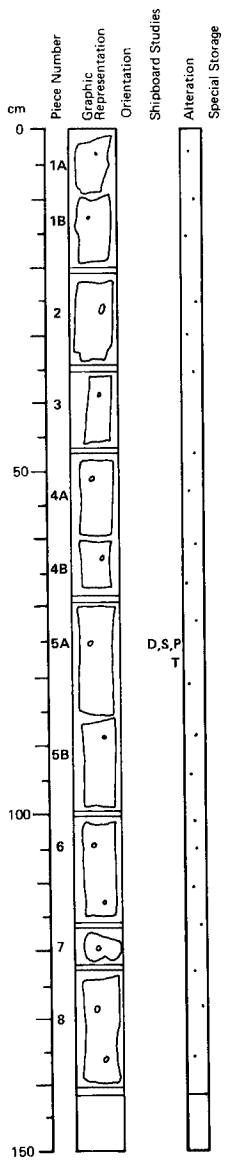
Depth: 553.9 to 555.4 m

Visual Description

0-150 cm: basalt identical to that described at the base of Core 21, Section 1.

Shipboard Data

Magnetic Data:	**128 cm**
Intensity (emu/cc)	109.9
Inclination before demag.	−16.7
Stable Inclination	19.3
Physical Properties:	**127 cm**
$\bar{V}p$ (km/s)	3.86
Other Data:	**127 cm**
Therm cond. (mcal/cm-s-°C)	3.73



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	21	3

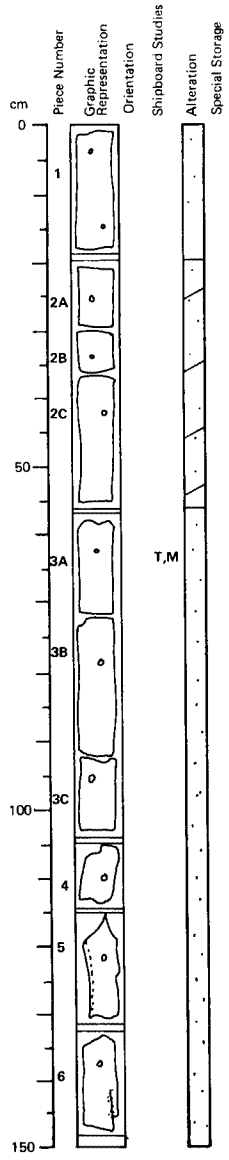
Depth: 555.4 to 556.8 m

Visual Description

0-140 cm: basalt, aphyric, fine-grained, very lightly altered (almost fresh). Vesicular, gray. Vesicles 10-15%, <1 mm, unfilled.

Shipboard Data

Magnetic Data:	**10 cm**
Intensity (emu/cc)	130.9
Inclination before demag.	34.5
Stable Inclination	34.6
Physical Properties:	**79 cm**
$\overline{V}p$ (km/s)	4.05
Porosity (%)	13.00
Wet Bulk Density	2.63
Grain Density	2.87
Other Data:	**79 cm**
Therm. cond. (mcal/cm-s-°C)	3.99



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	21	4

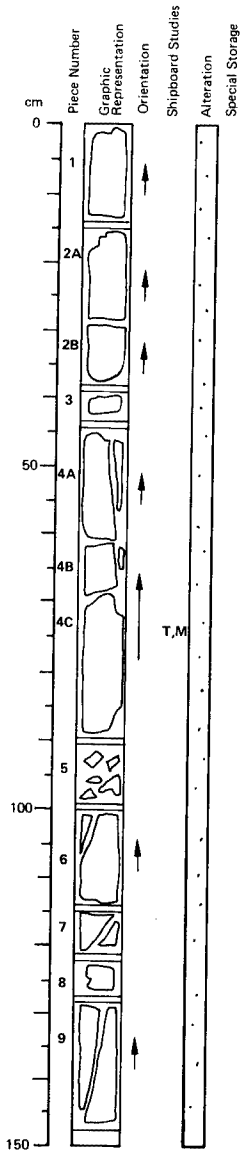
Depth: 556.8 to 557.3 m

Visual Description

0-150 cm: basalt (fresh), aphyric, identical to that described for Core 21, Section 3. Typical gray color.

Shipboard Data

Bulk Analysis:	**79 cm**	**Magnetic Data:**	**61 cm**
SiO_2	52.48	Intensity (emu/cc)	162.7
Al_2O_3	12.44	Inclination before demag.	15.7
Fe_2O_3	1.52	Stable Inclination	26.9
FeO	10.00		
MgO	6.59	**Physical Properties:**	**61 cm**
CaO	8.71	$\overline{V}p$ (km/s)	4.17
Na_2O	3.02		
K_2O	0.94	**Other Data:**	**61 cm**
TiO_2	3.62	Therm. cond. (mcal/cm-s-°C)	3.85
P_2O_5	0.41		
MnO	0.15		
LOI	---		
H_2O^+	---		
H_2O^-	---		
CO_2	---		
Cr	27.00		
Ni	35.00		
Sr	430.00		
Zr	290.00		



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	6	A	2	1	5

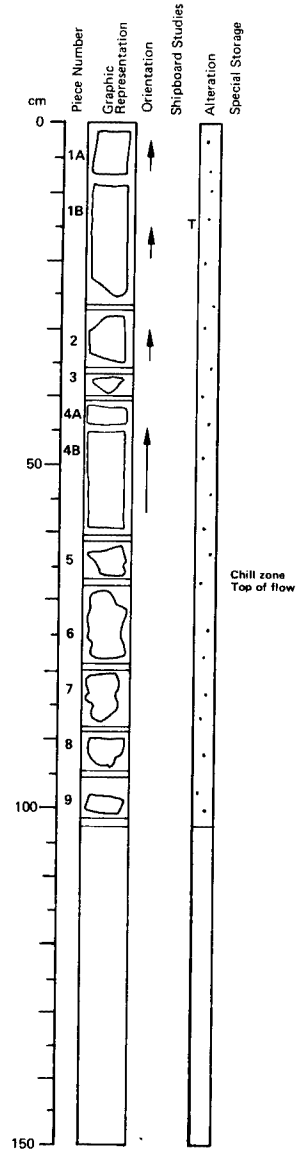
Depth: 557.3 to 558.8 m

Visual Description

0-150 cm: similar basalt to that of Core 21, Section 4. Basalt aphyric, fine-grained (coarser then before – 50-110 cm), gray, vesicular. Vesicles 10%, <1 mm, filled with calcite, chlorite and pyrite.
110-150 cm: basalt, fine-grained.

Shipboard Data

Magnetic Data:	**87 cm**
Intensity (emu/cc)	83.4
Inclination before demag.	15.7
Stable Inclination	36.3
Physical Properties:	**87 cm**
$\bar{V}p$ (km/s)	4.45
Porosity (%)	15.87
Wet Bulk Density	2.72
Grain Density	3.04
Other Data:	**7 cm**
Therm. cond. (mcal/cm-s-°C)	4.12



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	6	A	2	1	6

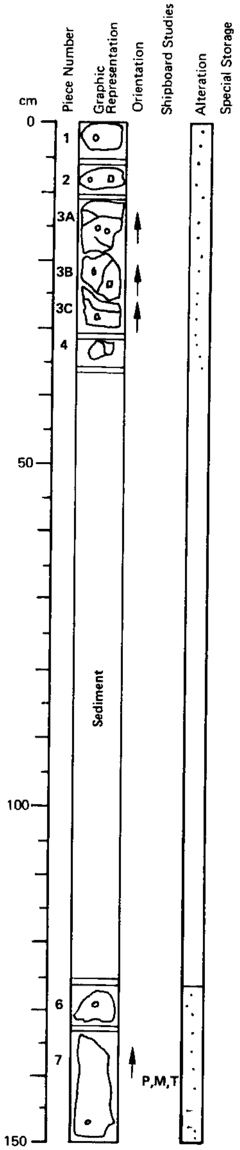
Depth: 558.8 to 559.8 m

Visual Description

0-67 cm: very fine-grained basalt. The same flow as described in Core 21, Section 5. It is the bottom of the lava flow. Basalt aphyric, gray, fresh.
67-78 cm: top of next lava flow. Chill zone (glass), dark.
78-82 cm: very fine-grained (aphanitic) basalt, dark,dense.
88-101 cm: basalt fine-grained, dark gray, fresh.

