INITIAL CORE DESCRIPTIONS

DEEP SEA DRILLING PROJECT

LEG 47A OFFSHORE NW AFRICA

LEG 47B OFFSHORE PORTUGAL

Prepared for the
NATIONAL SCIENCE FOUNDATION
National Ocean Sediment Coring Program
Under Contract C-482
By the
UNIVERSITY OF CALIFORNIA
Scripps Institution of Oceanography
Prime Contractor for the Project

UNIVERSITY OF CALIFORNIA, SAN DIEGO

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SCRIPPS INSTITUTION OF OCEANOGRAPHY

POST OFFICE BOX 1529
LA JOLLA, CALIFORNIA 92093

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 after 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

DEEP SEA DRILLING PROJECT

LEG 47A

20 March — 12 April 1976

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
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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

William Ryan, Ulrich von Rad, Michael Arthur, Pavel Cepek,
Maria B. Cita, Christopher Cornford, Linda Garifal,
N. Hamilton, I. S. Lopatin, G. F. Lutze,
Floyd McCoy, Greg Mountain, Michael Sarnthein.

Glomar Challenger departed from Las Palmas (Gran Canaria, Canary Islands) on 20 March 1976, drilled two holes at Site 397 (see Figure 1), and arrived at Vigo (Spain) on 12 April 1976.

The major objective of Leg 47A was to decipher the complex Cretaceous and Tertiary history of a flexured passive continental margin, for which the West Saharan segment between the Requibat Uplift (Cape Blanc) and the Canary Islands (Cape Juby) is a good example. The subsiding edge of this margin has experienced major episodes of erosion, non-deposition and redeposition, especially during two major regressions (mid-Cretaceous and mid-Tertiary). The thick wedge of uppermost continental rise sediments off NW Africa had never before been penetrated beyond the Neogene (DSDP Site 139). DSDP Site 369, on the continental slope nearby, served as an ideal companion site of our proposed drilling program for rise-slope comparisons. The planned site was expected to allow a better reconstruction of the history of uplift and subsidence, transgressions and regressions, mechanics of deposition and erosion during Early Cretaceous to Neogene time.

Results

The anticipated stratigraphy of Site 397 was based on the interpretation of reflectors D_1 (as mid-Cretaceous to Eocene) and D_2 (as Oligocene-early Miocene), and on previous drilling (Site 369) and presite surveys. The fact that 1300 meters of Miocene had to be drilled before Mesozoic strata were reached, changed our original objectives and provided new insights to the solution of many questions concerning the structure and stratigraphy of passive continental margins. Based on the revised stratigraphy and on seismic data, at least 4500 meters of Jurassic to Valanginian sediments remain unpenetrated at our drill site.

The oldest strata encountered at this site (Figure 2) are a 153 meter Valanginian/mid-Hauterivian interval of finely laminated, dark-gray quartzose mudstone with numerous thin dolomicrite intercalations. The mudstones are an enigmatic facies posing a number of interrelated sedimentary and paleoenvironmental problems which include depth and environment of deposition.

Tentatively, a marine prodeltaic (delta-slope) or a distal fan environment is suggested. A slope setting is indicated by slump structures, contorted laminations and consistently high dipping laminations. A distal setting is indicated by the dominance of the clay fraction, paucity of recognizable turbidites, and the abundance of plant fragments and micas. The equivalent Lower Cretaceous sections of the onshore Tarfaya and Aaiun Basins consist of thick non-marine sandy to conglomeratic sequences, which might represent the landward continuation of the

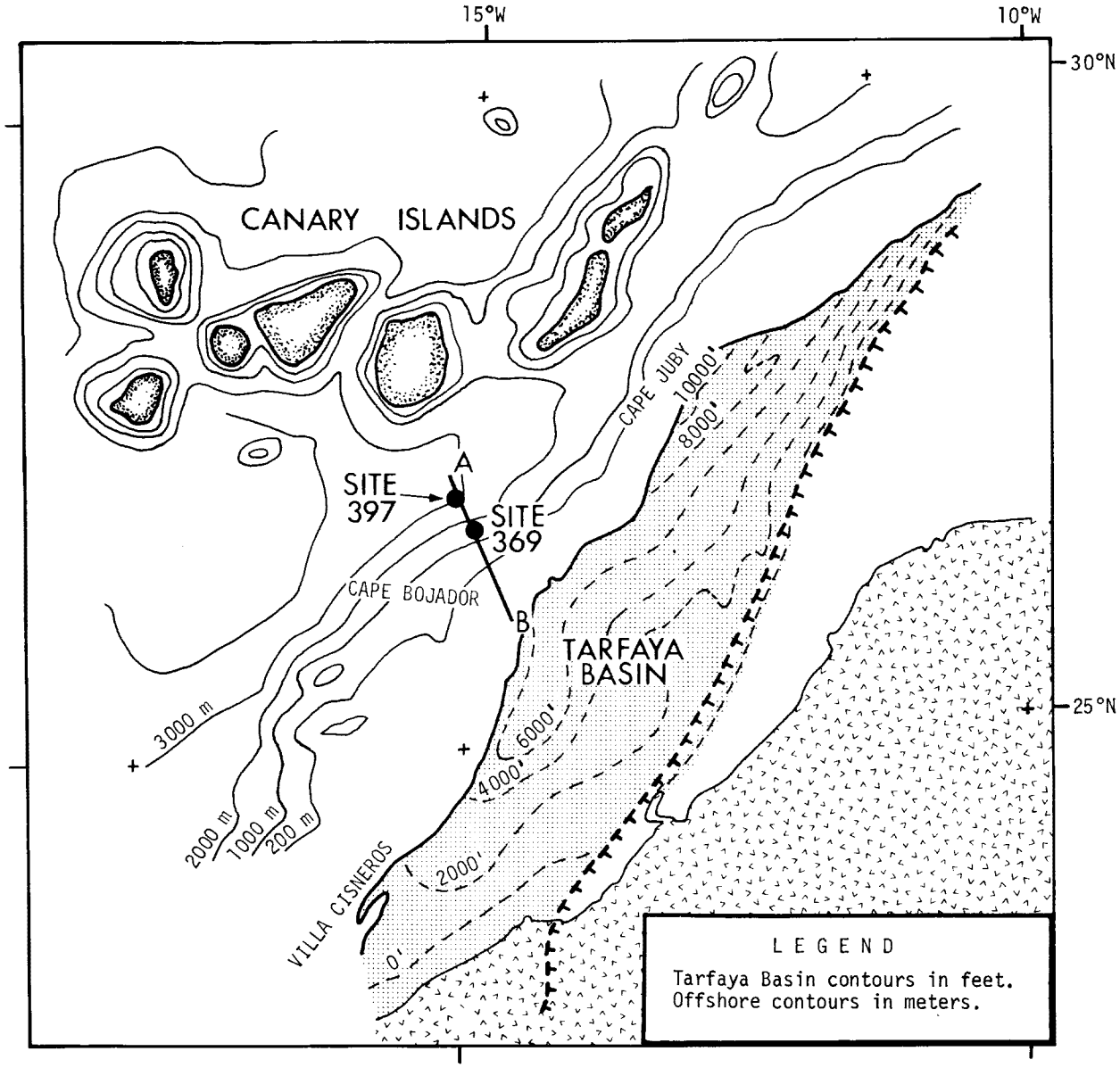


FIGURE 1. Topography near Site 397 with sediment isopachs for onshore portion of Tarfaya Basin.

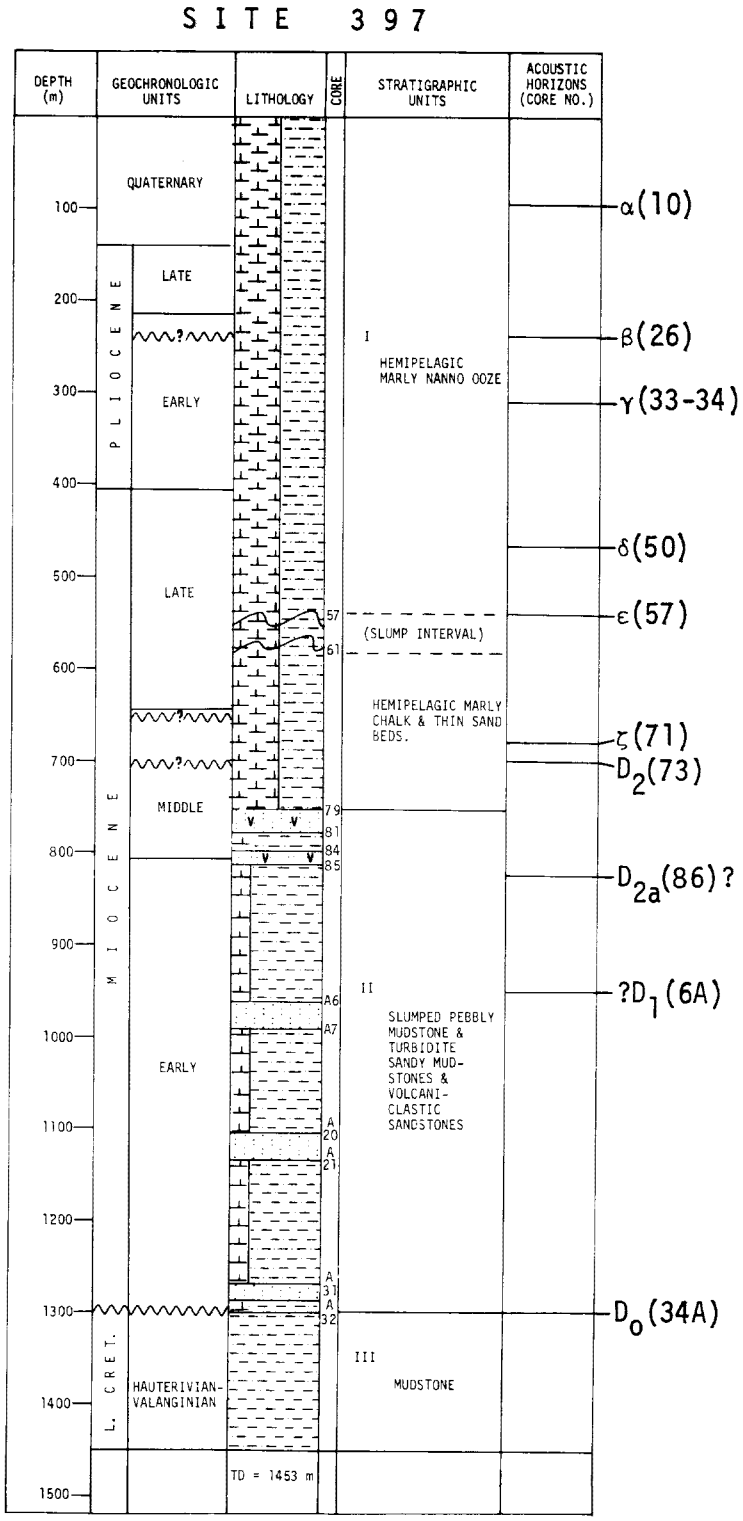


FIGURE 2 Litho-bio-acoustostratigraphy at Site 397.

same deltaic setting.

A 100 to 110 m.y. hiatus separates the Middle Hauterivian interval from overlying earliest Miocene rocks penetrated at 1300 meters. Such a large gap allows only tentative interpretations on the dating and processes of destruction of the continental slope and rise. Possibly this erosion was caused by geostrophic contour-following bottom currents enhanced by the late Oligocene initiation of the strong circum-Antarctic bottom water circulation after the separation of Australia from Antarctica. A vast amount of sediment, conceivably $>10^4 km^3$, was probably removed from this ancient and formerly prograding Mesozoic continental slope by one or more mass wasting events. This may have resulted in the back-cutting of an exaggerated 1 to 3 km deep escarpment into the Mesozoic continental margin. In this manner the gradient and instability of the slope were further increased.

Above the hiatus (Figure 2) is a rapidly deposited mostly allochthonous sequence. It consists of 550 meters of slump masses, debris flows, turbid layer sediments and turbidites which followed the major pre-Miocene erosional event and finally re-established an equilibrium gradient from the shelf to the continental rise. About 80 to 90 percent of the sediment section, deposited at a rapid sedimentation rate (up to 200 m/m.y.), contains "allochthonous" lithotypes. Only 10 to 20 percent consists of highly burrowed, more slowly deposited, hemipelagic foraminiferal nanno limestones.

Within this lithologic unit are several thick volcaniclastic tuffaceous sandstones and partly graded conglomerates which were deposited about 16 m.y.B.P. These were probably derived from the Canary Province as debris flows. The flows are contemporaneous with or predate the earliest shield-building phase known from Gran Canaria and Fuerteventura (13-14 m.y.B.P.) and might mark the earliest datable record of volcanic activity.

The youngest strata (Figure 2) are a Late Miocene to Quaternary sequence of hemipelagic marls, chalks, calcareous oozes and slumped deposits.

The partially siliceous calcareous oozes of this unit were rapidly deposited (50-80 m/m.y.) under conditions of high fertility (upwelling!) and good ventilation. Because of the high sedimentation rates, excellent fossil preservation and the lack of coarse-grained terrigenous input and any major hiatuses, this continuously cored section may permit a substantial refinement of planktonic foraminiferal and nannoplankton stratigraphy, as well as of magnetostratigraphy. Detailed paleomagnetic measurements revealed an alternating sequence of normal and reversed polarity intervals from the Brunhes Epoch to Epoch 6. Dissolution pulses noted in the uppermost Miocene sediments might reflect a rise of the CCD during the Messinian "salinity crisis". Scouring hiatuses at 3.0 and 0.9 m.y. can be tentatively correlated with known periods of intensification of the northern hemisphere oceanic circulation due to glacial

cooling and to an erosional event and transgression approximately 3 m.y. B.P. on Gran Canaria.

This continuously cored very deep continental margin hole will prove ideal for various studies on the diagenetic behavior of carbonates, clay, silica, and especially organic matter. Relatively organic-rich sediments derived from the oxygen-depleted upper slope regime were placed and preserved by the slumping mechanism, and thereby evaded biochemical degradation in the oxygenated deeper waters. This is an important aspect for the prospecting of hydrocarbons in the rapidly deposited flyschoid sediments of the upper continental rise. Methane and trace quantities of C_2 to C_5 hydrocarbons, generated partly by poorly understood low temperature diagenetic processes, were found and continuously monitored as a safety measure. Although no evidence of hazardous hydrocarbon accumulations or source beds was found, preferential diffusion and compaction migration of C_2 to C_5 gases apparently is taking place to a greater degree than was anticipated prior to drilling.

EXPLANATORY NOTES

Introduction

Persons wishing to obtain samples are directed to the DSDP-NSF sample distribution policy (reproduced herein, p. 17). Sample requests must be submitted on standard DSDP request forms which may be obtained from:

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

The following material is intended as an aid in understanding:

(1) the terminology, labeling, and numbering conventions used by the Deep Sea Drilling Project;

(2) the sediment classification and biostratigraphic framework used on Leg 47A; and

(3) the presentation of the lithologic and paleontologic data on the core forms which make up much of this publication.

Numbering of Sites, Hole, Cores, Samples

Drill site numbers run consecutively from the first site drilled by *Glomar Challenger* in 1968; the site number is thus unique. A site refers to the hole or holes drilled from one acoustic positioning beacon. Several holes may be drilled at a single locality by pulling the drill string above the sea floor ("mud line") and offsetting the ship some distance (usually 100 meters or more) from the previous hole.