Shipboard Data

Magnetic Data:	**16 cm**
Intensity (emu/cc)	185.4
Inclination before demag.	–7.7
Stable Inclination	34.7
Physical Properties:	**15 cm**
$\bar{V}p$ (km/s)	4.41
Other Data:	**15 cm**
Therm. cond. (mcal/cm-s-°C)	4.13



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	22	1

Depth: 562.0 to 563.5 m

Visual Description

0-35 cm: very sparsely phyric, dark gray fine-grained basalt (< 1% to 1% plagioclase phenocrysts 2-3 mm). Vesicles 1% infilled by dark clay, pyrite or zeolite (about 0.5 mm). Cross-cutting, chloritic and zeolite lined veins and fractures (dark clay). Similar to end of previous core.

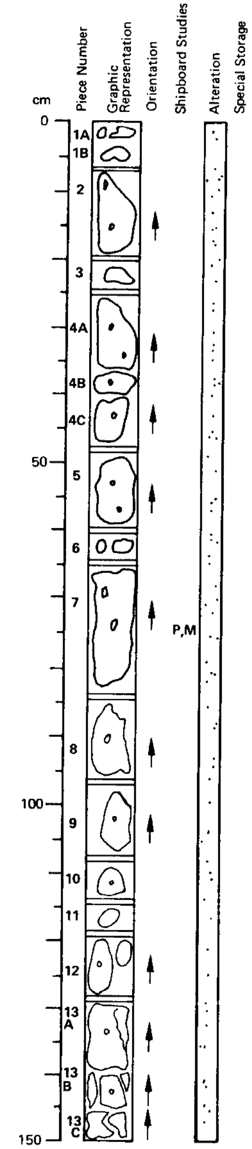
35-126 cm: claystone, sandy mudstone and volcanic ash sediments. No immediately obvious signs of baking.

126-150 cm: light gray, fine-grained aphyric, sparsely vesicular basalt. Vesicles 1%, 0.5-2 mm, lined by green clay (overlying zeolites?). No evidence of chill margins above or below sediment.

Shipboard Data

Bulk Analysis:	**29 cm**
SiO_2	48.06
Al_2O_3	12.23
Fe_2O_3	1.72
FeO	11.33
MgO	7.11
CaO	8.01
Na_2O	3.14
K_2O	1.08
TiO_2	4.65
P_2O_5	0.50
MnO	0.23
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	3.00
Ni	20.00
Sr	453.00
Zr	378.00

Magnetic Data:	**140 cm**
Intensity (emu/cc)	366.0
Inclination before demag.	−14.8
Stable Inclination	−13.2
Physical Properties:	**135 cm**
$\overline{V}p$ (km/s)	3.54
Other Data:	**135 cm**
Therm. cond. (mcal/cm-s-°C)	3.40



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
58	446	A	22	2

Depth: 563.5 to 565.0 m

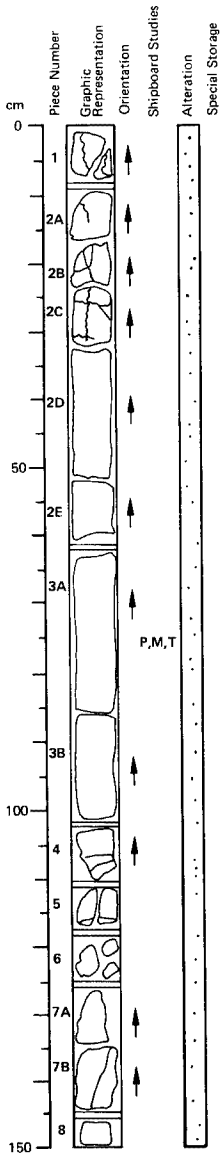
Visual Description

Light gray, fine- to medium-grained aphyric, sparsely vesicular basalt. Similar to previous section (end of). Odd plagioclase phenocryst (1.5-2 mm). Vesicles 1-2%, in general 0.5-1 mm across. Occasionally 2 mm across. Occur mainly between 15-70 cm. Lined by green clay, occasional pyrite and zeolite. Chloritic lining to fracture surfaces with odd pyrite grain between Pieces 4A and 4B, 12, 13A,B,C and 2.

Shipboard Data

Bulk Analysis:	**82 cm**
SiO_2	47.50
Al_2O_3	13.65
Fe_2O_3	1.22
FeO	8.02
MgO	4.95
CaO	10.79
Na_2O	3.87
K_2O	2.17
TiO_2	3.76
P_2O_5	0.38
MnO	0.22
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	30.00
Ni	28.00
Sr	756.00
Zr	211.00

Magnetic Data:	**75 cm**
Intensity (emu/cc)	594.4
Inclination before demag.	−16.2
Stable Inclination	−12.5
Physical Properties:	**73 cm**
$\overline{V}p$ (km/s)	3.82
Porosity (%)	18.29
Wet Bulk Density	2.68
Grain Density	3.05
Other Data:	**73 cm**
Therm. cond. (mcal/cm-s-°C)	3.59



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	6	A	2 2	3

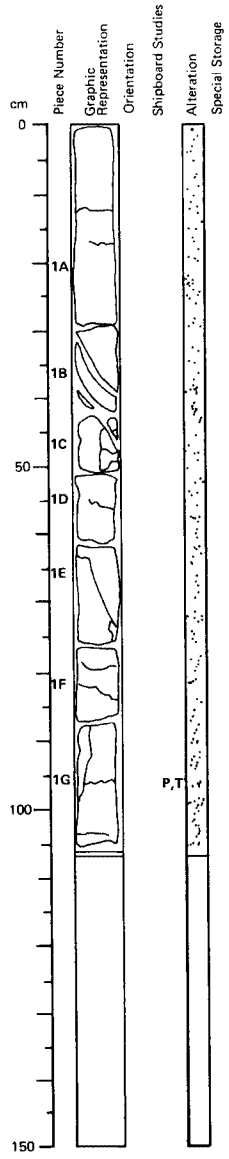
Depth: 565.0 to 566.5 m

Visual Description

Light gray, aphyric, medium-grained basalt. Similar to end of previous section. Plagioclase and pyroxene discernable under binocular microscope (<0.5-1 mm). Cross-cutting chloritic/clay (grayish and greenish). Lined veins from 0.5-2 mm wide also lines fractures. Pyrite visible on fracture surfaces.

Shipboard Data

Magnetic Data:	**75 cm**
Intensity (emu/cc)	732.5
Inclination before demag.	−14.2
Stable Inclination	−16.5
Physical Properties:	**78 cm**
$\bar{V}p$ (km/s)	4.27
Porosity (%)	16.06
Wet Bulk Density	2.83
Grain Density	3.17
Other Data:	**78 cm**
Therm. cond. (mcal/cm-s-°C)	3.51



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	6	A	2 2	4

Depth: 566.5 to 567.6 m

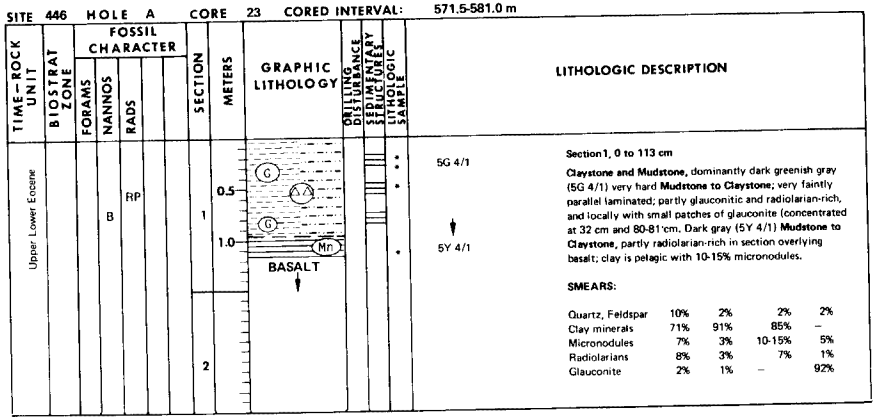
Visual Description

Light gray, medium- to fine-grained basalt, similar to previous section. Cross-cutting chloritic and pyrite lined fractures and veins.