The first (or only) hole drilled at a site takes the site number. Additional holes at the same site are further distinguished by a letter suffix. The first hole has only the site number; the second has the site number with suffix A; the third has 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 usually do not come from equivalent positions in the stratigraphic column at different holes.

Cores are numbered sequentially from the top down. In the ideal case, they consist of 9.3 meters of sediment or rock in a plastic liner of 6.6 cm diameter. In addition, a short sample is obtained from the core catcher (a multi-fingered device at the bottom of the core barrel which prevents cored materials from sliding out during core-barrel

recovery). This usually amounts to about 0.2 meters of sediment or rock. During Leg 47A the core catcher sample was split, described, and stored along with the rest of the core, if at all possible, taking care to maintain its proper vertical orientation. This sample represents the lowest stratum recovered in a particular cored interval.

The cored interval is the interval in meters below the sea floor measured from the point at which coring for a particular core was started to the point at which it was terminated. This interval is generally 9.5 meters (nominal length of a core barrel) but may be shorter if conditions dictate. The interval can also be longer if the core barrel was placed in the drill string during a long drilling interval. On Leg 47A almost all core intervals were 9.5 meters, because the drilling program called for nearly continuous coring.

When a core is brought aboard the *Glomar Challenger* it is labeled and the plastic liner and core cut into 1.5-meter sections. A full, 9.5-meter core would thus consist of six sections full and one 0.5-meter section numbered from the top down, 1 to 7. (Section 7 would consist of 0.3 meters of the lowermost sediment from the plastic liner plus the 0.2 meters of core catcher material.) The procedure for labeling both full and partially full cores is shown on Figure 3.

In the core laboratory on the *Glomar Challenger*, after routine processing, the 1.5-meter sections of sediment core and liner are split in half lengthwise. One half is designated the "archive" half, which is described by the shipboard geologists, and photographed; and the other is the "working" half, which is sampled by the shipboard sedimentologists and paleontologists for further shipboard and shore-based analysis.

Samples taken from core sections are designated by the interval in centimeters from the top of the core section from which the sample was extracted; the sample size, in CC, is also given. Thus, a full sample designation would consist of the following information:

Leg (Optional)
Site (Hole, if other than first hole)
Core Number
Section Number
Interval in centimeters from top of section

Site 397A-11-3, 122-124 cm (10cc) designates a 10cc sample taken from Section 3 of Core 11 from the second hole drilled at Site 397. The depth below the sea floor for this sample would then be the depth to the top of the cored interval (1020.5 meters in the example above) plus 3 meters for Sections 1 and 2, plus 1.22 meters (depth below the top of Section 3), or 1024.7 meters. Note, however, that subsequent sample requests should refer to a specific interval within a core section (in centimeters) rather than depth in meters below the sea floor.

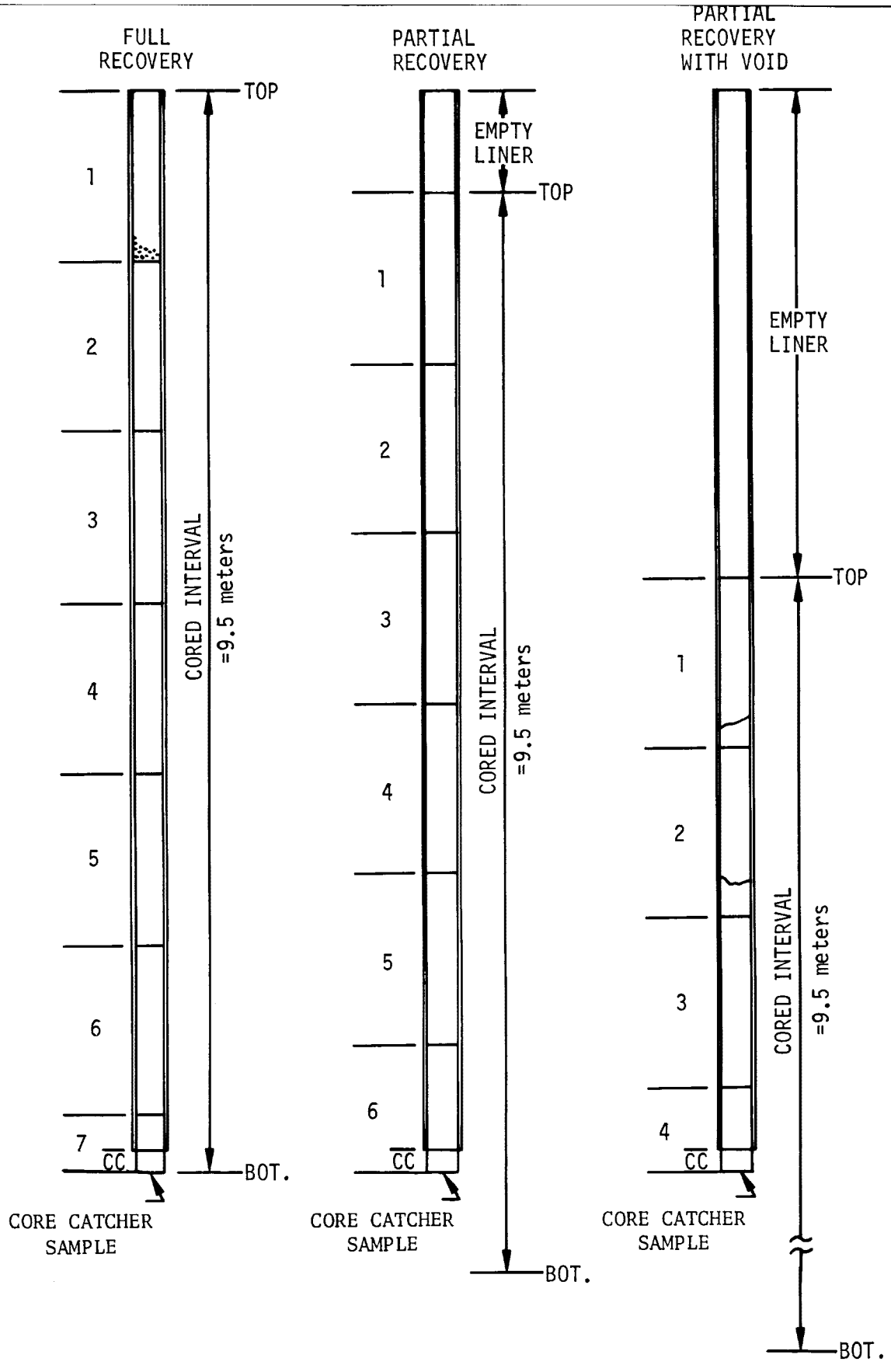


FIGURE 3. Diagram showing procedure in cutting and labeling of core sections.

Core Disturbance

Unconsolidated sediments are often quite disturbed by the rotary drilling/coring technique, and there is a complete gradation of disturbance style with increasing sediment induration. An assessment of degree and style of drilling deformation is made on board ship for all cored material, and shown graphically on the core description sheets. The following symbols are used:

Slightly deformed; bedding contacts slight bend.

Moderately deformed; bedding contacts have undergone extreme bowing.

Highly deformed; bedding completely disturbed, often showing symmetrical diapir-like structures.

Soupy, or drilling breccia; water-satured intervals that have lost all aspects of original bedding and sediment cohesiveness.

Biscuit structure; a drilling "breccia" wherein the broken core material retains some or all aspects of original bedding.

Consolidated sediments and rocks seldom show much internal deformation, but are usually broken by drilling into cylindrical pieces of varying length. There is frequently no indication if adjacent pieces in the core liner are actually contiguous or if intervening sediment has been lost during drilling.

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 ($\pm$1 or 2%), but that an accuracy of $\pm$10% for major constituents is more common. Carbonate content is especially difficult to estimate in smear slides, as is the amount of clay present. Smear slide analyses at selected levels as well as averaged analyses for intervals of uniform lithology are given on the core description sheets.

Carbonate Data

During Leg 47A, extensive use was made of the carbonate bomb device as an aid in sediment classification. This device is basically a cylindrical vessel with pressure gauge in which a sediment sample of known weight is reacted with acid. The pressure of CO_2 generated is

measured and converted to percent carbonate. Accuracy to within ±5% total carbonate has been quoted for the device. Shipboard carbonate bomb data are listed on the core description sheet.

Samples were taken for DSDP shore-based carbon-carbonate analysis using the LECO 70-second Analyzer. These and organic carbon values are also listed on the core description sheet.

The carbonate bomb and LECO data was used to update the carbonate content (mostly shown as nannofossil, foraminifera or limestone) depicted in the graphic lithology column. No attempt was made to adjust smear slide estimates or sediment names to reflect this correction.

Sediment Induration

The determination of induration is highly subjective, but field geologists have successfully made similar distinctions for many years. The criteria of Moberly and Heath (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 finger 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 that the core can 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).

Sediment Classification

The sediment classification scheme used on Leg 47A is basically that devised by the JOIDES Panel on Sedimentary Petrology and Physical Properties and adopted for use by the JOIDES Planning Committee in March, 1974, with minor modifications. The classification is outlined below.

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%.

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 Pelagic clay

>10% authigenic components
<30% siliceous microfossils
<30% $CaCO_3$
<30% terrigenous components

III Pelagic Siliceous Biogenic Sediments

>30% siliceous microfossils
<30% $CaCO_3$
<30% terrigenous components (mud)

Radiolaria dominent: radiolarian ooze (or radiolarite).
Diatoms dominent: diatom ooze (or diatomite).
Sponge spicules dominent: sponge spicule ooze (or spiculite).
Where uncertain: siliceous (biogenic) ooze (or chert, porcellanite).
When containing 10-30% $CaCO_3$: modified by nannofossil---, foraminiferal---, calcareous---, nannofossil-foraminiferal---, or foraminiferal-nannofossil---, depending upon kind and quantity of $CaCO_3$ component.

IV Transitional Biogenic Siliceous Sediments

10-70% siliceous microfossils
30-90% terrigenous components (mud)
<30% $CaCO_3$

If diatoms <mud: diatomaceous mud (stone).
If diatoms >mud: muddy diatom ooze (muddy diatomite).
If $CaCO_3$ 10-30%: appropriate qualifier is used (see III).

V Pelagic Biogenic Calcareous Sediments

>30% $CaCO_3$

<30% terrigenous components
<30% siliceous microfossils

Principal components are nannofossils and foraminifera; qualifiers are used as follows:

Foram %	Name
<10	nannofossil ooze (chalk, limestone)
10-25	foraminiferal-nannofossil ooze
25-50	nannofossil-foraminiferal ooze
>50	foraminiferal ooze

Calcareous sediment containing 10-30% siliceous fossils carry the qualifier radiolarian, diatomaceous or siliceous depending upon the identification.

VI Transitional Biogenic Calcareous Sediments

>30% $CaCO_3$
>30% terrigenous components
<30% siliceous microfossils

If $CaCO_3$ 30-60%: marly is used as a qualifier:

soft: marly calcareous (or nannofossil, etc.) ooze.
firm: marly chalk (or marly nannofossil chalk, etc.).
hard: marly limestone (or marly nannofossil limestone,

If $CaCO_3$ >60%:

soft: calcareous (or nannofossil, etc.) ooze.
firm: chalk (or nannofossil chalk, etc.).
hard: limestone (or nannofossil limestone, etc.).

NOTE: Sediments containing 10-30% $CaCO_3$ fall in other classes where they are denoted with the adjective "calcareous", "nannofossil", etc.

VII Terrigenous Sediments

>30% terrigenous
<30% $CaCO_3$
<10% siliceous microfossils
<10% authigenic components

Sediments in this category are subdivided into textural groups on the basis of the relative proportions of three grain-size components, i.e. sand, silt and clay. Sediments coarser than sand-size are treated as "Special Rock Types". The size limits are those

defined by Wentworth (1922). The textural classification is according to the triangular diagram of Shepard (1954) (Figure). The suffix "-stone" is used to indicate hard or consolidated equivalents of the unconsolidated sediments.

If $CaCO_3$ is 10-30%: calcareous, nannofossil, etc. is used as a qualifier.

Other qualifiers (e.g. feldspathic, glauconitic, etc.) are used for components >10%.

VIII Volcanogenic Sediments

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

Volcanic breccia 32mm
Volcanic lapilli 32mm
Volcanic ash (tuff, if indurated) 4mm

Compositionally, these pyroclastic rocks are described as vitric (glass), crystal or lithic.

b) Clastic sediments of volcanic provenance are described in the same fashion as the terrigenous sediments, noting the dominant composition of the volcanic grains where possible.

Lithologic Symbols

Figure 4 shows the graphic symbols used to depict the lithologies encountered on Leg 47A.

Core Forms

The core forms provide a variety of data. Shipboard paleontological determinations are provided in appropriate columns along the left hand margin. In the column headed "Graphic Lithology", appropriate symbols are used to depict lithologies found in the cores. The columns titled "Drilling Disturbance" and "Sedimentary Structures" provide information on these aspects of the cores according to the conventions previously described. Drilling disturbance symbols were shown on page 9 Conventions relating to sedimentary structures are shown on Figure 5. All smear slides made aboard the ship are appropriately located in the column headed "Lithologic Samples".

The broad column headed "Lithologic Description" provides a variety of data. Along the left margin are found the color descriptions according to the Munsell color designations. Boundaries where color changes occur are shown by short horizontal lines. The symbol ——

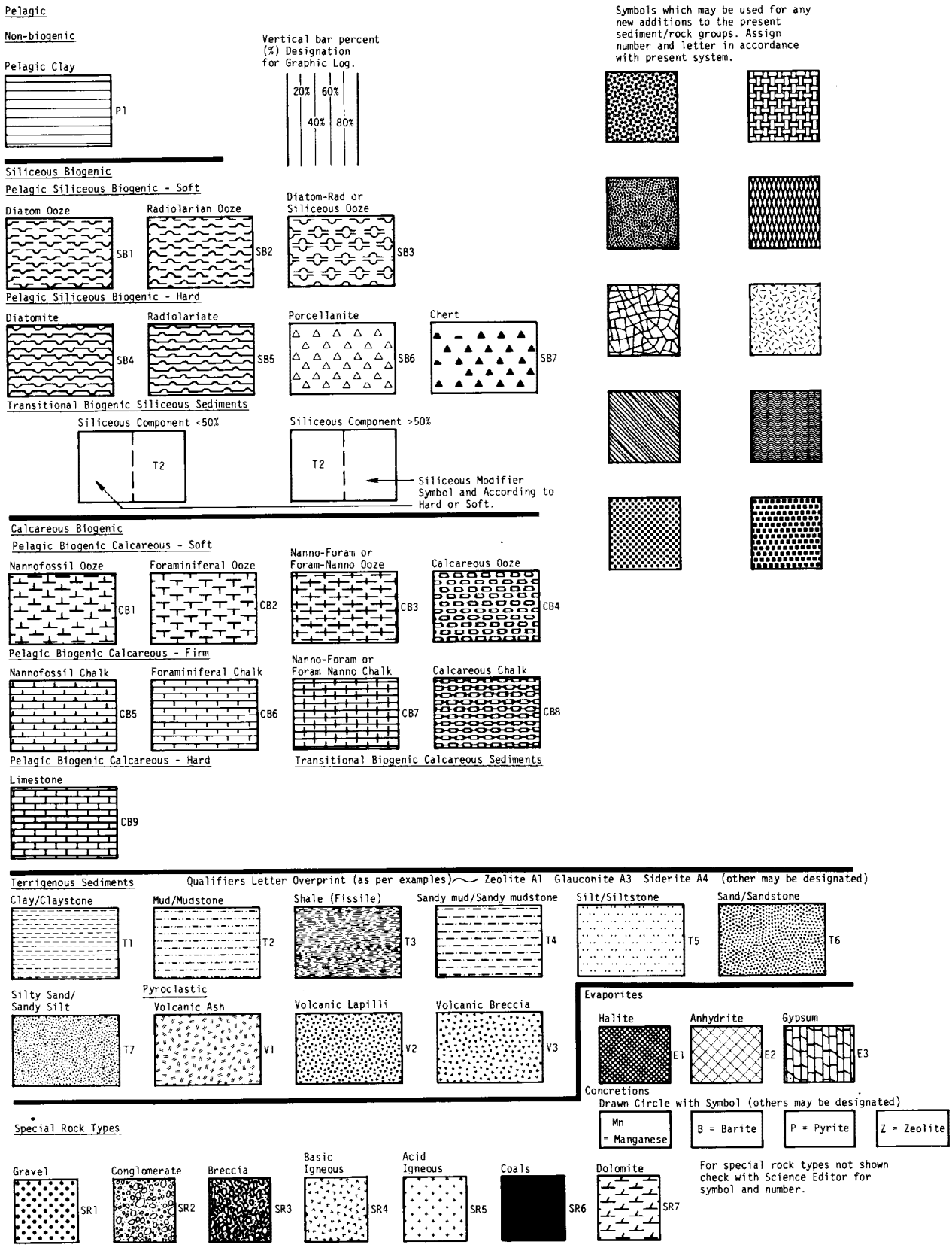


Figure 4. Key to Lithologic and Biostratigraphic Symbols.

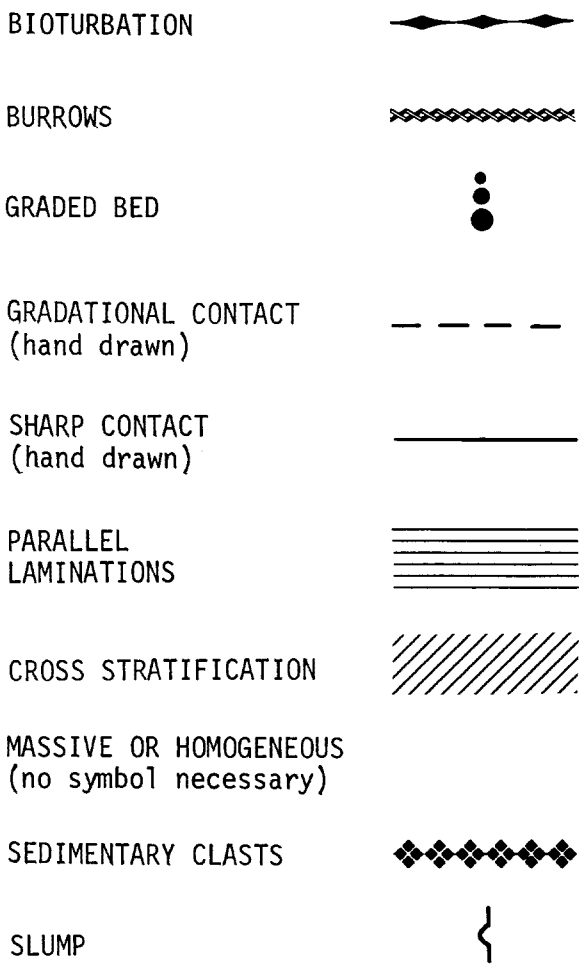


FIGURE 5 SEDIMENTARY STRUCTURE SYMBOLS

The Sedimentary Structure Symbols are used in the make-up of Core Forms. They can be found on Format Sheets 6415, 7071, 7215, 7069 and Artist Aid Transfer Sheet 10030. The remaining are hand drawn.

designates an abrupt color change and — — — indicates a gradual change. All smear slides (abbreviated SS) are identified by a centimeter designation corresponding to that shown in the "Lithologic Sample" column. The percentage occurrence of each constituent is indicated, based on visual estimates. The estimates of the carbonate constituents may vary by small or large amounts from that determined by the carbonate bomb or the LECO. Where a large difference occurred the instrumentally determined values are used to define the amount of carbonate indicated in the "Graphic Lithology" column.

Biostratigraphy

At the time of this compilation, biostratigraphic studies of Leg 47A material are still in progress. Revisions in nannofossil ages to date have been incorporated. A radiolarian specialist was not on board the *Glomar Challenger* during Leg 47A; consequently, no radiolarian zonal assignments are given.

The Cenozoic planktonic foraminiferal zonation used follows the letter/number scheme of Blow for the Miocene and for the Quaternary. The Pliocene zonation follows the letter/number scheme of Cita (1975) which is preferred because it is based on biostratigraphic horizons calibrated to the paleomagnetic stratigraphy.

The nannofossil zonation follows the letter/number scheme of Martini (1971) for the Neogene and of Thierstein (1971) for the Cretaceous.

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 each 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

SITE 397 HOLE CORE 1 CORED INTERVAL: 0-9 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
HOLOCENE	*Globorotalia truncatulinoides*	NN20/NN21	Ag	Cg	Ag						35	1

1 = FORAM NANNO OOZE = dom. lith. Homog. with some black specks of iron oxides.

FORAM NANNO OOZE

SS: 1-35 cm

60%	nannos
15	forams
5	det. carb.
5	quartz
5	mica
5	heavy mins.
5	clay
tr	diatoms
tr	sponge spics.

		$CaCO_3$%	C_{org}%
LECO:	Sect. CC	45	0.3

COLOR LEGEND

1 = brn. 7.5YR 5/4

SITE 397 HOLE CORE 2 CORED INTERVAL: 9-18.5 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
QUATERNARY	*Globorotalia truncatulinoides*	NN20/NN21	Ag	Cg	Ag	1	0.5				36	1 & 2
							1.0				148	
						2					34	
						3						3 & 4
						4					26	
											79	
						5					74	5 & 6
											101	3
						CC						Geochem. Samp.
												6

MARLY FORAM NANNO OOZE = dom. lith. Disturbed and soupy, smell of H_2S; specks iron throughout; pyritized worm burrow at 73 cm (Sect. 5).

MARLY FORAM NANNO OOZE

SS: 1-36, 148 cm
2-34 cm
4-26, 79 cm

50-60%	nannos
15-20	forams
tr- 5	quartz
tr	feldspar
tr	mica
tr- 5	heavy mins.
5-15	clay
tr	glauc.
tr- 5	pyrite
tr-15	carb. unspec.
tr- 5	sponge spics.
tr	rads

SS: 5-101 cm

45%	nannos
20	forams
20	clay
10	quartz
5	pyrite
tr- 5	carb. unspec.
tr	moll. det.
tr	glauc.
tr	diatoms
tr	rads

NANNO OOZE

SS: 5-74 cm

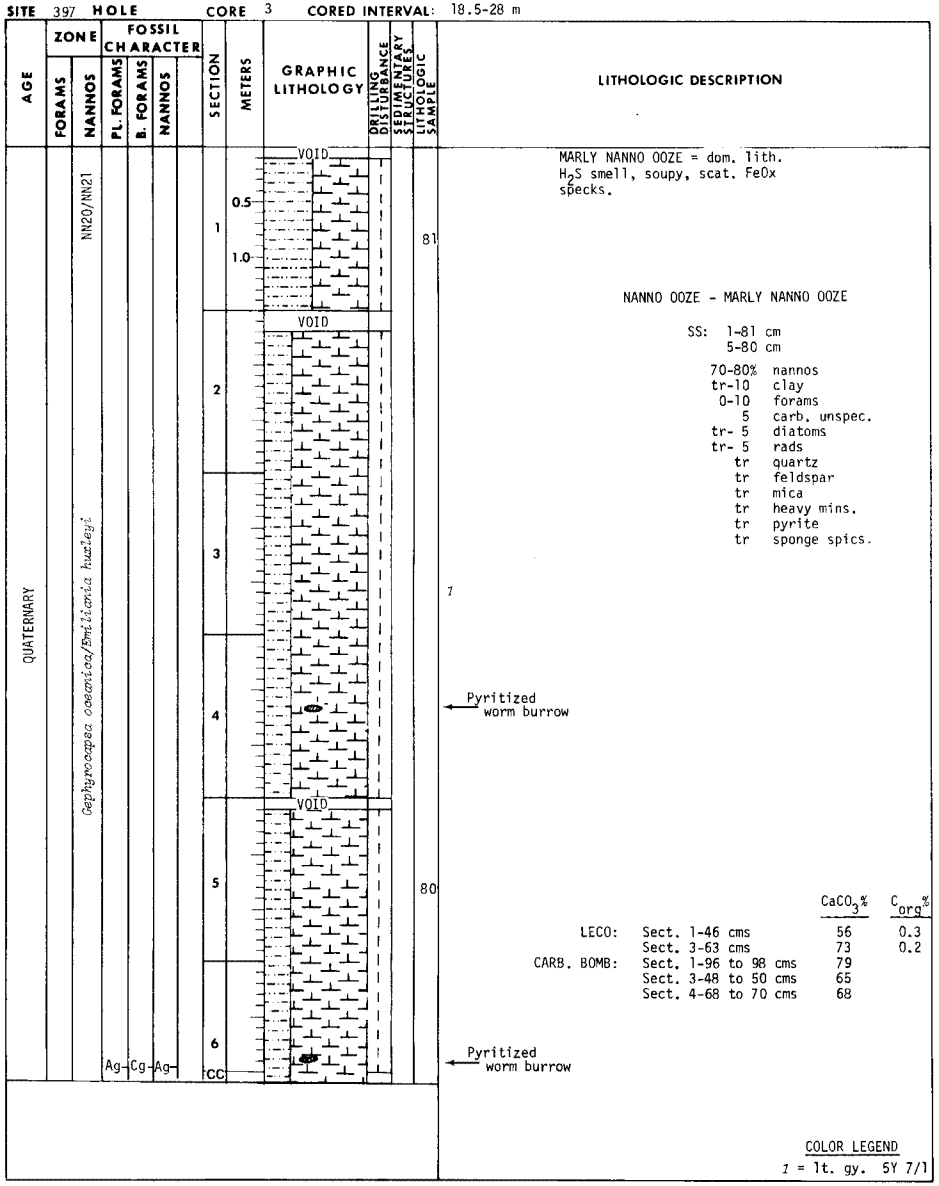
70%	nannos
10	clay
6	forams
5	pyrite
4	carb. unspec.
4	quartz
tr	mica
tr	sponge spics.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-34 cms	56	0.4
CARB. BOMB:	Sect. 1-32 to 33 cms	46	

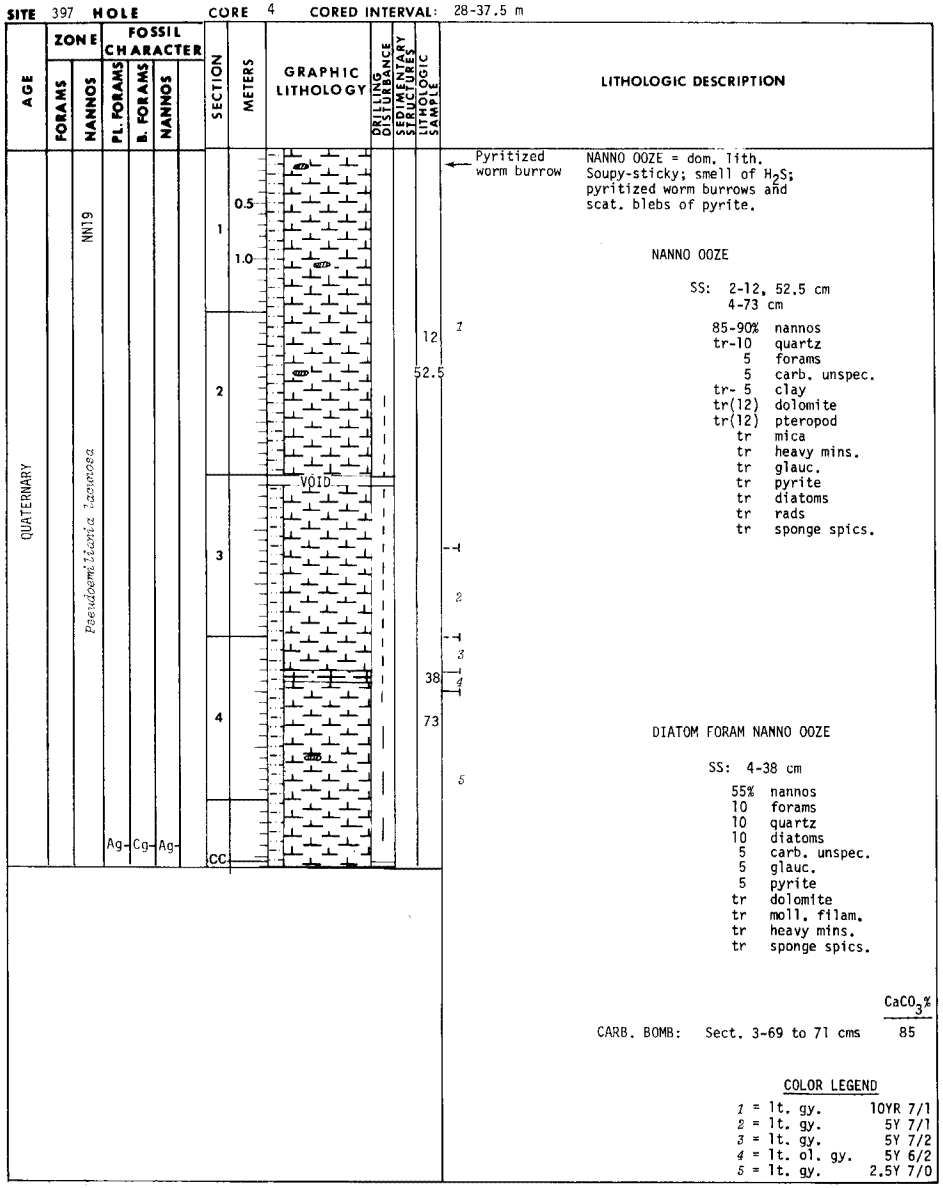
COLOR LEGEND

1 =	lt. brn. gy.	10YR 6/2
2 =	gy.	10YR 6/1
3 =	lt. ol. gy.	5Y 6/2
4 =	lt. gy.	10YR 7/1
5 =	pl. brn.	10YR 6/3
6 =	lt. gy.	2.5Y 7/0

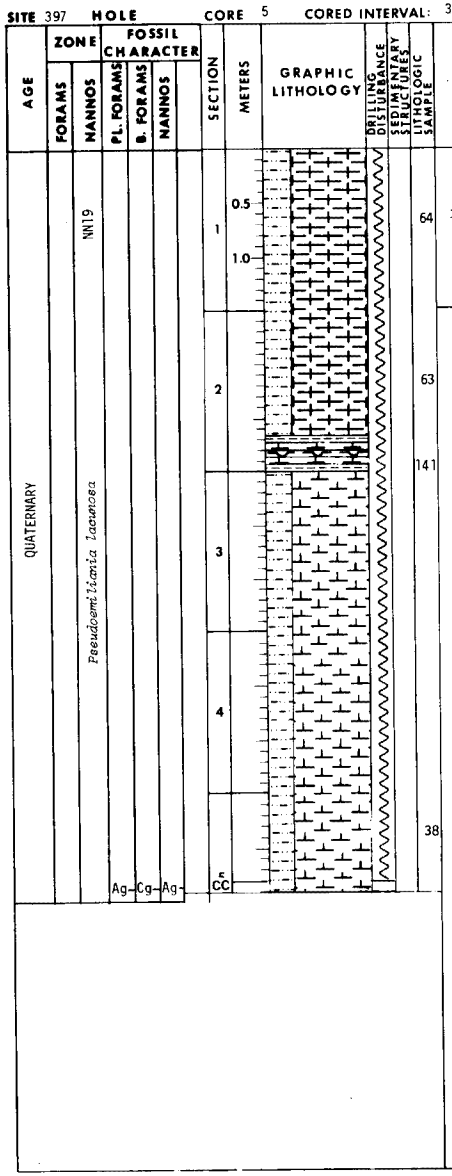
SITE 397 HOLE CORE 3 CORED INTERVAL: 18.5-28 m



SITE 397 HOLE CORE 4 CORED INTERVAL: 28-37.5 m



SITE 397 HOLE CORE 5 CORED INTERVAL: 37.5-47 m



NANNO OOZE = dom. lith.
Scat. hydrotroilite; H_2S smell.