Shipboard Data

Magnetic Data:	**95 cm**
Intensity (emu/cc)	619.4
Inclination before demag.	−20.2
Stable Inclination	−17.8
Physical Properties:	**95 cm**
$\bar{V}p$ (km/s)	3.90
Other Data:	**95 cm**
Therm. cond. (mcal/cm-s-°C)	3.68

SITE 446 HOLE A CORE 23 CORED INTERVAL: 571.5-581.0 m

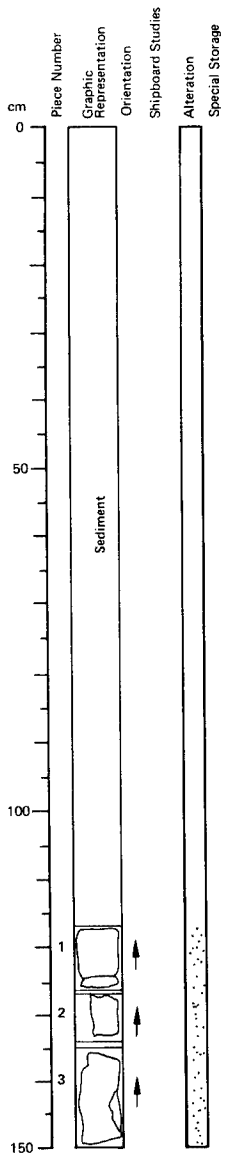


Section 1, 0 to 113 cm

Claystone and Mudstone, dominantly dark greenish gray (5G 4/1) very hard **Mudstone to Claystone;** very faintly parallel laminated; partly glauconitic and radiolarian-rich, and locally with small patches of glauconite (concentrated at 32 cm and 80-81 cm. Dark gray (5Y 4/1) **Mudstone to Claystone,** partly radiolarian-rich in section overlying basalt; clay is pelagic with 10-15% micronodules.

SMEARS:

Quartz, Feldspar	10%	2%	2%	2%
Clay minerals	71%	91%	85%	–
Micronodules	7%	3%	10-15%	5%
Radiolarians	8%	3%	7%	1%
Glauconite	2%	1%	–	92%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 3	1

Depth: 571.5 to 573.0 m

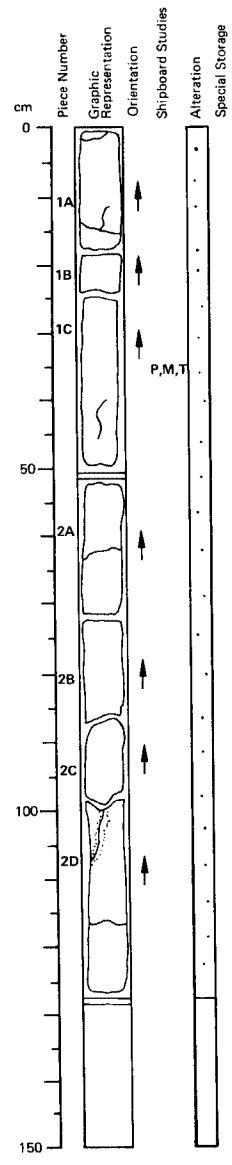
Visual Description

0-117 cm: sediment, mudstone and claystone.

117-150 cm: aphyric, gray, aphanitic to fine-grained basalt. Odd cross-cutting carbonate lined vein.

Pieces 2 and 3: 1% vesicles (carbonate filled amygdules or lined by light olive green clay [smectite?]).

Piece 3: two large (one – 20 mm x 5 mm, the other 8 mm x 3 mm) vugs infilled by carbonate.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 3	2

Depth: 573.0 to 574.3 m

Visual Description

Aphyric, gray, fine-grained basalt. Similar to previous section. Cross-cutting calcite or chloritic and pyrite line veins.

Occasional vesicles, 0.5-1 mm, usually filled by carbonate or lined by light olive green clay (smectite).

26 cm (between Pieces 1B and 1C): large vug at least 25 x 40 mm infilled by carbonate (continues through from outer surface to inner?).

84 cm (Piece 2B): large vug 17 x 10 mm filled by carbonate.

97-103 cm: chloritic vein with 2 mm wide alteration zone.

Some other large carbonate vugs (from 5 mm - 10 mm).

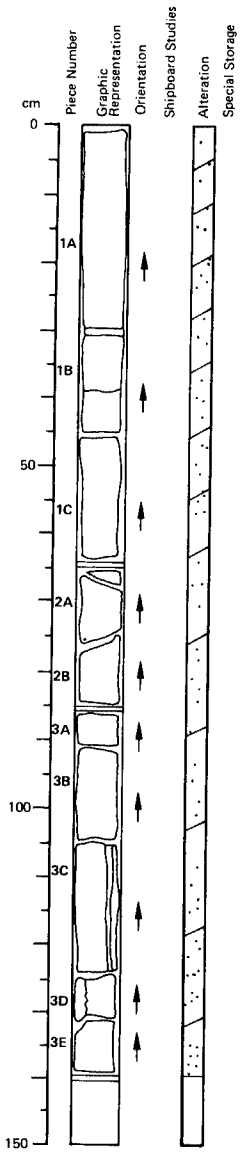
Shipboard Data

Bulk Analysis:	**52 cm**
SiO_2	52.17
Al_2O_3	12.02
Fe_2O_3	1.42
FeO	9.36
MgO	8.34
CaO	8.82
Na_2O	2.66
K_2O	0.83
TiO_2	3.31
P_2O_5	0.42
MnO	0.16
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	176.00
Ni	93.00
Sr	413.00
Zr	268.00

Magnetic Data:	**43 cm**
Intensity (emu/cc)	275.4
Inclination before demag.	−3.8
Stable Inclination	−4.8

Physical Properties:	**43 cm**
$\bar{V}p$ (km/s)	4.48

Other Data:	**43 cm**
Therm. cond. (mcal/cm-s-°C)	4.11



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 3	3

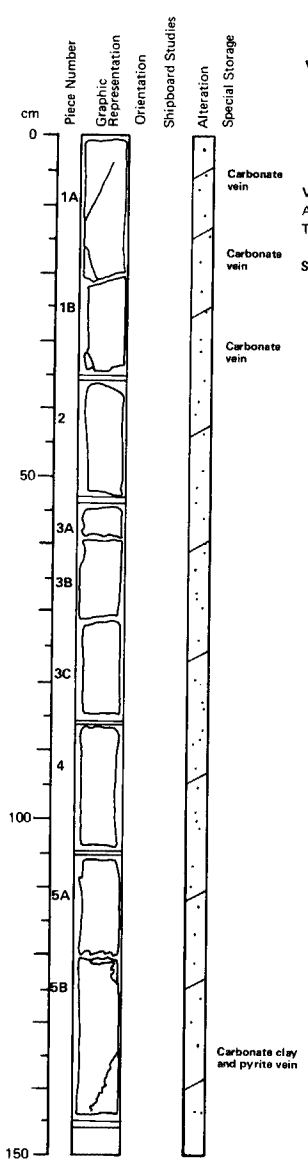
Depth: 574.3 to 575.7 m

Visual Description

Aphyric fine-grained basalt, < 1% calcite filled amygdules. A few carbonate filled veins have caused the core to split lengthwise (Piece 3C).

Shipboard Data

	38 cm
Magnetic Data:	
Intensity (emu/cc)	243.2
Inclination before demag.	−18.3
Stable Inclination	−12.1
Physical Properties:	**38 cm**
$\overline{V}p$ (km/s)	4.85
Porosity (%)	9.47
Wet Bulk Density	2.80
Grain Density	2.99
Other Data:	**38 cm**
Therm. cond. (mcal/cm-s-° C)	4.12



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 3	4

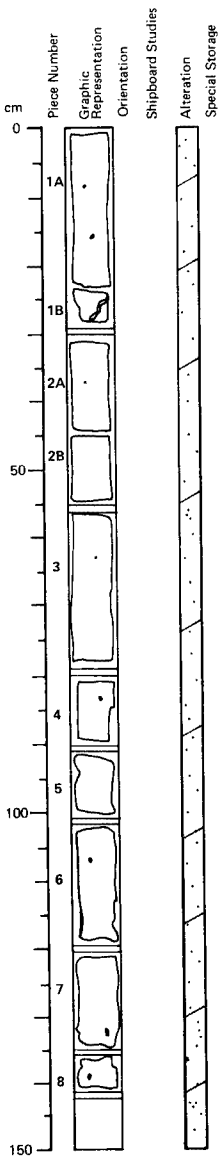
Depth: 575.7 to 577.1 m

Visual Description

Aphyric fine-grained basalt, < 1% calcite filled vesicles.
Thick calcite, clay and pyrite filled veins (1 mm or less). Massive.

Shipboard Data

	44 cm
Magnetic Data:	
Intensity (emu/cc)	165.4
Inclination before demag.	−14.8
Stable Inclination	−10.1
Physical Properties:	**44 cm**
$\overline{V}p$ (km/s)	4.92
Other Data:	**44 cm**
Therm. cond. (mcal/cm-s-° C)	4.13



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 3	5

Depth: 577.1 to 578.5 m

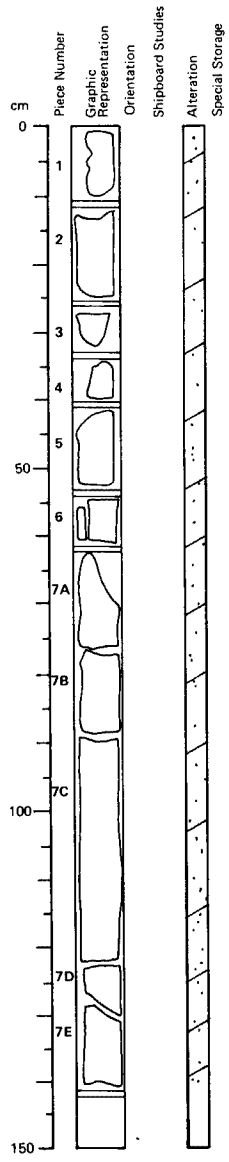
Visual Description

Aphyric massive basalt, appears to be moderately altered. Clay filled amygdules (< 1%). Fine-grained and massive. No chill zones.

Shipboard Data

Bulk Analysis:	**73 cm**
SiO_2	52.34
Al_2O_3	12.87
Fe_2O_3	1.39
FeO	9.20
MgO	7.22
CaO	9.18
Na_2O	2.95
K_2O	0.95
TiO_2	3.34
P_2O_5	0.42
MnO	0.14
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	174.00
Ni	93.00
Sr	409.00
Zr	273.00

Magnetic Data:	**37 cm**
Intensity (emu/cc)	151.4
Inclination before demag.	−18.0
Stable Inclination	−10.6
Physical Properties:	**37 cm**
$\bar{V}p$ (km/s)	4.64
Porosity (%)	9.20
Wet Bulk Density	2.89
Grain Density	3.07
Other Data:	**37 cm**
Therm. cond. (mcal/cm-s-° C)	3.90



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 3	6

Depth: 578.5 to 579.9 m

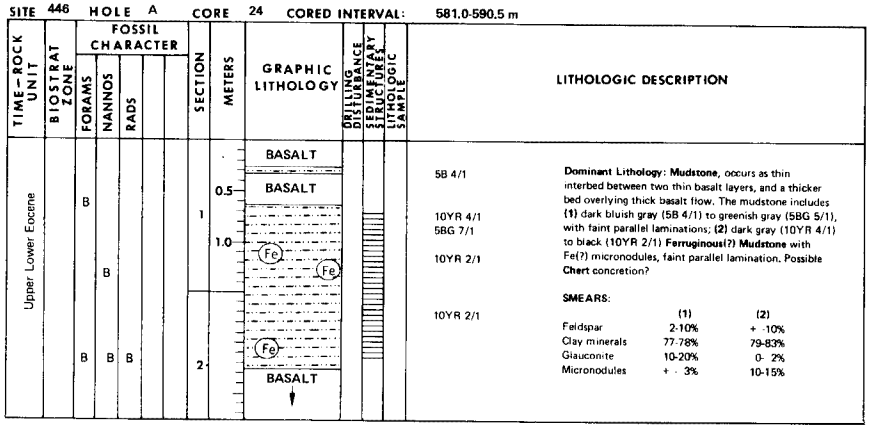
Visual Description

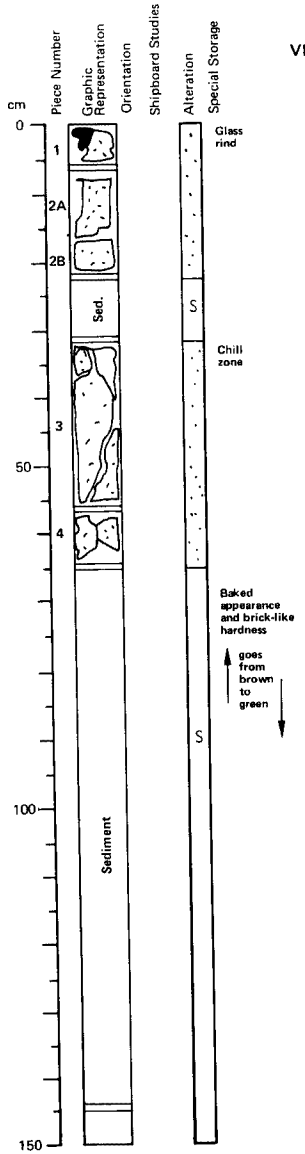
Basalt(?) massive, aphyric. Grain amount indicates that plagioclase is around An_{55}-An_{65}; however quartz is present. The rock appears to be quite leucocratic compared to most basalts, but there appears to be no break between it and the more basaltic appearing material above in Section 1 through 5. Mafics present in grain mount but lack cleavage and could be epidote, therefore this may be simply a highly altered basalt. Final determination awaits thin sections. Vesicles < 1%, virtually absent.

Shipboard Data

Magnetic Data:	**101 cm**
Intensity (emu/cc)	99.6
Inclination before demag.	−27.8
Stable Inclination	−15.5
Physical Properties:	**100 cm**
$\bar{V}p$ (km/s)	4.39
Other Data:	**100 cm**
Therm. cond. (mcal/cm-s-° C)	3.68

SITE 446 HOLE A CORE 24 CORED INTERVAL: 581.0-590.5 m





VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 4	1

Depth: 581.0 to 582.4 m

Visual Description

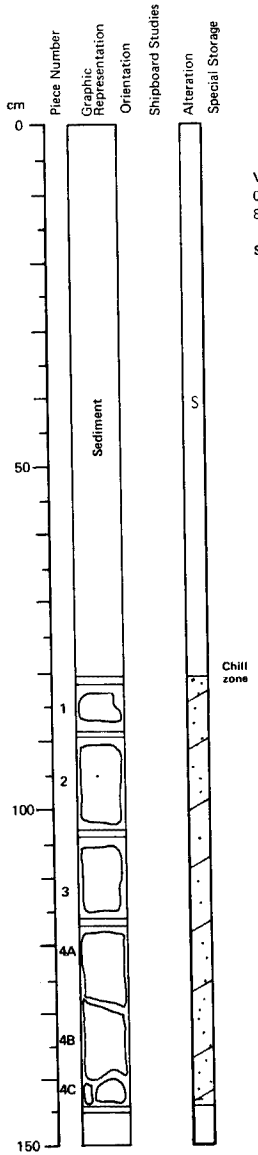
0-22 cm: plagioclase phyric basalt. Plagioclase laths 3-4%, 0.5-2.0 mm, in glassy zone. Possible relict olivine, rare clay-filled amygdules.
23-32 cm: claystone.
34-64 cm: plagioclase phyric basalt, similar to 0-22 cm.
65 cm: sediment.

Shipboard Data

Bulk Analysis:	19 cm
SiO_2	47.33
Al_2O_3	12.88
Fe_2O_3	1.63
FeO	10.75
MgO	5.19
CaO	11.08
Na_2O	2.71
K_2O	0.47
TiO_2	4.46
P_2O_5	0.52
MnO	0.44
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	64.00
Ni	50.00
Sr	452.00
Zr	341.00

Magnetic Data:	18 cm	43 cm
Intensity (emu/cc)	2467.7	1719.9
Inclination before demag.	-2.4	1.7
Stable Inclination	-4.3	5.8

Physical Properties:	18 cm	43 cm
$\overline{V}p$ (km/s)	4.47	4.41
Porosity (%)	16.18	
Wet Bulk Density	2.79	
Grain Density	3.13	



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 4	2

Depth: 582.4 to 583.8 m

Visual Description

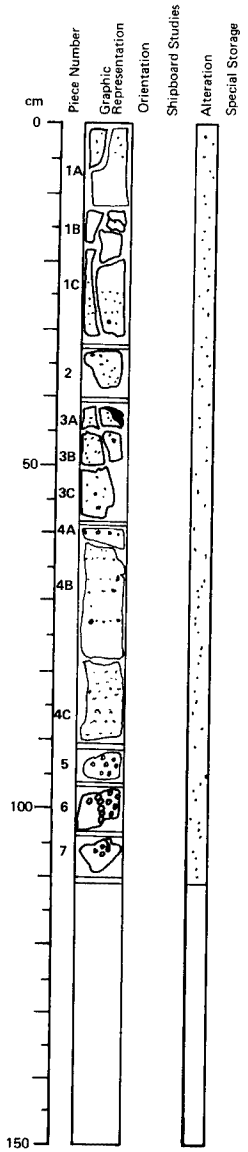
0-80 cm: sediment, noticeably harder near basalt.
80-150 cm: fine-grained massive aphyric basalt. Coarsens downwards.