FORAM NANNO OOZE - MARLY FORAM NANNO OOZE

SS: 1-64 cm, 2-63 cm

75-80%	nannos
10	forams
3- 5	carb. unspec.
tr- 5	clay
tr- 1	pyrite
tr	mica
tr	heavy mins.
tr	glauc.
tr	diatoms
tr	rads
tr	sponge spics.
tr	silicoflag.

DIATOM NANNO OOZE

SS: 2-141 cm

70%	nannos
10	diatoms
5	forams
5	carb. unspec.
5	quartz
5	clay
tr	dolomite
tr	glauc.
tr	sponge spics.

NANNO OOZE

SS: 5-38 cm

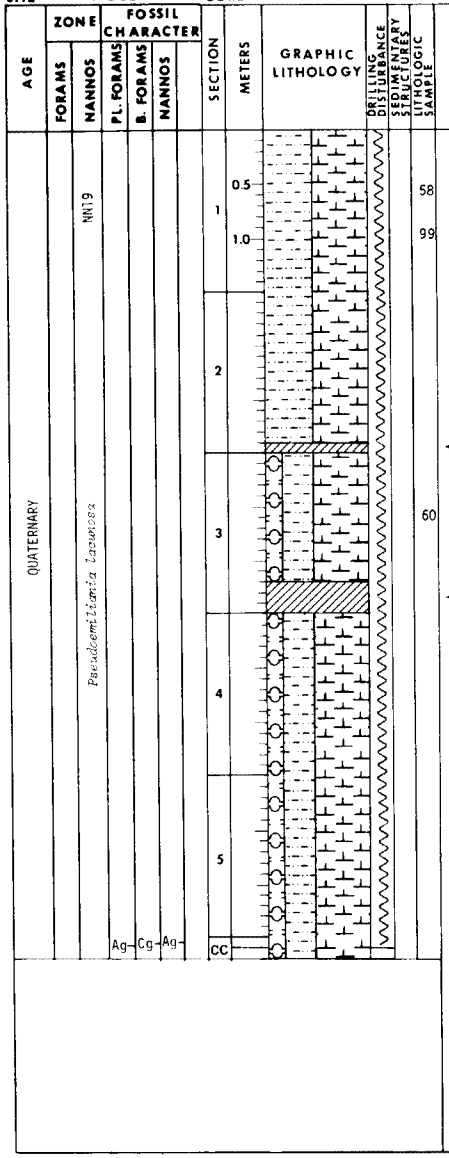
85%	nannos
5	forams
3	carb. unspec.
1	quartz
1	mica
1	diatoms
1	sponge spics.
tr	heavy mins.
tr	clay
tr	pyrite
tr	rads

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-62 cms	75	0.5
CARB. BOMB:	Sect. 1-64 to 66 cms	80	
	Sect. 3-75 to 77 cms	68	

COLOR LEGEND

1 = lt. gy. 5Y 7/1
2 = wht. 2.5Y 8/0
3 = lt. gy. 5Y 7/2

SITE 397 HOLE CORE 6 CORED INTERVAL: 47-56.5 m



Geochem. Samp.

Geochem. Samp.

SILICEOUS NANNO OOZE = dom. lith.
Gas expansion cracks throughout;
H_2S smell; scat. blebs of pyrite
(See SS at 99 cms).

NANNO OOZE

SS: 1-58 cm

80%	nannos
8	forams
5	carb. unspec.
3	quartz
2	sponge spics.
1	diatoms
1	rads
tr	mica
tr	heavy mins.
tr	clay
tr	glauc.
tr	pyrite
tr	silicoflag.

SS: 1-99 cm (blk. bleb)

50%	nannos
20	quartz
15	pyrite
5	forams
5	carb. unspec.
tr-5	diatoms
tr	rads
tr	sponge spics.

SILICEOUS NANNO OOZE

SS: 3-60 cm, CC

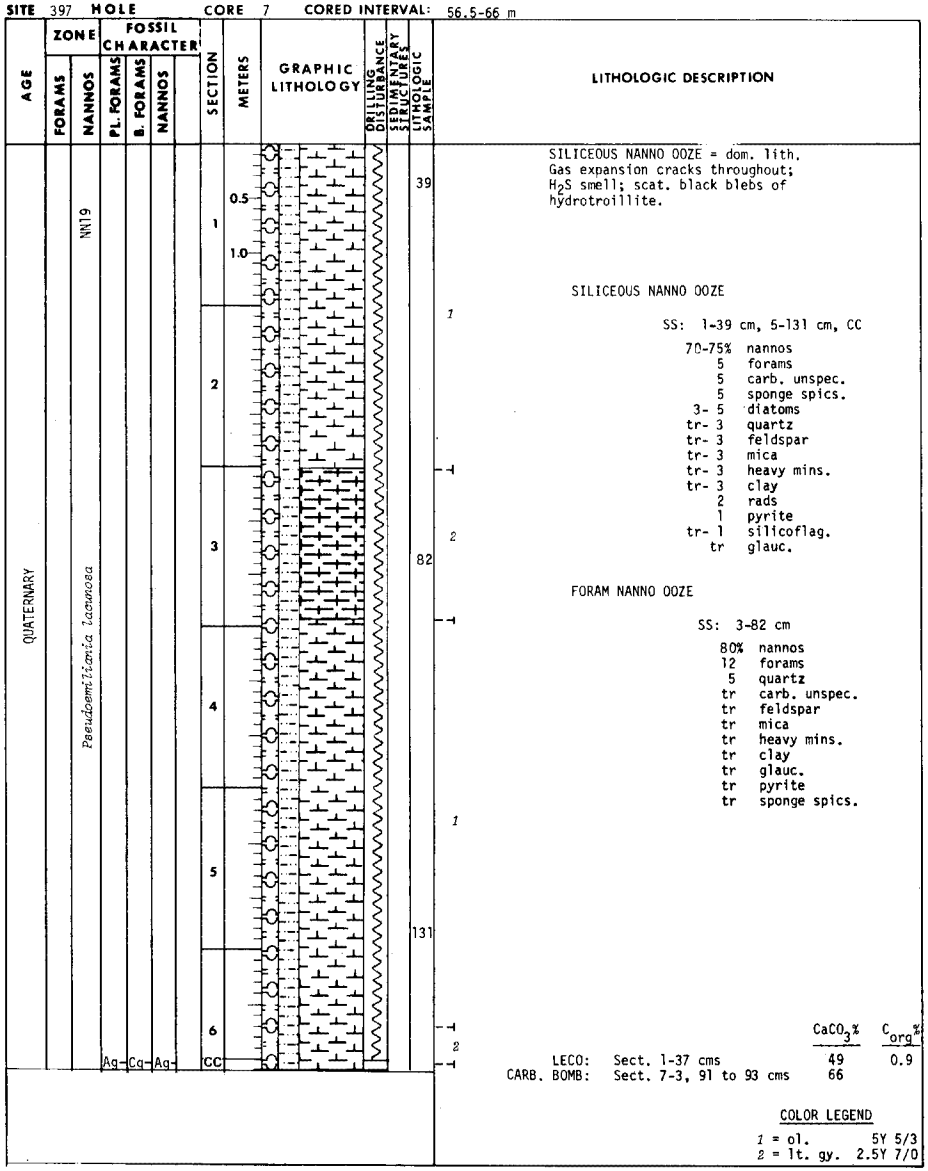
65-70%	nannos
tr-15	forams
5-10	carb. unspec.
5	sponge spics.
3- 5	rads
1- 5	quartz
tr- 5	heavy mins.
tr- 5	clay
tr- 5	feldspar
tr- 5	mica
tr- 5	diatoms

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-45 cms	55	1.1
CARB. BOMB:	Sect. 3-62 to 64 cms	44	

COLOR LEGEND

1 = lt. ol. gy. 5Y 6/2

SITE 397 HOLE CORE 7 CORED INTERVAL: 56.5-66 m



LITHOLOGIC DESCRIPTION

SILICEOUS NANNO OOZE = dom. lith. Gas expansion cracks throughout; H_2S smell; scat. black blebs of hydrotroillite.

SILICEOUS NANNO OOZE

SS: 1-39 cm, 5-131 cm, CC

70-75%	nannos
5	forams
5	carb. unspec.
5	sponge spics.
3- 5	diatoms
tr- 3	quartz
tr- 3	feldspar
tr- 3	mica
tr- 3	heavy mins.
tr- 3	clay
2	rads
1	pyrite
tr- 1	silicoflag.
tr	glauc.

FORAM NANNO OOZE

SS: 3-82 cm

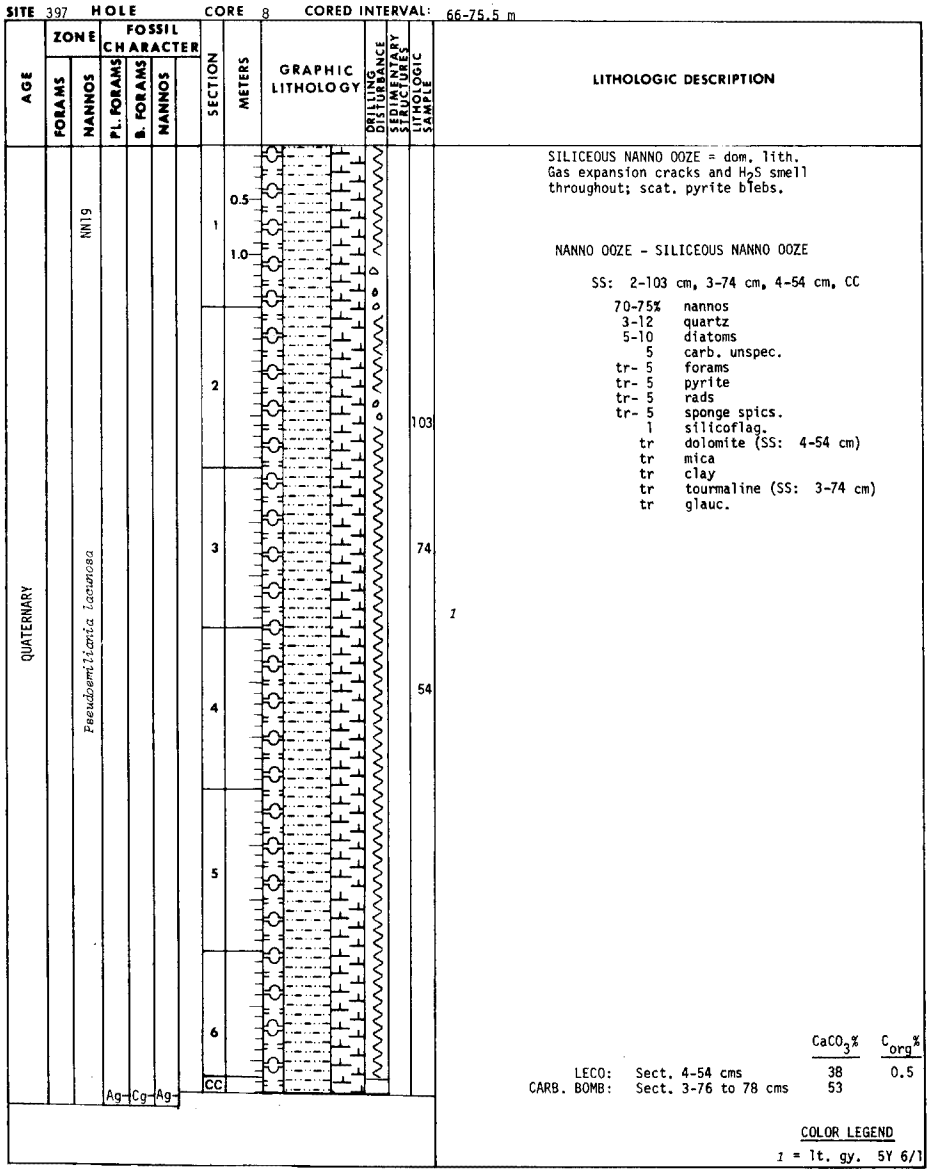
80%	nannos
12	forams
5	quartz
tr	carb. unspec.
tr	feldspar
tr	mica
tr	heavy mins.
tr	clay
tr	glauc.
tr	pyrite
tr	sponge spics.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-37 cms	49	0.9
CARB. BOMB:	Sect. 7-3, 91 to 93 cms	66	

COLOR LEGEND

1 = ol. 5Y 5/3
2 = lt. gy. 2.5Y 7/0

SITE 397 HOLE CORE 8 CORED INTERVAL: 66-75.5 m



LITHOLOGIC DESCRIPTION

SILICEOUS NANNO OOZE = dom. lith. Gas expansion cracks and H_2S smell throughout; scat. pyrite blebs.