Shipboard Data

Magnetic Data:	99 cm	99 cm
Intensity (emu/cc)	197.9	--
Inclination before demag.	47.0	--
Stable Inclination	79.0	50.4

Physical Properties:	99 cm
$\overline{V}p$ (km/s)	3.96
Porosity (%)	18.50
Wet Bulk Density	2.60
Grain Density	2.96

Other Data:	78 cm
Therm. cond. (mcal/cm-s-°C)	4.35



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 4	3

Depth: 583.8 to 584.9 m

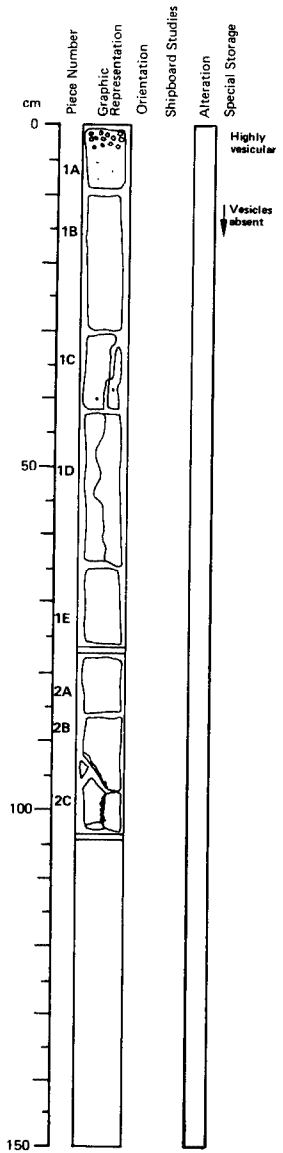
Visual Description

Amygdaloidal basalt. Aphyric, 0-30% vesicles, note horizontal orientation of some chains of vesicles, 0.2-4.0 mm calcite and clay infilling. Vesicles in Pieces 5, 6, and 7 empty. The basalt is fine-grained and lightly altered.

Shipboard Data

Magnetic Data:	**74 cm**
Intensity (emu/cc)	581.9
Inclination before demag.	1.0
Stable Inclination	−1.5

Physical Properties:	**74 cm**
$\bar{V}p$ (km/s)	4.55
Porosity (%)	13.73
Wet Bulk Density	2.75
Grain Density	3.03



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 4	4

Depth: 584.9 to 586.0 m

Visual Description

Massive aphyric basalt. Vesicles 20% in top 1.5 cm, absent beneath. A few clay filled amygdules. Fine-grained up to Piece 2C which abruptly becomes medium-grained.

Shipboard Data

Bulk Analysis:	**73 cm**
SiO_2	49.51
Al_2O_3	13.43
Fe_2O_3	1.61
FeO	10.60
MgO	6.67
CaO	10.31
Na_2O	2.69
K_2O	0.37
TiO_2	3.11
P_2O_5	0.40
MnO	0.24
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	83.00
Ni	53.00
Sr	415.00
Zr	251.00

Magnetic Data:	**86 cm**
Intensity (emu/cc)	222.3
Inclination before demag.	−8.2
Stable Inclination	2.5

Physical Properties:	**86 cm**
$\bar{V}p$ (km/s)	4.99
Porosity (%)	6.16
Wet Bulk Density	2.89
Grain Density	3.02

SITE 446 HOLE A CORE 25 CORED INTERVAL: 590.5-600.0 m

TIME–ROCK UNIT: Upper Lower Eocene

BIOSTRAT ZONE: *T. orthostylus* Zone (N)

FOSSIL CHARACTER: FORAMS, NANNOS, RADS

SECTION: 1, 2, 3, 4

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: BASALT

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE

Mudstone, Clayey Nannofossil Chalk with Siliceous Fossils or Zeolites, or Feldspars, or Micronodules or/and Ash. Zeolitic and feldspar-rich mudstone underlies a basalt flow, with obvious contact zone. The contact zone shows new components (feldspars very close to basalt, zeolites at 5 cm) as well as remainders of previous structures = slight bioturbation, some laminae. Color very dark gray (2.5Y 3/0) to dark brown (7.5YR 3/2).

Below the contact zone, irregular alternating mudstone with ash and clayey nannofossil/calcareous ooze. Colors are chiefly gray (N5, 2.5Y 6) in the calcareous zone, chiefly very dark gray (2.5Y 3) to black (2.5Y 2) sometimes reddish black = micronodules (10R 2/1) in the muddy zone. Slight bioturbation is recognizable. Laminations appear throughout, but are more abundant in calcareous parts. Laminae are parallel or irregular. There are minor micro- cross-beds, lenses and other current structures.

Ash is common in mudstone, as well as siliceous fossils (mainly radiolarians), which are partly dissolved.

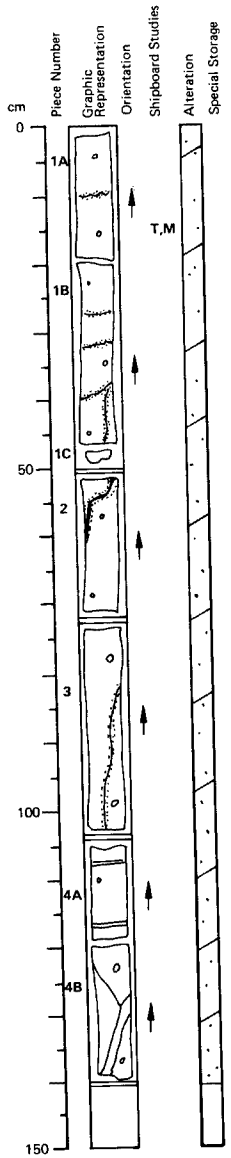
SMEARS:

		Mudstone with Feldspars	Mudstone with Ash	Mudstone with Zeolites	with Ash and Micronodules
Feldspar		15%	6- 8%	5%	8%
Clay minerals		79%	44-48%	70%	44%
Volcanic glass		–	22-34%	–	21%
Opaque minerals	2.5Y 3/0	2%	5%	2%	+
Heavy minerals	7.5YR 3/2	1%	+ - 2%	1%	2%
Carbonate unspec.	7.5YR 2/0	3%	1- 5%	8%	5%
Siliceous fossils	N5, N4	–	10%	–	3%
Mica	2.5Y 3/0	–	1-5% (mica-chlorite)	–	5% (mica-chlorite)
Glauconite	2.5Y 2	–	+ - 3%	–	2%
Zeolites	2.5Y 6	–	–	15%	–
	2.5Y 2				
	2.5Y 3/0				
	2.5Y 2				
	10R 2/1				

3-112 (Clayey Nannofossil Chalk)

Feldspar	1%
Clay minerals	48%
Mica	1%
Carbonate unspec.	15%
Nannofossils	35%

CARBON-CARBONATE:
4-14 (5.8, 2.9, 24)



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 5	1

Depth: 590.5 to 591.9 m

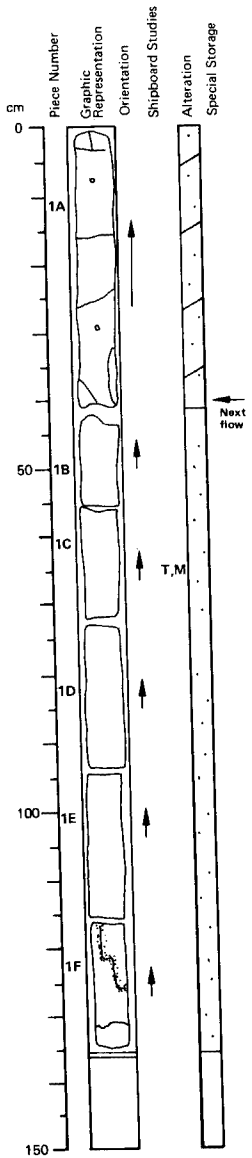
Visual Description

0-140 cm: basalt aphyric, fine-grained, dark gray. Vesicles 1-2%, 2-3 mm, filled with calcite (0-80 cm) and chlorite (80-140 cm).

Upper one-third appears to contain approximately 5% relict phenocrysts possibly after olivine as suggested by euhedral outlines with expansion cracks in alteration products.

Shipboard Data

Magnetic Data:	**13 cm**
Intensity (emu/cc)	192.3
Inclination before demag.	−9.6
Stable Inclination	2.4
Physical Properties:	**13 cm**
$\overline{V}p$ (km/s)	5.19
Porosity (%)	9.70
Wet Bulk Density	2.83
Grain Density	3.02
Other Data:	**13 cm**
Therm. cond. (mcal/cm-s-° C)	4.28



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 5	2

Depth: 591.9 to 593.3 m

Visual Description

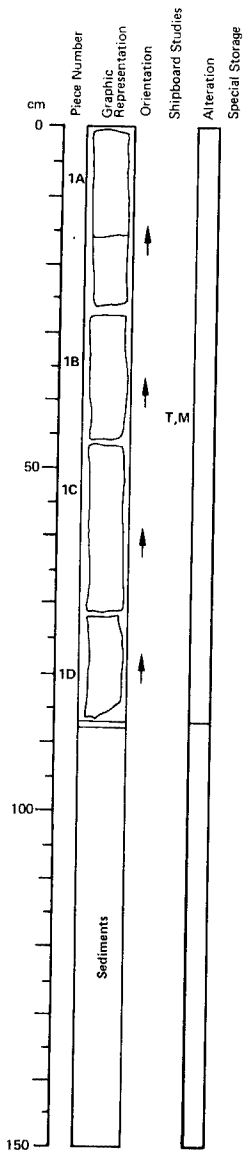
0-40 cm: basalt aphyric, fine-grained, gray. Vesicles < 1%, < 2 mm, filled with chlorite and calcite. Similar to Core 25, Section 1.

40-135 cm: basalt, aphyric fine-grained, dark, non-vesicular.

Shipboard Data

Bulk Analysis:	**51 cm**
SiO_2	52.60
Al_2O_3	12.78
Fe_2O_3	1.55
FeO	10.22
MgO	6.71
CaO	8.81
Na_2O	2.91
K_2O	0.84
TiO_2	3.28
P_2O_5	0.42
MnO	0.15
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	50.00
Ni	51.00
Sr	393.00
Zr	255.00

Magnetic Data:	**69 cm**
Intensity (emu/cc)	151.9
Inclination before demag.	−23.3
Stable Inclination	−11.1
Physical Properties:	**69 cm**
$\overline{V}p$ (km/s)	4.75



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 5	3

Depth: 593.3 to 594.1 m

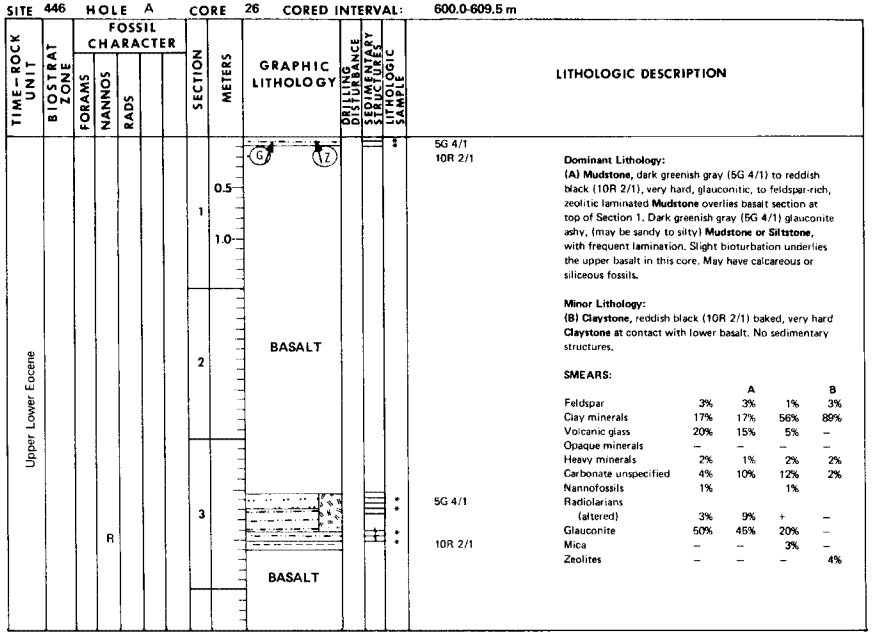
Visual Description

0-87 cm: basalt identical to that described at the base of Core 25, Section 2, but fresher, aphyric, fine-grained, dark.

Shipboard Data

Magnetic Data:	**41 cm**
Intensity (emu/cc)	329.6
Inclination before demag.	4.5
Stable Inclination	1.5
Physical Properties:	**41 cm**
$\bar{V}p$ (km/s)	4.39
Other Data:	**41 cm**
Therm. cond. (mcal/cm-s-°C)	4.11

SITE 446 HOLE A CORE 26 CORED INTERVAL: 600.0-609.5 m

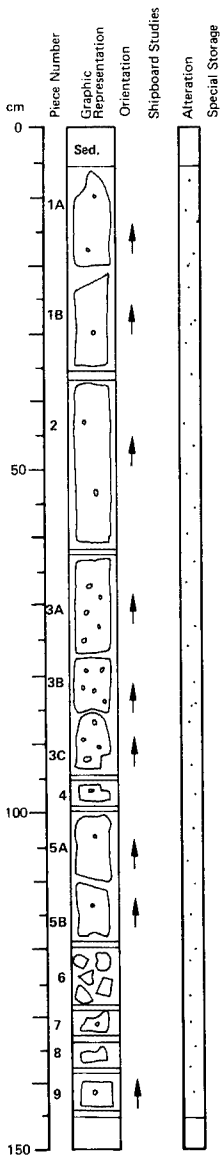


Dominant Lithology:
(A) Mudstone, dark greenish gray (5G 4/1) to reddish black (10R 2/1), very hard, glauconitic, to feldspar-rich, zeolitic laminated **Mudstone** overlies basalt section at top of Section 1. Dark greenish gray (5G 4/1) glauconite ashy, (may be sandy to silty) **Mudstone or Siltstone,** with frequent lamination. Slight bioturbation underlies the upper basalt in this core. May have calcareous or siliceous fossils.

Minor Lithology:
(B) Claystone, reddish black (10R 2/1) baked, very hard **Claystone** at contact with lower basalt. No sedimentary structures.

SMEARS:

	A		B	
Feldspar	3%	3%	1%	3%
Clay minerals	17%	17%	56%	89%
Volcanic glass	20%	15%	5%	–
Opaque minerals	–	–	–	–
Heavy minerals	2%	1%	2%	2%
Carbonate unspecified	4%	10%	12%	2%
Nannofossils	1%		1%	
Radiolarians (altered)	3%	9%	+	–
Glauconite	50%	45%	20%	–
Mica	–	–	3%	–
Zeolites	–	–	–	4%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	6	A	2	6		1

Depth: 600.0 to 601.5 m

Visual Description

5-145 cm: basalt aphyric, fine-grained, gray, vesicular.
Vesicles 1%, <1 mm, filled with calcite and chlorite.
60-100 cm: vesicles 5-7%, <2 mm.

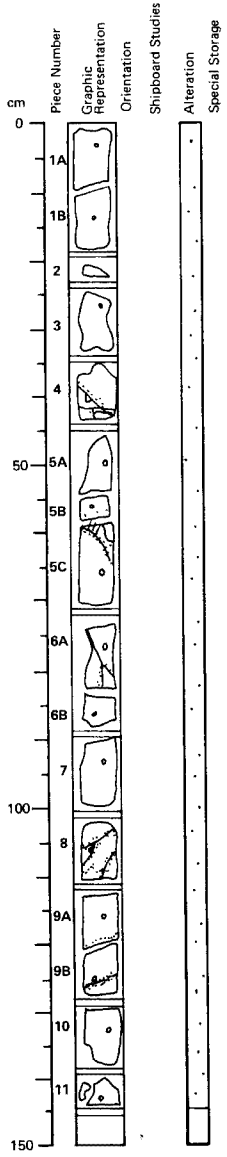
Shipboard Data

Bulk Analysis:	**33 cm**
SiO_2	48.69
Al_2O_3	13.05
Fe_2O_3	1.44
FeO	9.54
MgO	6.89
CaO	10.87
Na_2O	2.80
K_2O	0.83
TiO_2	3.41
P_2O_5	0.40
MnO	0.24
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	169.00
Ni	88.00
Sr	423.00
Zr	243.00

Magnetic Data:	**47 cm**
Intensity (emu/cc)	198.1
Inclination before demag.	−34.6
Stable Inclination	−16.6

Physical Properties:	**47 cm**
Vp (km/s)	4.36
Porosity (%)	12.29
Wet Bulk Density	2.76
Grain Density	3.01