NANNO OOZE - SILICEOUS NANNO OOZE

SS: 2-103 cm, 3-74 cm, 4-54 cm, CC

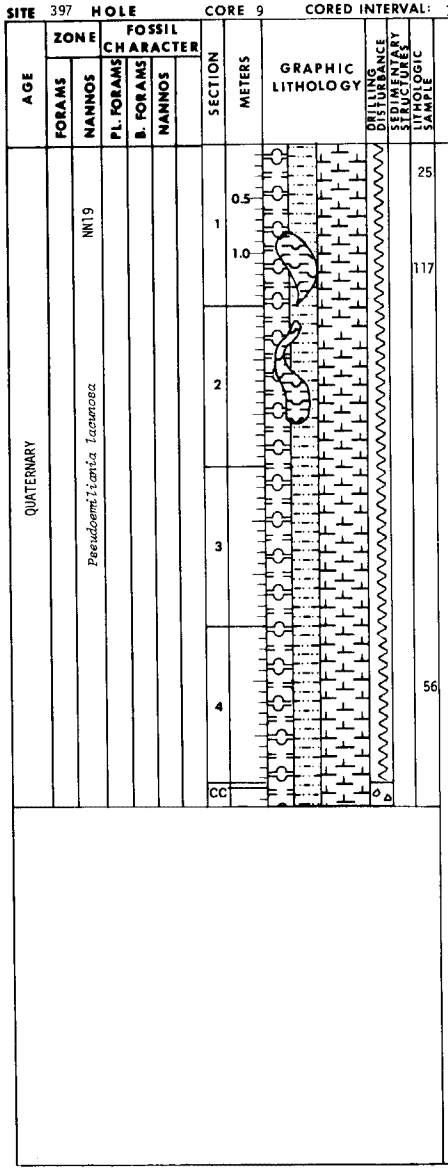
70-75%	nannos
3-12	quartz
5-10	diatoms
5	carb. unspec.
tr- 5	forams
tr- 5	pyrite
tr- 5	rads
tr- 5	sponge spics.
1	silicoflag.
tr	dolomite (SS: 4-54 cm)
tr	mica
tr	clay
tr	tourmaline (SS: 3-74 cm)
tr	glauc.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 4-54 cms	38	0.5
CARB. BOMB:	Sect. 3-76 to 78 cms	53	

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 9 CORED INTERVAL: 75.5-85 m



LITHOLOGIC DESCRIPTION

SILICEOUS NANNO OOZE = dom. lith. Mixed colors due to core disturb. numerous small patches of ol. col. seds. scat. throughout; H_2S smell; gas expansion cracks but not as abund. as in prev. cores.

NANNO DIATOM OOZE patches

SS: 1-117 cm

50%	diatoms
35	nannos
5	clay
5	rads
5	sponge spics.
tr	quartz
tr	pyrite

NANNO OOZE - SILICEOUS NANNO OOZE

SS: 1-25 cm, 4-56 cm, CC

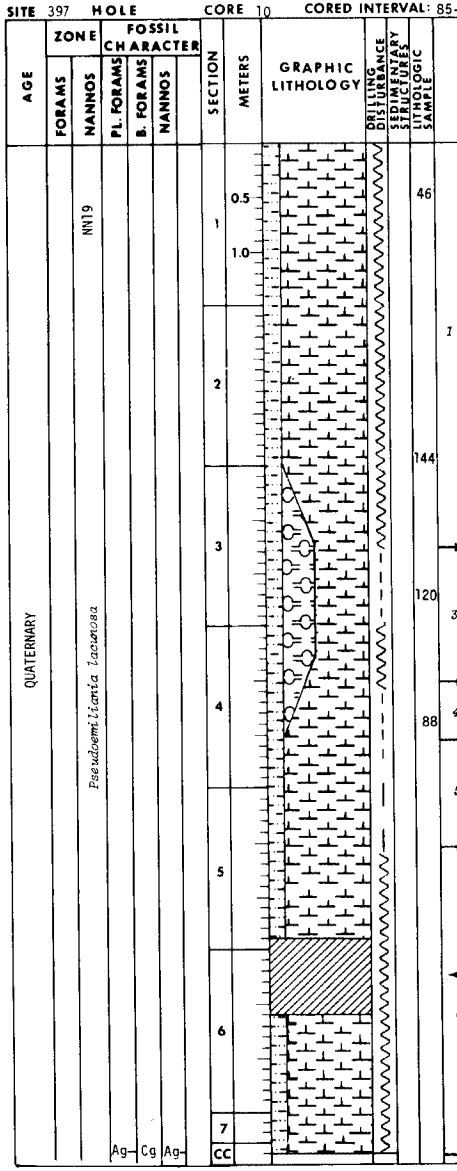
78-85%	nannos
3- 8	forams
2-10	diatoms
2- 5	carb. unspec.
1- 3	sponge spics.
tr- 2	quartz
tr- 1	pyrite
tr- 1	rads
tr- 1	silicoflag.
tr	mica
tr	heavy mins.
tr	clay
tr	glauc.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-48 cms	56	0.2
CARB. BOMB:	Sect. 4-60 to 62 cms	39	

COLOR LEGEND

1 = ol. 5Y 5/3
2 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 10 CORED INTERVAL: 85-94.5 m



LITHOLOGIC DESCRIPTION

MARLY NANNO OOZE = dom. lith. Gas expansion cracks; H_2S smell.

MARLY NANNO OOZE

SS: 1-46 cm

45%	nannos
20	clay
15	quartz
5	forams
5	carb. unspec.
5	sponge spics.
tr- 5	pyrite
tr	feldspar
tr	mica
tr	glauc.
tr	rads

NANNO OOZE

SS: 2-44 cm, 4-88 cm, CC

80%	nannos
3- 5	forams
3- 5	carb. unspec.
3- 5	diatoms
1- 5	sponge spics.
1	rads
tr- 1	quartz
tr	dolomite (SS: 4-88 cm)
tr	feldspar (SS: 2-144 cm)
tr	mica
tr	heavy mins.
tr	clay
tr	tourmaline (SS: 2-144 cm)
tr	glauc.
tr	pyrite
tr	silicoflag.

SILICEOUS NANNO OOZE

SS: 3-120 cm

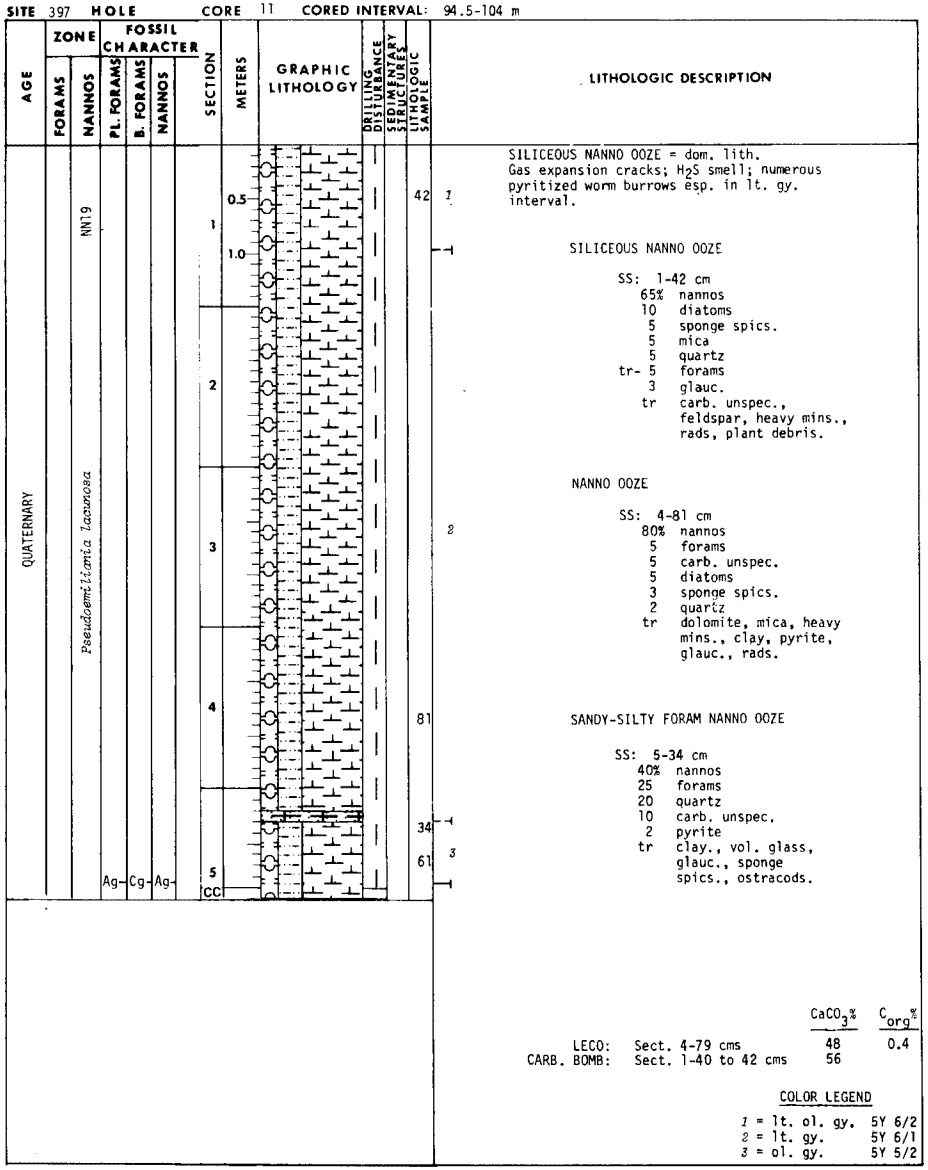
75%	nannos
10	diatoms
5	sponge spics.
3	forams
3	carb. unspec.
1	silicoflag.
1	quartz
1	mica
tr- 1	pyrite
tr	heavy mins.
tr	clay
tr	glauc.
tr	rads

		$CaCO_3$%	C_{org}%
LECO:	Sect. 4- 84 cms	31	0.6
CARB. BOMB:	Sect. 3-103 to 108 cms	43	

COLOR LEGEND

1 = lt. ol. gy. 5Y 6/2
2 = lt. gy. 5Y 7/1
3 = ol. gy. 5Y 5/2
4 = 5Y 6/1 5Y 6/1
5 = ol. 5Y 5/3
6 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 11 CORED INTERVAL: 94.5-104 m



SILICEOUS NANNO OOZE = dom. lith. Gas expansion cracks; H_2S smell; numerous pyritized worm burrows esp. in lt. gy. interval.

SILICEOUS NANNO OOZE

SS: 1-42 cm
- 65% nannos
- 10 diatoms
- 5 sponge spics.
- 5 mica
- 5 quartz
- tr- 5 forams
- 3 glauc.
- tr carb. unspec., feldspar, heavy mins., rads, plant debris.

NANNO OOZE

SS: 4-81 cm
- 80% nannos
- 5 forams
- 5 carb. unspec.
- 5 diatoms
- 3 sponge spics.
- 2 quartz
- tr dolomite, mica, heavy mins., clay, pyrite, glauc., rads.

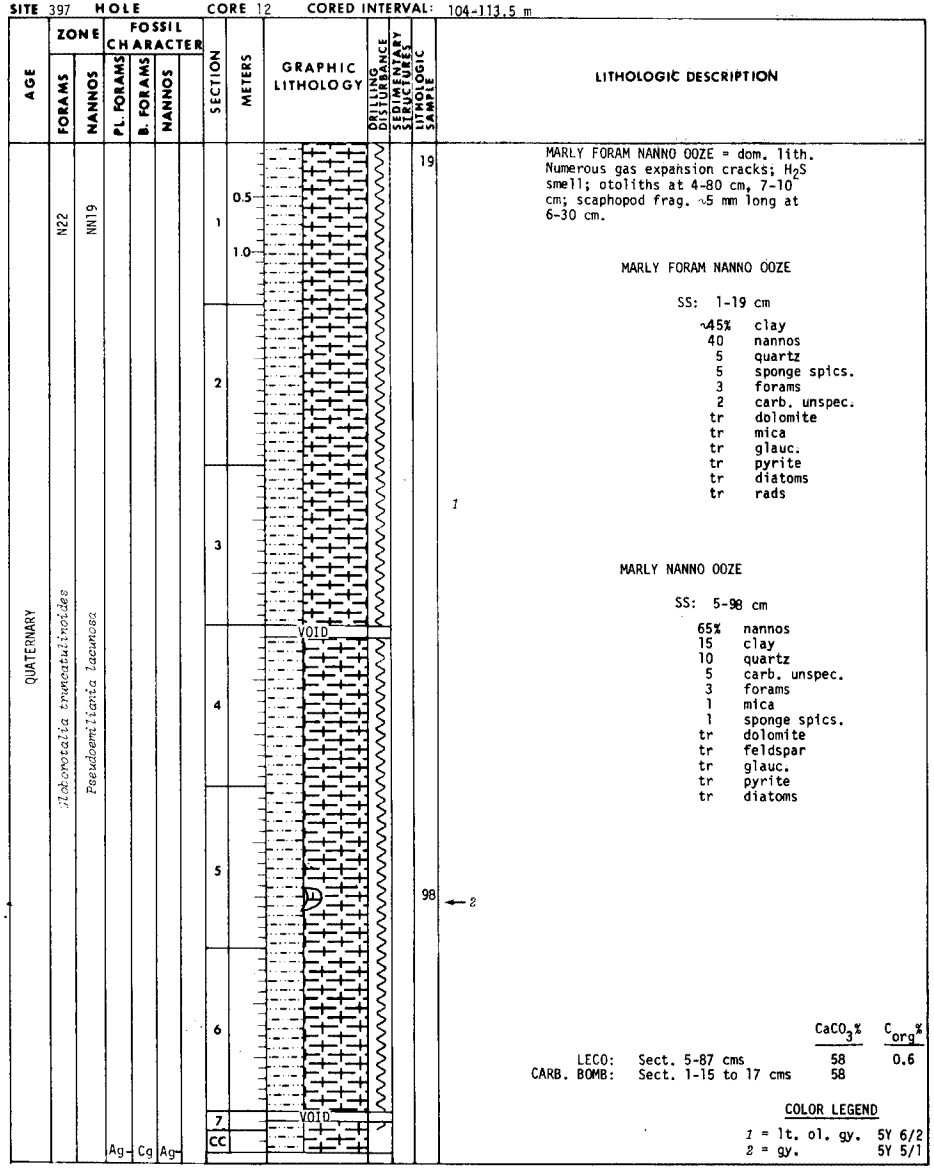
SANDY-SILTY FORAM NANNO OOZE

SS: 5-34 cm
- 40% nannos
- 25 forams
- 20 quartz
- 10 carb. unspec.
- 2 pyrite
- tr clay., vol. glass, glauc., sponge spics., ostracods.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 4-79 cms	48	0.4
CARB. BOMB:	Sect. 1-40 to 42 cms	56	

COLOR LEGEND
1 = lt. ol. gy. 5Y 6/2
2 = lt. gy. 5Y 6/1
3 = ol. gy. 5Y 5/2

SITE 397 HOLE CORE 12 CORED INTERVAL: 104-113.5 m



MARLY FORAM NANNO OOZE = dom. lith. Numerous gas expansion cracks; H_2S smell; otoliths at 4-80 cm, 7-10 cm; scaphopod frag. ~5 mm long at 6-30 cm.

MARLY FORAM NANNO OOZE

SS: 1-19 cm
- ~45% clay
- 40 nannos
- 5 quartz
- 5 sponge spics.
- 3 forams
- 2 carb. unspec.
- tr dolomite
- tr mica
- tr glauc.
- tr pyrite
- tr diatoms
- tr rads

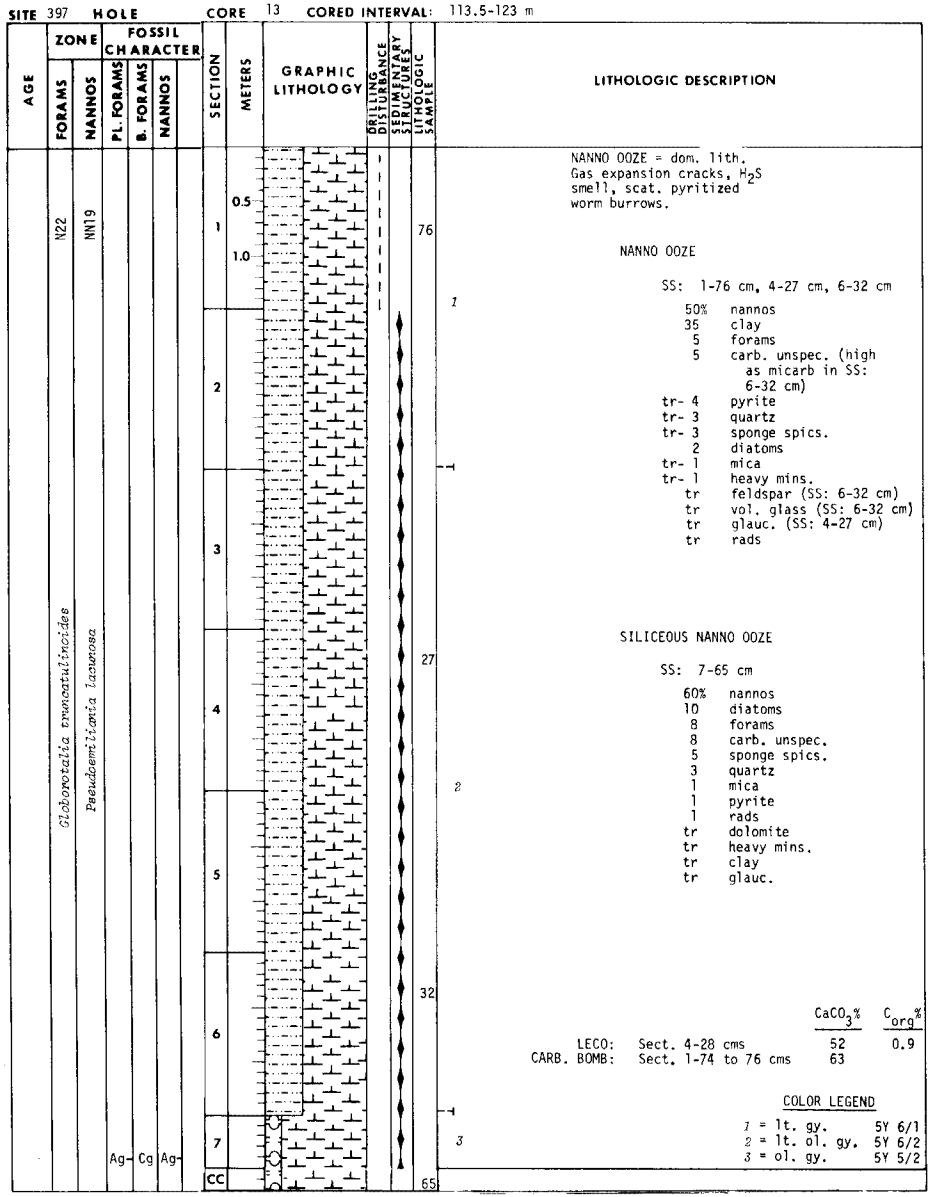
MARLY NANNO OOZE

SS: 5-98 cm
- 65% nannos
- 15 clay
- 10 quartz
- 5 carb. unspec.
- 3 forams
- 1 mica
- 1 sponge spics.
- tr dolomite
- tr feldspar
- tr glauc.
- tr pyrite
- tr diatoms

		$CaCO_3$%	C_{org}%
LECO:	Sect. 5-87 cms	58	0.6
CARB. BOMB:	Sect. 1-15 to 17 cms	58	

COLOR LEGEND
1 = lt. ol. gy. 5Y 6/2
2 = gy. 5Y 5/1

SITE 397 HOLE CORE 13 CORED INTERVAL: 113.5-123 m



NANNO OOZE = dom. lith. Gas expansion cracks, H_2S smell, scat. pyritized worm burrows.

NANNO OOZE

SS: 1-76 cm, 4-27 cm, 6-32 cm

50%	nannos
35	clay
5	forams
5	carb. unspec. (high as micarb in SS: 6-32 cm)
tr- 4	pyrite
tr- 3	quartz
tr- 3	sponge spics.
2	diatoms
tr- 1	mica
tr- 1	heavy mins.
tr	feldspar (SS: 6-32 cm)
tr	vol. glass (SS: 6-32 cm)
tr	glauc. (SS: 4-27 cm)
tr	rads

SILICEOUS NANNO OOZE

SS: 7-65 cm

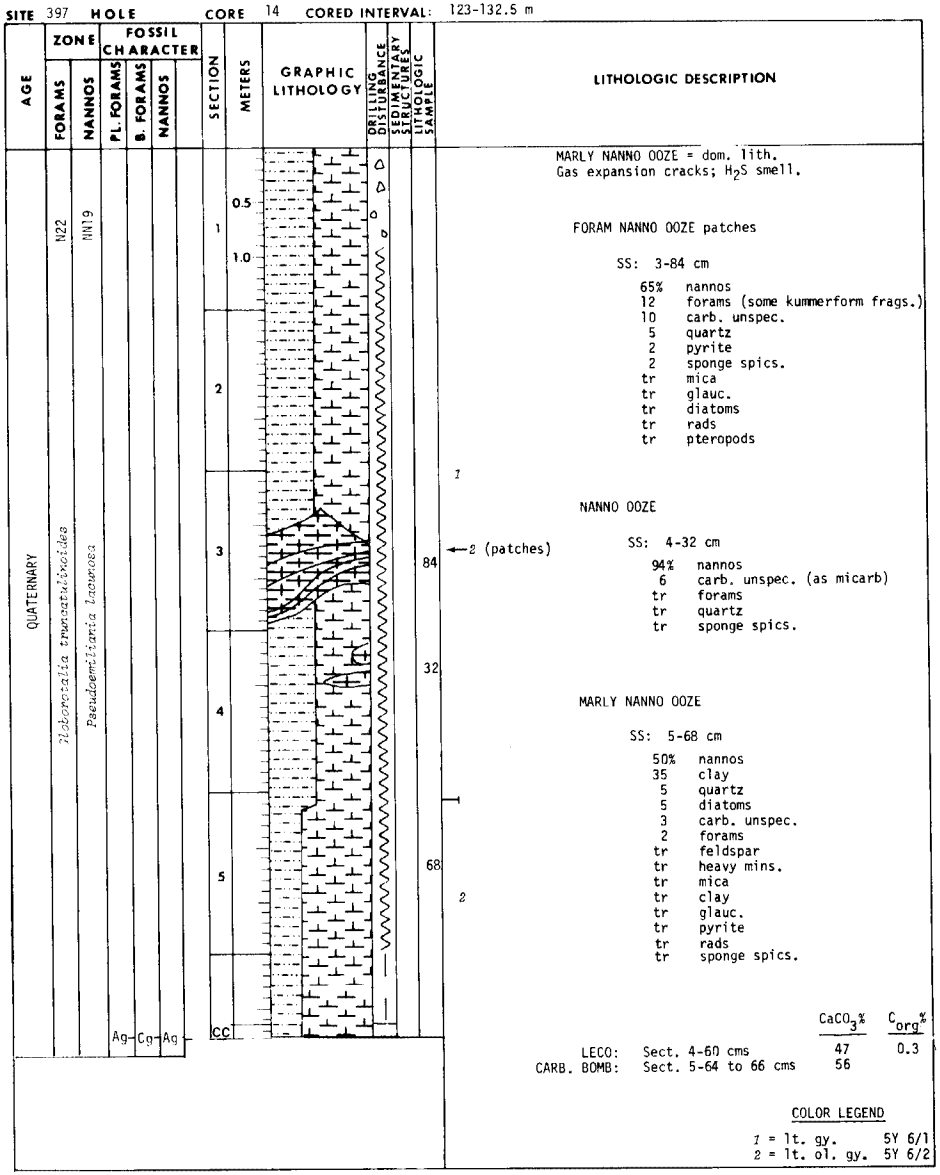
60%	nannos
10	diatoms
8	forams
8	carb. unspec.
5	sponge spics.
3	quartz
1	mica
1	pyrite
1	rads
tr	dolomite
tr	heavy mins.
tr	clay
tr	glauc.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 4-28 cms	52	0.9
CARB. BOMB:	Sect. 1-74 to 76 cms	63	

COLOR LEGEND

1 = lt. gy. 5Y 6/1
2 = lt. ol. gy. 5Y 6/2
3 = ol. gy. 5Y 5/2

SITE 397 HOLE CORE 14 CORED INTERVAL: 123-132.5 m



MARLY NANNO OOZE = dom. lith. Gas expansion cracks; H_2S smell.

FORAM NANNO OOZE patches

SS: 3-84 cm

65%	nannos
12	forams (some kummerform frags.)
10	carb. unspec.
5	quartz
2	pyrite
2	sponge spics.
tr	mica
tr	glauc.
tr	diatoms
tr	rads
tr	pteropods

NANNO OOZE

SS: 4-32 cm

94%	nannos
6	carb. unspec. (as micarb)
tr	forams
tr	quartz
tr	sponge spics.

MARLY NANNO OOZE

SS: 5-68 cm

50%	nannos
35	clay
5	quartz
5	diatoms
3	carb. unspec.
2	forams
tr	feldspar
tr	heavy mins.
tr	mica
tr	clay
tr	glauc.
tr	pyrite
tr	rads
tr	sponge spics.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 4-60 cms	47	0.3
CARB. BOMB:	Sect. 5-64 to 66 cms	56	

COLOR LEGEND

1 = lt. gy. 5Y 6/1
2 = lt. ol. gy. 5Y 6/2

SITE 397 HOLE CORE 15 CORED INTERVAL: 132.5-142 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS
LATE PLIOCENE (Placenzian)/QUATERNARY	N22	NN18	Ag–	Cg	Ag–

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

NANNO OOZE = dom. lith.
Scat. blebs of pyrite; "drilling breccia" noted partly due to gas expansion cracks; H_2S smell.

NANNO OOZE

SS: 1-84 cm, 3-65 cm, 6-36 cm

50%	nannos
30	heavy mins.
30	feldspar
30	mica
30	clay
5-10	carb. unspec.
2- 3	diatoms
tr- 5	forams
tr- 3	sponge spics.
tr- 3	quartz
tr- 1	rads
tr	glauc.
tr	pyrite

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-86 cms	53	1.0
CARB. BOMB:	Sect. 6-32 to 38 cms	66	

COLOR LEGEND
1 = lt. ol. gy. 5Y 6/2
2 = lt. gy. 5Y 7/1

SITE 397 HOLE CORE 16 CORED INTERVAL: 142-151.5 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS
LATE PLIOCENE (Placenzian)	M PL 6	NN18	Ag–	Cg	Ag–

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

NANNO OOZE & SILICEOUS NANNO OOZE = dom. lith.
Gas expansion cracks; H_2S smell; scat. pyritized worm burrows from Sect. 4-7; "drilling breccia" in part also due to numerous gas expansion cracks.

NANNO OOZE

SS: 1-123 cm, 4-38 cm

50%	nannos
30	clay
5	forams
5	carb. unspec.
tr- 5	diatoms
2- 3	sponge spics.
2	pyrite
tr- 2	quartz
tr- 1	rads
tr	pteropods (SS: 1-123 cm)
tr	mica
tr	glauc.

SILICEOUS NANNO OOZE

SS: 4-59 cm

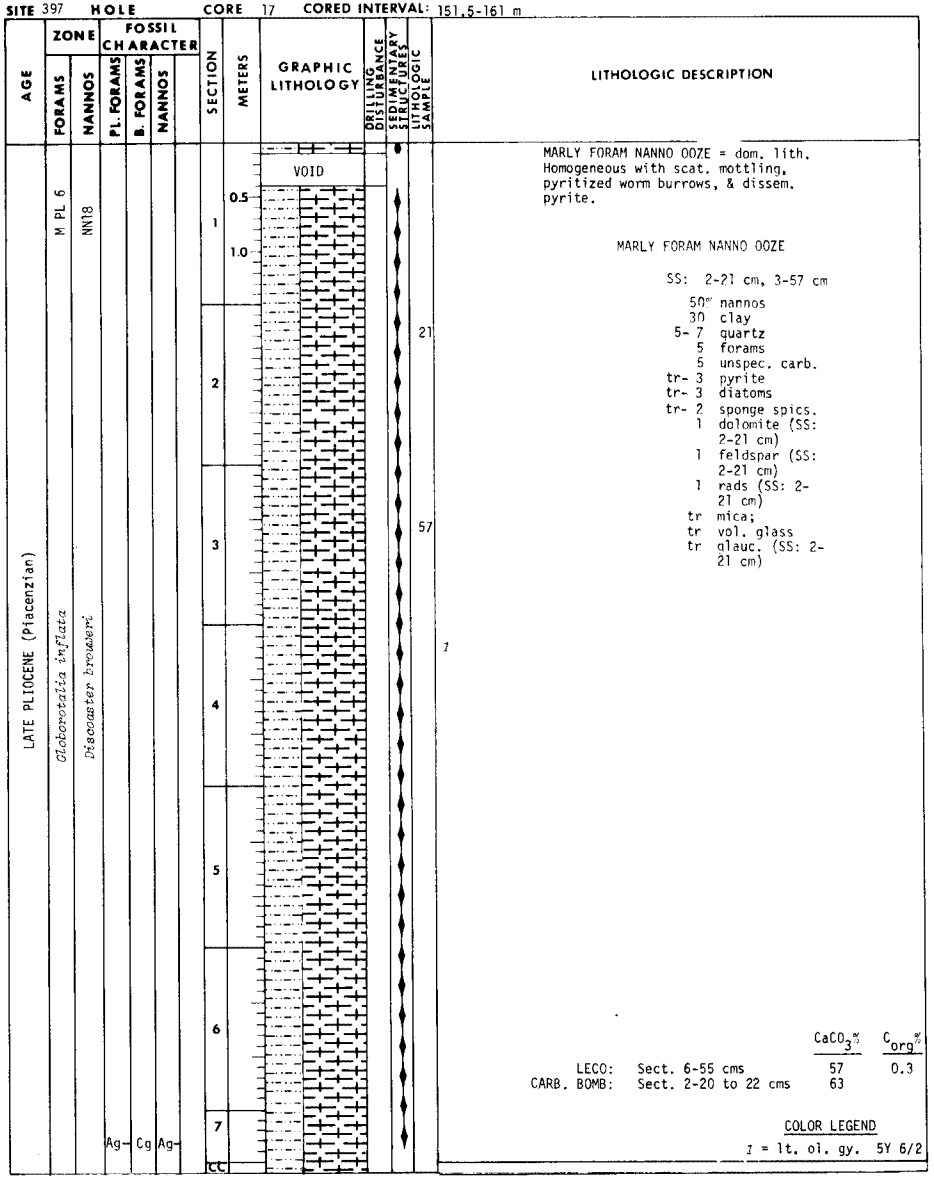
64%	nannos
10	carb. unspec.
10	diatoms
8	forams
5	sponge spics.
2	quartz
1	rads
tr	dolomite
tr	pteropods
tr	mica
tr	clay
tr	glauc.
tr	pyrite

← Geochem. Samp.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 4- 36 cms	50	0.2
CARB. BOMB:	Sect. 1-121 to 123 cms	60	

COLOR LEGEND
1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 17 CORED INTERVAL: 151.5-161 m



MARLY FORAM NANNO OOZE = dom. lith. Homogeneous with scat. mottling, pyritized worm burrows, & dissem. pyrite.