Other Data:	**47 cm**
Therm. cond. (mcal/cm-s-°C)	3.89



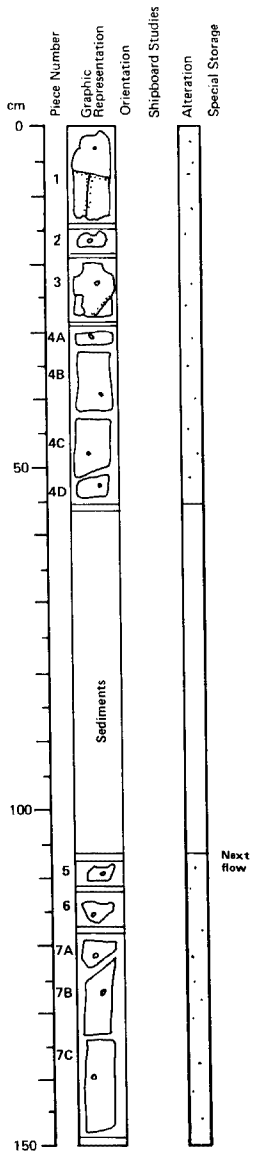
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	4	6	A	2	6		2

Depth: 601.5 to 602.9 m

Visual Description

0-145 cm: basalt identical to that described for Core 26, Section 1, fresher. Vesicles <1%, <1 mm, filled with chlorite. Vein with calcite and chlorite.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	6	A	2	6	3

Depth: 602.9 to 604.4 m

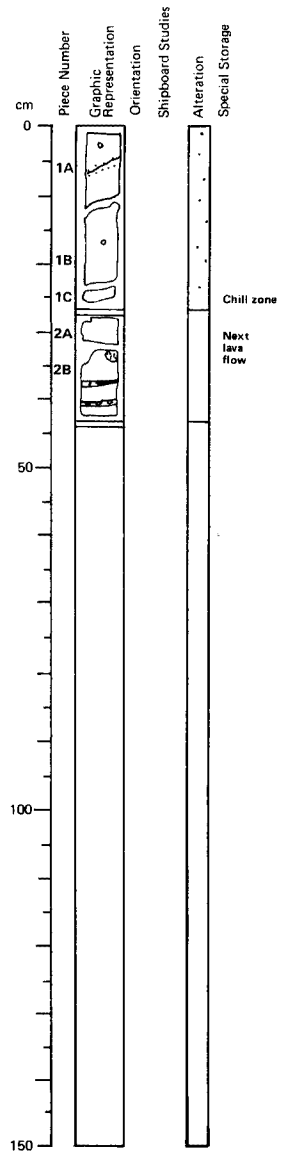
Visual Description

0-55 cm: basalt similar to Core 26, Section 2.
55-107 cm: sediments.
107-150 cm: next lava flow. Basalt aphyric, fine-grained, dark gray. Vesicles 1%, <2 mm filled with calcite and chlorite.

Shipboard Data

Bulk Analysis:	**46 cm**
SiO_2	51.05
Al_2O_3	13.64
Fe_2O_3	1.48
FeO	9.79
MgO	6.02
CaO	10.85
Na_2O	3.02
K_2O	0.31
TiO_2	3.12
P_2O_5	0.35
MnO	0.22
LOI	--
H_2O^+	--
H_2O^-	--
CO_2	--
Cr	175.00
Ni	94.00
Sr	426.00
Zr	229.00

Magnetic Data:	**44 cm**	**140 cm**
Intensity (emu/cc)	973.0	198.2
Inclination before demag.	-22.3	25.6
Stable Inclination	-21.6	22.2
Physical Properties:	**44 cm**	**140 cm**
$\bar{V}p$ (km/s)	5.72	4.88
Porosity (%)	--	9.55
Wet Bulk Density	--	2.86
Grain Density	--	3.05



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	8	4	6	A	2	6	4

Depth: 604.4 to 604.8 m

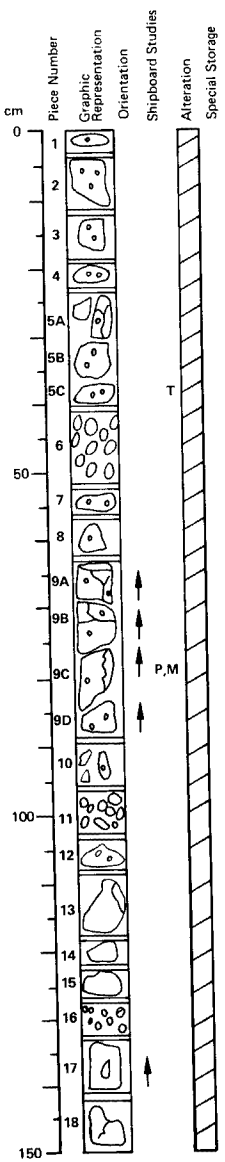
Visual Description

0-27 cm: basalt identical to that described at the base of Core 26, Section 3.
27-43 cm: chill zone (27-31 cm glass), next lava flow. Basalt aphyric, fine-grained (to aphanitic), dark. Vein with calcite.

SITE 446 HOLE A CORE 27 CORED INTERVAL: 609.5-619.0 m

TIME–ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	FOSSIL CHARACTER: NANNOS	FOSSIL CHARACTER: RADS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
Upper Lower Eocene	*T. orthostylus* Zone (N)		FP		1	0.5 1.0	BASALT				**Drilling Breccia** **Three pieces plus small fragments** **(1) Calcareous to Chalky Claystone** **(2) Chalk** **(3) Chalky Claystone with Radiolarians** **(1)** Dark greenish gray to blue-green (5BG 4/1 to 5B 4/1) **Calcareous Claystone** faintly laminated, faintly bioturbated. **(2)** Gray to light gray (5GY 6/1 to 5GY 7/1) **Chalk**, massive. **(3)** Dark greenish gray (5BG 4/1) **Claystone** with calcareous laminae and thin (approximately 2 mm) very fine silty fining-upward layers with fairly well-developed load casts and sharp lower contacts.
					2						**SMEARS:**
											146 cm 150 cm
					3		VOID				

	(1)	(2)	(3)
Feldspar	+ - 1%	+	+
Clay minerals	55-65%	34%	55%
Volcanic glass	–	–	–
Opaque minerals	?	–	–
Heavy minerals	+	–	1%
Micronodules	10%	5%	5%
Carbonate unspec.	20-30% (with forams?)	60%	30%
Radiolarians	–	–	5%
Glauconite	+	+	2%
Zeolites	1%	–	1%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 7	1

Depth: 609.5 m to 611.0 m

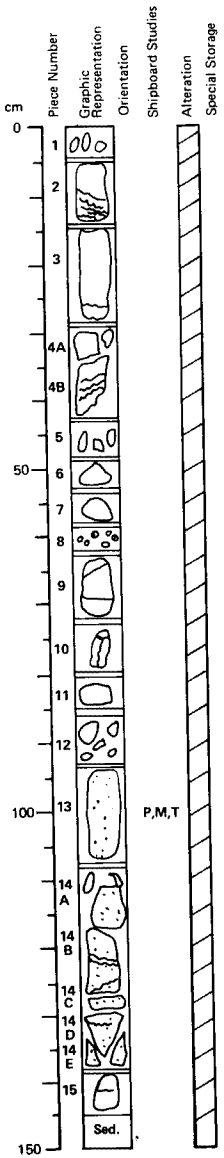
Visual Description

Gray, aphyric, amygdaloidal (initially) basalt.
5-40 cm: possibly altered microphenocrysts of olivine.
0-55 cm: amygdules filled by carbonate around 10%. Some pyrite and smectite (0.25-2 mm). Odd calcite vein.
55-110 cm: amygdules filled by greenish chloritic/clay material and fine-grained pyrite. Initially about 10% but fading out. Some chloritic/clay filled veins and lined fractures.
132-141 cm: Piece 17 has a large vug partially filled by dark clays and pyrite (30 x 10 mm).
141-150 cm: pyrite lined vein.
Pieces 6, 11, and 16: drilling breccia.

Shipboard Data

Bulk Analysis:	112 cm
SiO_2	47.47
Al_2O_3	11.61
Fe_2O_3	1.75
FeO	11.55
MgO	7.10
CaO	9.47
Na_2O	2.40
K_2O	0.86
TiO_2	4.29
P_2O_5	0.45
MnO	0.23
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	32.00
Ni	35.00
Sr	431.00
Zr	312.00

Physical Properties:	77 cm
$\overline{V}p$ (km/s)	3.44
Porosity (%)	28.04
Wet Bulk Density	2.56
Grain Density	3.16



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 8	4 4 6	A	2 7	2

Depth: 611.0 to 612.5 m

Visual Description

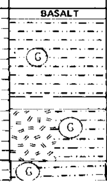
Dark gray, aphyric basalt. Occasional plagioclase phenocrysts (0.5-1 mm) and altered olivine phenocrysts (0.5-1 mm). Some microphenocrysts of olivine(?) (altered). Occasional vesicles (0.25-10 mm) lined or filled by dark clay minrals. Cross-cutting clay and pyrite lined veins.
94-137 cm: 10% very fine vesicles (<0.25 mm) clay filled.
Piece 15, 137-145 cm: 3 mm wide vein with euhedral carbonate crystals.
Piece 4B, 41-42 cm: 1 cm thick clayey filled vein.
145-150 cm: sediment.