MARLY FORAM NANNO OOZE

SS: 2-21 cm, 3-57 cm

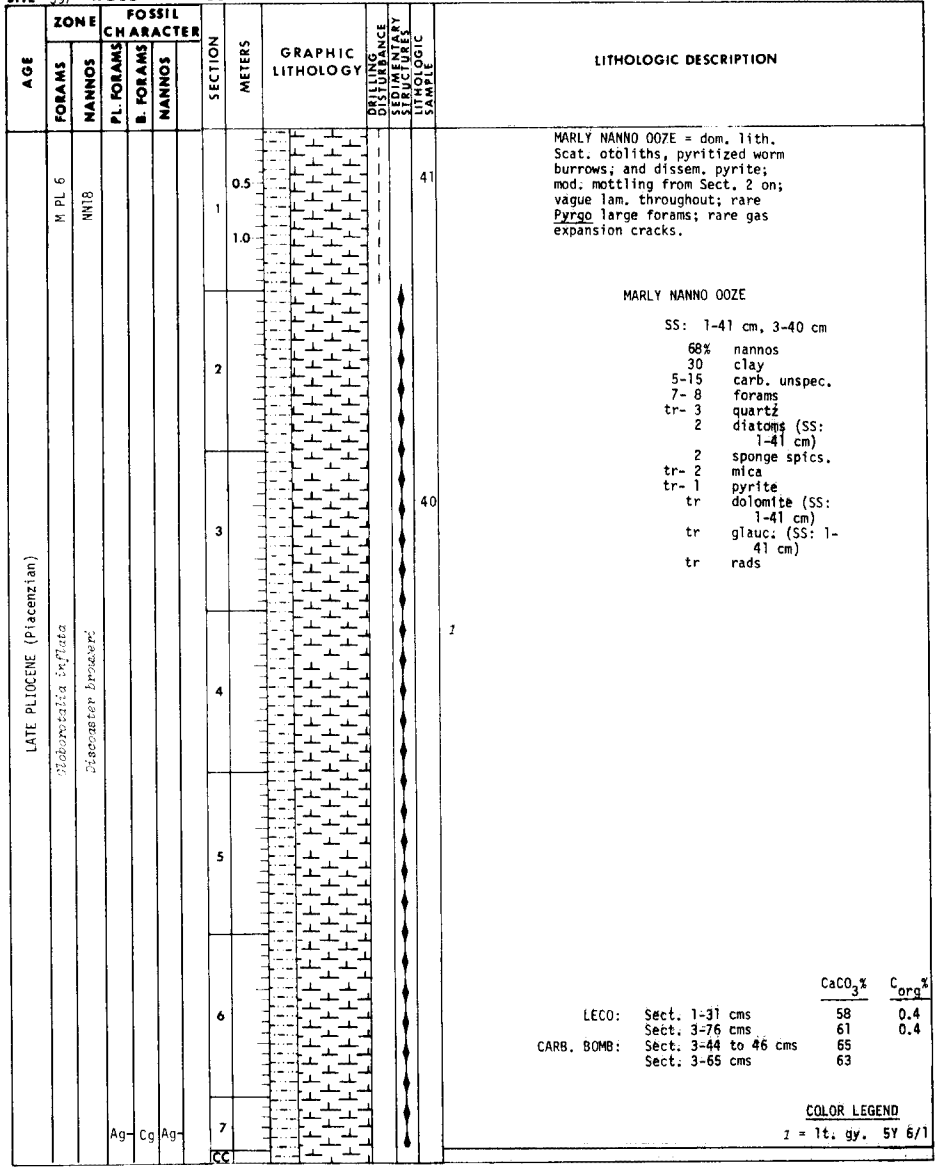
50%	nannos
30	clay
5- 7	quartz
5	forams
5	unspec. carb.
tr- 3	pyrite
tr- 3	diatoms
tr- 2	sponge spics.
1	dolomite (SS: 2-21 cm)
1	feldspar (SS: 2-21 cm)
1	rads (SS: 2-21 cm)
tr	mica;
tr	vol. glass
tr	glauc. (SS: 2-21 cm)

		$CaCO_3$%	C_{org}%
LECO:	Sect. 6-55 cms	57	0.3
CARB. BOMB:	Sect. 2-20 to 22 cms	63	

COLOR LEGEND

1 = lt. ol. gy. 5Y 6/2

SITE 397 HOLE CORE 18 CORED INTERVAL: 161-170.5 m



MARLY NANNO OOZE = dom. lith. Scat. otoliths, pyritized worm burrows; and dissem. pyrite; mod. mottling from Sect. 2 on; vague lam. throughout; rare Pyrgo large forams; rare gas expansion cracks.

MARLY NANNO OOZE

SS: 1-41 cm, 3-40 cm

68%	nannos
30	clay
5-15	carb. unspec.
7- 8	forams
tr- 3	quartz
2	diatoms (SS: 1-41 cm)
2	sponge spics.
tr- 2	mica
tr- 1	pyrite
tr	dolomite (SS: 1-41 cm)
tr	glauc. (SS: 1-41 cm)
tr	rads

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-31 cms	58	0.4
	Sect. 3-76 cms	61	0.4
CARB. BOMB:	Sect. 3-44 to 46 cms	65	
	Sect. 3-65 cms	63	

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 19 CORED INTERVAL: 170.5-180 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
LATE PLIOCENE (Piacenzian)	M PL 5	NN17	Ag–Cg–Ag–			1	0.5				111
	Globigerinoides obliquus extremus					1	1.0				
		Discoaster pentaradiatus				2					
						3					
						4					1 & 2
						5					16
						CC					

NANNO OOZE = dom. lith. Dissem. pyrite throughout; scat. pyritized worm burrows; mod. mottling with 5Y 7/1 lt. gy.; some vague lam. poss. some fn. burrows; rare gas expansion cracks.

NANNO OOZE

SS: 1-111 cm, 5-16 cm

65-75%	nannos
20	clay
5-20	carb. unspec.
tr- 5	forams
3	rads (SS: 1-111 cm)
2- 3	sponge spics.
1- 5	quartz
tr- 1	diatoms
tr	feldspar
tr	mica
tr	glauc.
tr	pyrite

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-110 cms	59	0.5
CARB. BOMB:	Sect. 3-130 cms	67	

COLOR LEGEND

1 = lt. gy. 5Y 6/1
2 = lt. gy. 5Y 7/1

SITE 397 HOLE CORE 20 CORED INTERVAL: 180-189.5 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
LATE PLIOCENE (Piacenzian)	M PL 5	NN16	Ag–Cm–Ag–			1	0.5				28
	Globigerinoides obliquus extremus					1	1.0				
		Discoaster asymmetricus				2					
						3					
						4					1 & 2
						5					
						6					92
						7					
						CC					

NANNO OOZE = dom. lith. Dissem. pyrite throughout; some pyritized worm burrows; rare gas expansion cracks; mod. mottling; mottling distinctive by 5Y 6/2 lt, ol. gy.; poss. some fn. burrowing.

NANNO OOZE

SS: 2-28 cm, 6-92 cm

65-75%	nannos
20	clay
3- 8	forams
5	carb, unspec.
tr- 5	quartz
1- 3	sponge spics.
tr- 1	diatoms
tr	mica
tr	heavy mins. (tourmaline - SS: 6-92 cm)
tr	vol. glass
tr	glauc. (SS: 6-92 cm)
tr	pyrite
tr	rads (SS: 2-28 cm)

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-100 cms	71	0.3
	Sect. 3-100 cms	70	0.4
CARB. BOMB:	Sect. 5- 88 to 90 cms	69	

COLOR LEGEND

1 = lt. gy. 5Y 7/1
2 = lt. ol. gy. 5Y 6/2

SITE 397 HOLE CORE 21 CORED INTERVAL: 189.5-199 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS
LATE PLIOCENE (Piacenzian)	M PL 5	NN16	Ag–	Cm	Ag–

Globigerinoides obliquus extremus

Discoaster surculus

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

NANNO OOZE = dom. lith. Mottled; Sect. 4 distinctively darker in color; extensive fn. burrows; dissem. pyrite throughout; apparently in some of worm burrows; rare gas expansion cracks.

NANNO OOZE

SS: 4-80 cm, 5-71 cm

55-65%	nannos
20	clay
5-10	carb. unspec.
5- 6	diatoms
5	forams
1- 5	quartz
3- 4	sponge spics.
2	pyrite
tr- 2	mica
1	sil. unspec. (SS: 5-71 cm)
tr	dolomite (SS: 5-71 cm)
tr	glauc. (SS: 5-71 cm)
tr	rads

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-90 cms	56	0.5
	Sect. 4-76 cms	50	0.9
CARB. BOMB:	Sect. 5-71 to 73 cms	70	

COLOR LEGEND

1 = lt. ol. gy. 5Y 6/2
2 = pl. ol. 5Y 6/3

SITE 397 HOLE CORE 22 CORED INTERVAL: 199-208.5 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS
LATE PLIOCENE (Piacenzian)	M PL 5	NN16	Ag–	Cm	Ag–

Globigerinoides obliquus extremus

Discoaster surculus

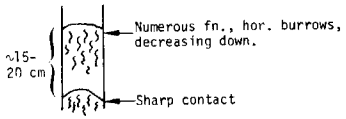
SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

VOID

LITHOLOGIC DESCRIPTION

NANNO OOZE = dom. lith. Numerous fn. burrows; dissem. pyrite throughout; no gas expansion cracks; some mottling (slight) particularly from Sect. 4 down (with apparent concomittant decrease in fn. burrows).

Sequences noted in Sect. 3 (only 2 noted, possibly 3)



NANNO OOZE

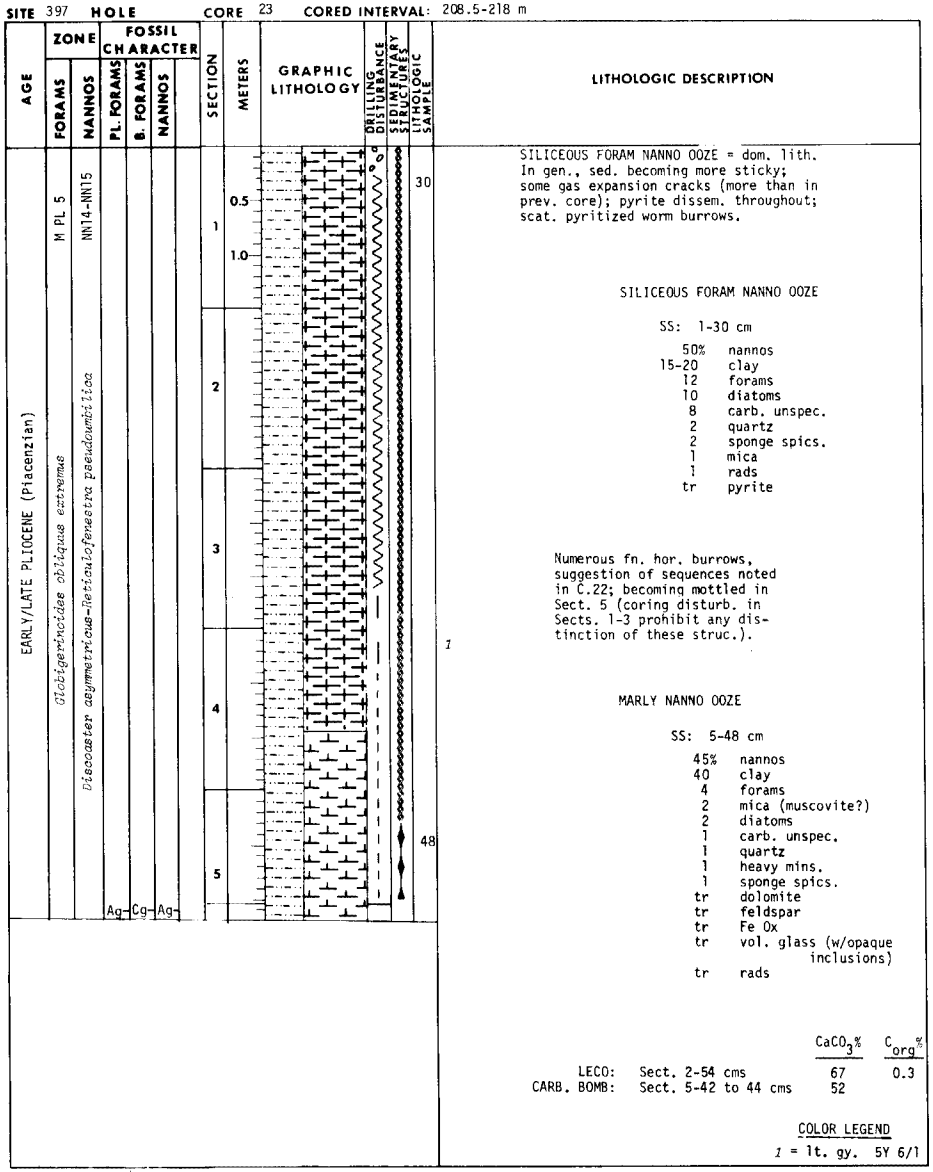
SS: 1-49 cm, 3-46 cm

60-70%	nannos
15-20	clay
2- 8	forams
5	carb. unspec.
2- 5	diatoms
2	sponge spics.
1	sil. unspec. (SS: 3-46 cm)
1	quartz
tr	dol. (SS: 3-46 cm)
tr	feldspar (SS: 3-46 cm)
tr	mica
tr	heavy mins. (SS: 3-46 cm)

COLOR LEGEND

1 = lt. ol. gy. 5Y 6/2
2 = lt. gy. 5Y 7/1

SITE 397 HOLE CORE 23 CORED INTERVAL: 208.5-218 m



SILICEOUS FORAM NANNO OOZE = dom. lith. In gen., sed. becoming more sticky; some gas expansion cracks (more than in prev. core); pyrite dissem. throughout; scat. pyritized worm burrows.

SILICEOUS FORAM NANNO OOZE

SS: 1-30 cm

50%	nannos
15-20	clay
12	forams
10	diatoms
8	carb. unspec.
2	quartz
2	sponge spics.
1	mica
1	rads
tr	pyrite

Numerous fn. hor. burrows, suggestion of sequences noted in C.22; becoming mottled in Sect. 5 (coring disturb. in Sects. 1-3 prohibit any distinction of these struc.).