Shipboard Data

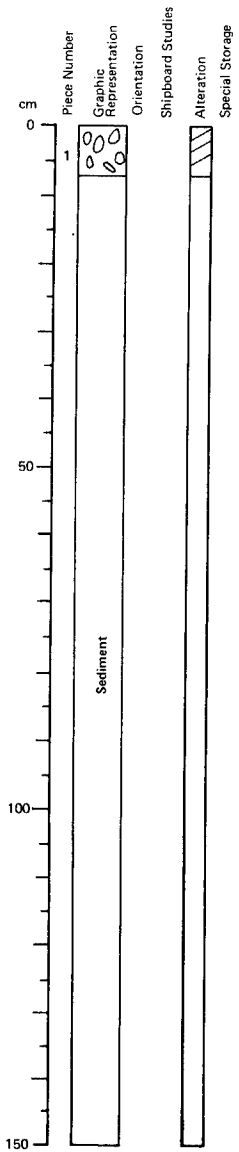
Bulk Analysis:	94 cm
SiO_2	47.29
Al_2O_3	12.11
Fe_2O_3	1.68
FeO	11.06
MgO	6.78
CaO	9.55
Na_2O	2.45
K_2O	0.89
TiO_2	4.36
P_2O_5	0.43
MnO	0.22
LOI	—
H_2O^+	—
H_2O^-	—
CO_2	—
Cr	36.00
Ni	42.00
Sr	442.00
Zr	307.00

SITE 446 HOLE A CORE 28 CORED INTERVAL: 619.0-628.5 m

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS			SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE		LITHOLOGIC DESCRIPTION
Upper Lower Eocene	*T. orthostylus* Zone (N)		CM				1	0.5, 1.0	BASALT			•	N4	Glauconitic Mudstone, dark gray (N4), locally laminated and with faint color band alternation with dark bluish gray (5B 4/1) to dark gray (N4); an interbed of dark greenish gray (5G 4/1) of Glauconitic Altered Tuff (Ash) at 80.5-82.0 cm (1.5 cm thick).
												••	5G 4/1	
												•	N4	
			FP				CC						N4	



SMEARS:	Glauconitic Mudstone		Altered Ash
Feldspar	8%	1- 2%	15%
Clay minerals	68%	65-70%	–
Volcanic glass	–	–	75%
Micronodules	15%	5-15%	–
Radiolarians	4%	–	–
Glauconite	5%	10%	7%
Carbonate unspec. (Nannofossils)		4- 7%	
Biotite			3%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	8	4	4	6	A	2	8	1

Depth: 619.0 to 620.5 m

Visual Description

0-7 cm: dark gray, aphyric, aphanitic basalt. Odd vesicle, 0.5-1 mm, lined by light olive green clay (smectite). Outer surfaces of pieces covered by dark green chloritic material with very fine pyrite or dark gray clayey material. Odd quartz or zeolite grain in vesicle on outer surface of one piece. Possible upholecontamination.

TOPOGRAPHY of the OCEANS with DEEP SEA DRILLING PROJECT SITES through LEG 64

Prepared at the
Geologic Data Center
and the
Deep Sea Drilling Project
Scripps Institution of Oceanography

MERCATOR PROJECTION

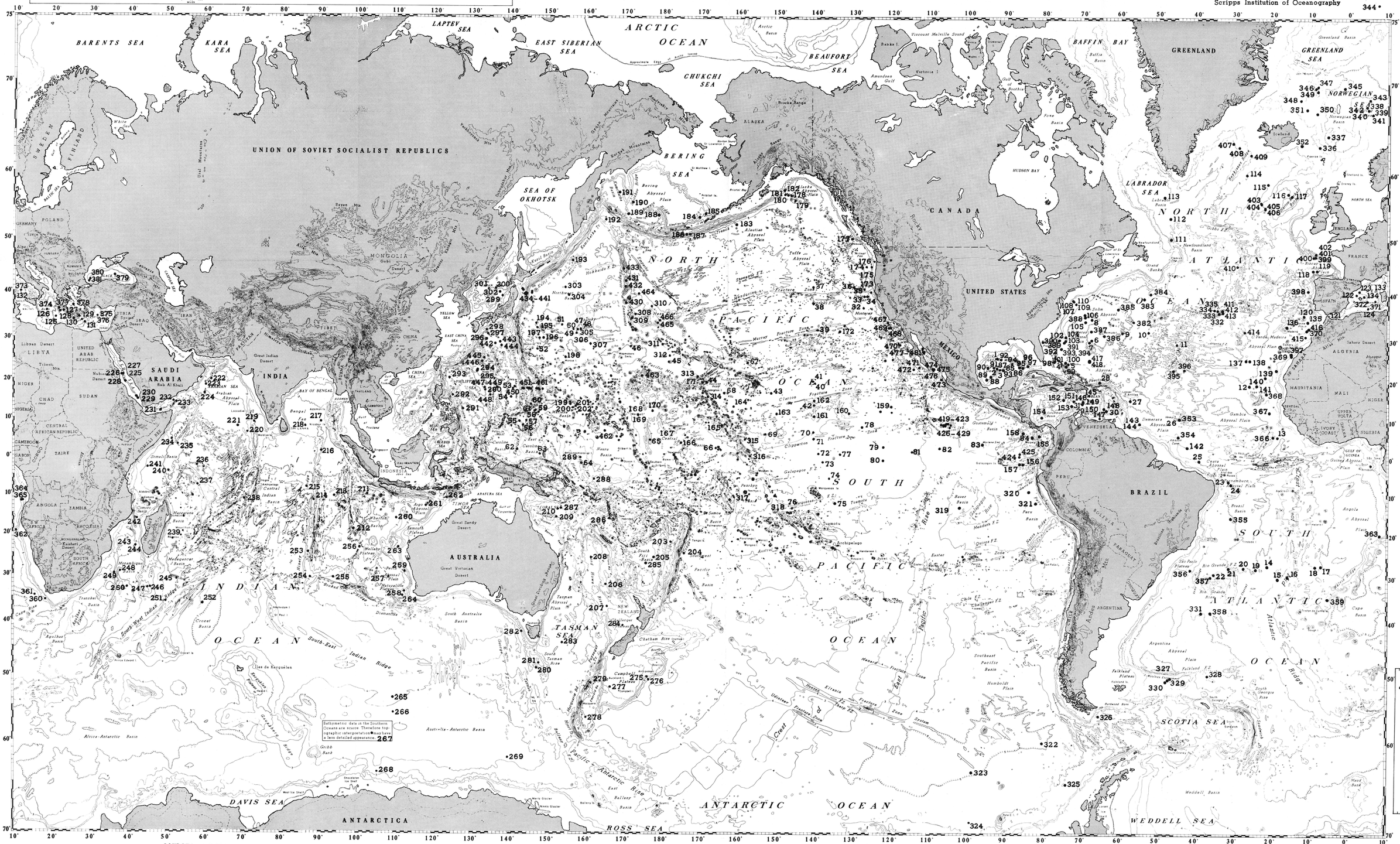
CONTOURS IN KILOMETERS

LEGEND

SCALE
1" = 47,520,000 AT EQUATOR

ABBREVIATIONS
Smt – Seamount
Tr. – Trench
F.Z. – Fracture Zone
Ba. – Basin
Rd. – Ridge
Ri. – Rise
Mts. – Mountains
Is – Islands

SYMBOLS
Depression or Trench
Edge of Ice or Glacier



SOURCES of DATA

Oceanic: R L Fisher, F J Emmel, T W C Hilde, D E Hayes, J Mammerickx, R G Markl, H W Menard, A S Laughton, D A Newhouse, E L Hamilton, E S W Simpson, E Uchupi, G B Udintsev, T E Chase, E C Buffington, D W Scholl, K S Rodolfo, P Wilde.

Continental: Bureau Hydrographique International, Monaco; U S Naval Oceanographic Office, U S Geologic Survey.

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For DSDP data, contact:
B.J. Long, D.S.D.P.
Scripps Institution of Oceanography