MARLY NANNO OOZE

SS: 5-48 cm

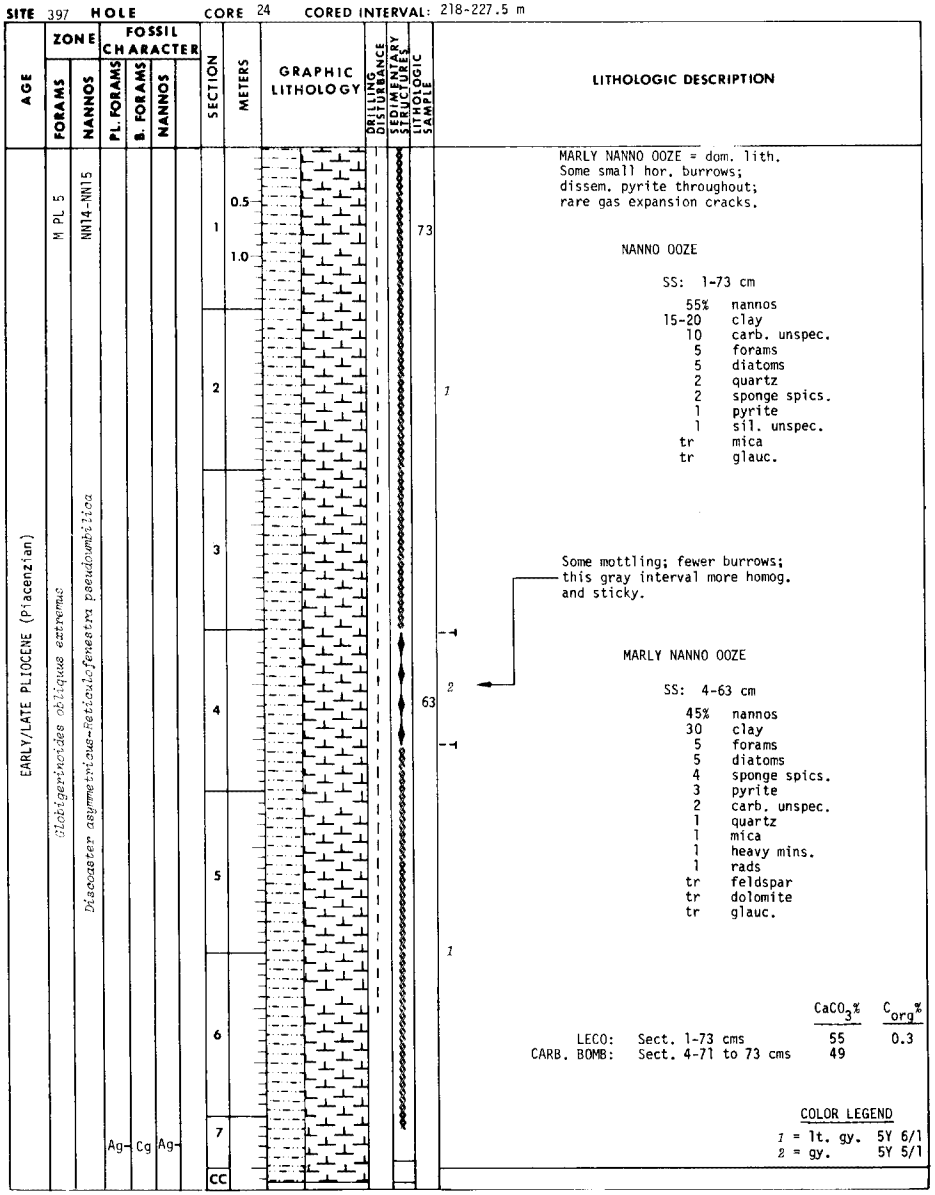
45%	nannos
40	clay
4	forams
2	mica (muscovite?)
2	diatoms
1	carb. unspec.
1	quartz
1	heavy mins.
1	sponge spics.
tr	dolomite
tr	feldspar
tr	Fe Ox
tr	vol. glass (w/opaque inclusions)
tr	rads

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-54 cms	67	0.3
CARB. BOMB:	Sect. 5-42 to 44 cms	52	

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 24 CORED INTERVAL: 218-227.5 m



MARLY NANNO OOZE = dom. lith. Some small hor. burrows; dissem. pyrite throughout; rare gas expansion cracks.

NANNO OOZE

SS: 1-73 cm

55%	nannos
15-20	clay
10	carb. unspec.
5	forams
5	diatoms
2	quartz
2	sponge spics.
1	pyrite
1	sil. unspec.
tr	mica
tr	glauc.

Some mottling; fewer burrows; this gray interval more homog. and sticky.

MARLY NANNO OOZE

SS: 4-63 cm

45%	nannos
30	clay
5	forams
5	diatoms
4	sponge spics.
3	pyrite
2	carb. unspec.
1	quartz
1	mica
1	heavy mins.
1	rads
tr	feldspar
tr	dolomite
tr	glauc.

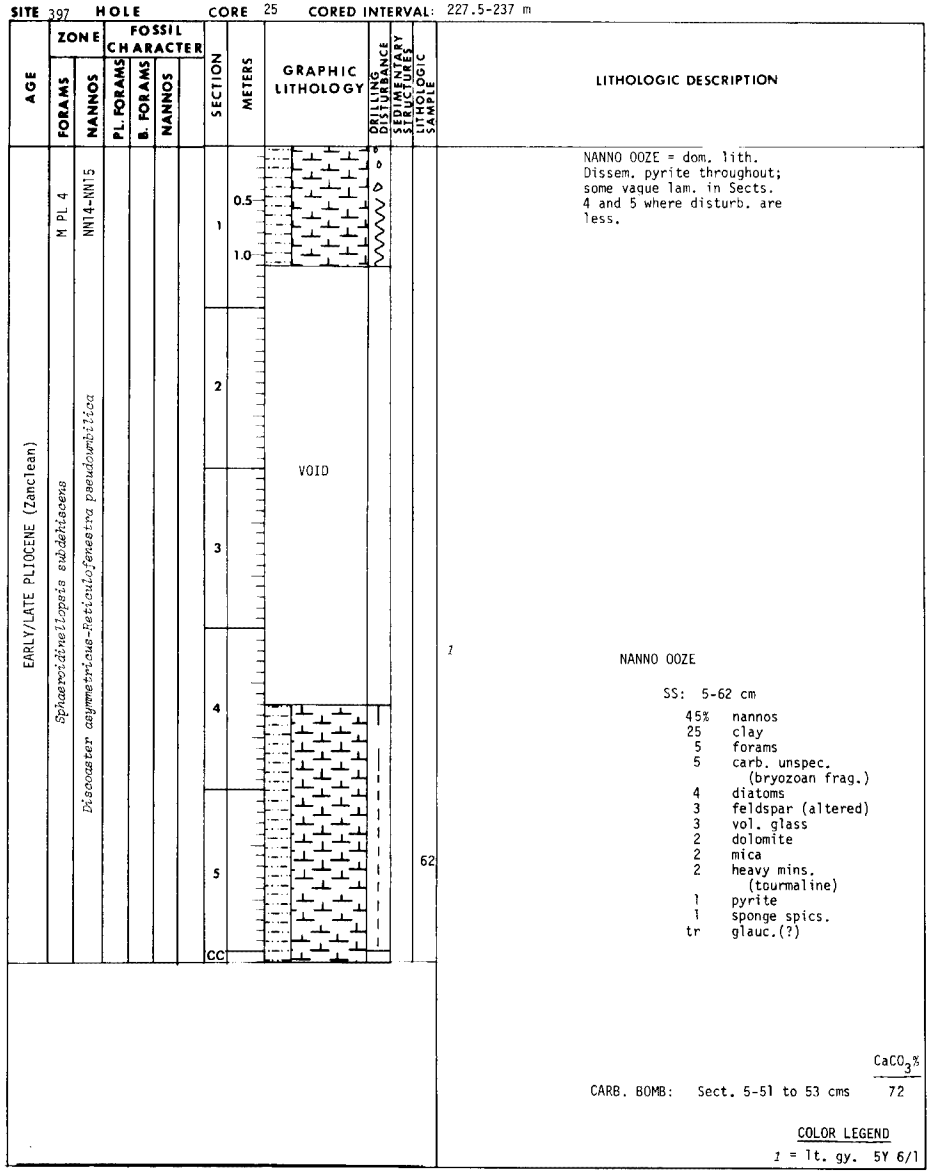
		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-73 cms	55	0.3
CARB. BOMB:	Sect. 4-71 to 73 cms	49	

COLOR LEGEND

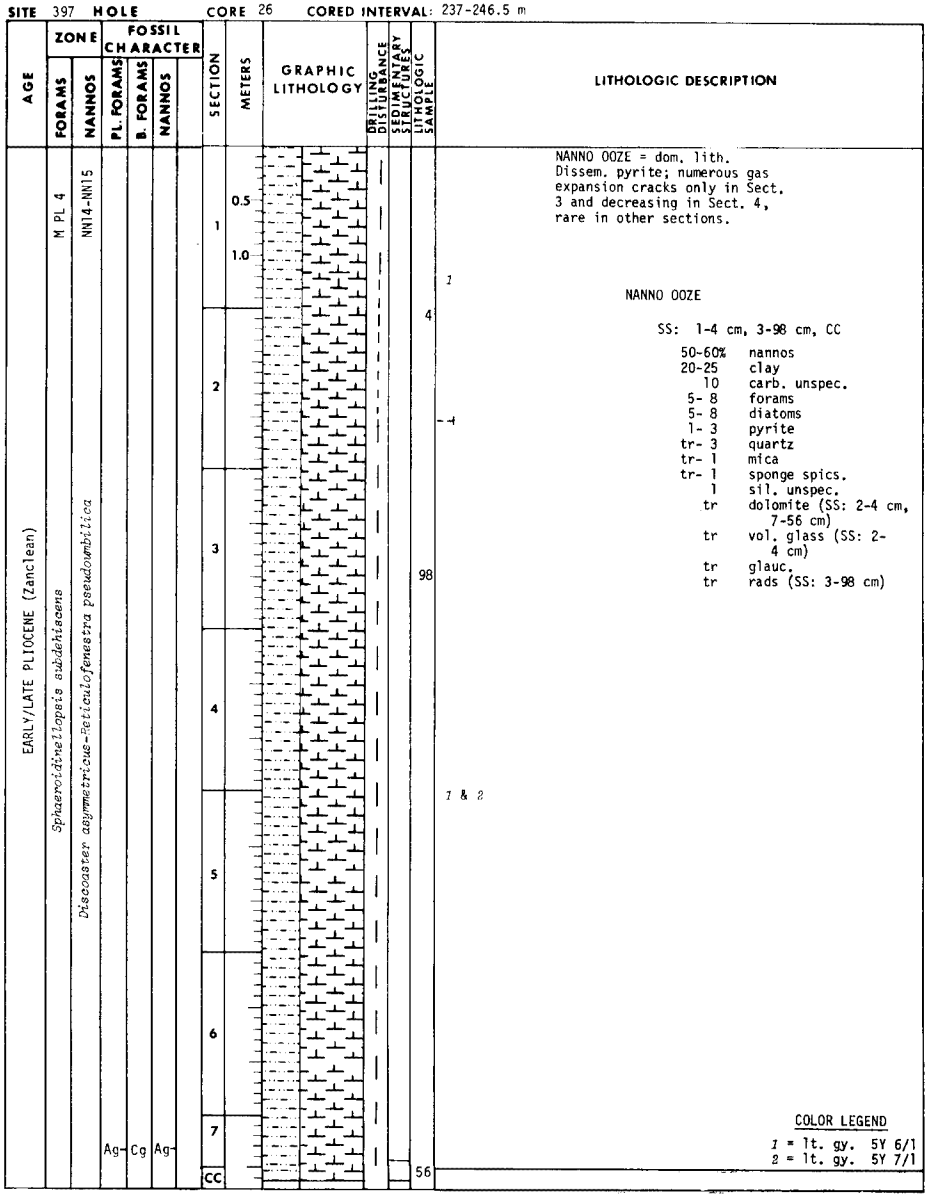
1 = lt. gy. 5Y 6/1

2 = gy. 5Y 5/1

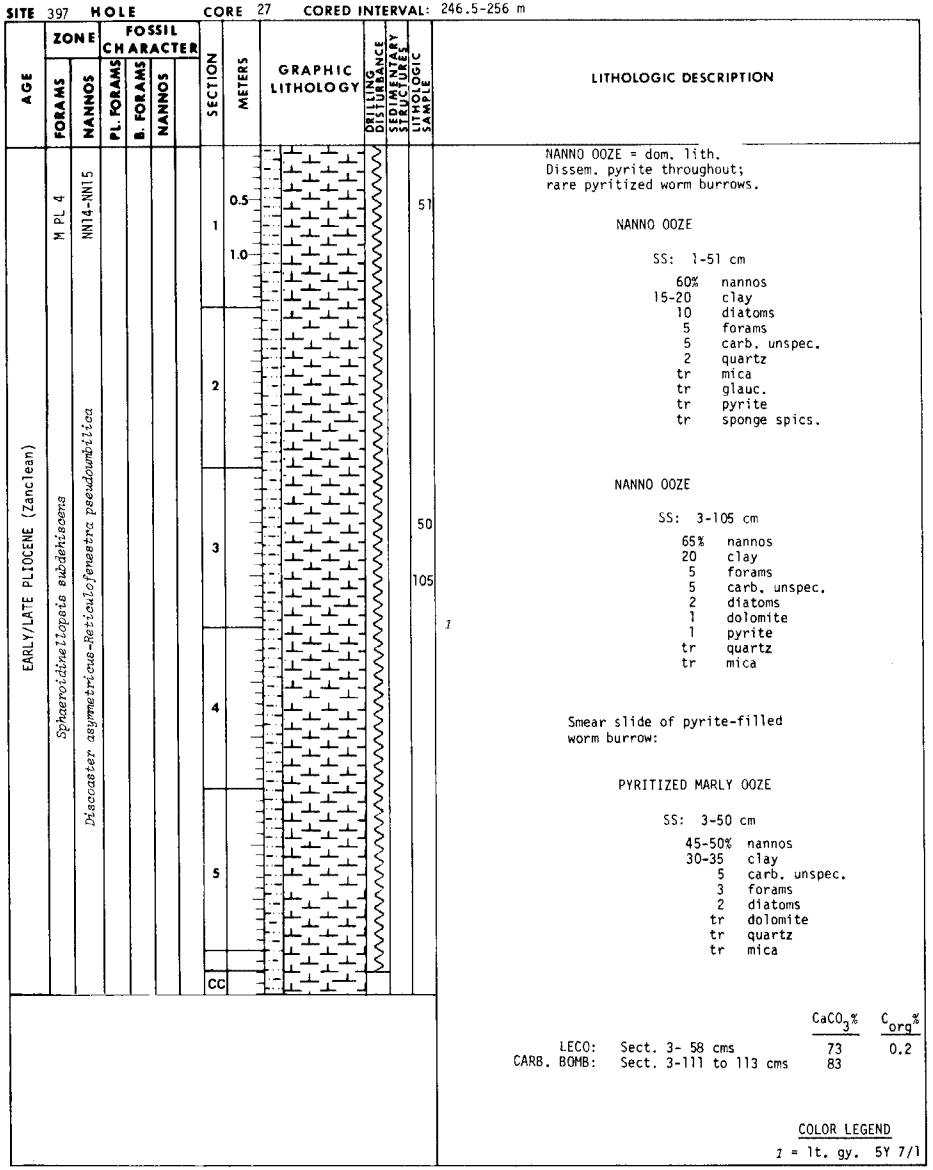
SITE 397 HOLE CORE 25 CORED INTERVAL: 227.5-237 m



SITE 397 HOLE CORE 26 CORED INTERVAL: 237-246.5 m



SITE 397 HOLE CORE 27 CORED INTERVAL: 246.5-256 m



NANNO OOZE = dom. lith.
Dissem. pyrite throughout;
rare pyritized worm burrows.

NANNO OOZE

SS: 1-51 cm

60%	nannos
15-20	clay
10	diatoms
5	forams
5	carb. unspec.
2	quartz
tr	mica
tr	glauc.
tr	pyrite
tr	sponge spics.

NANNO OOZE

SS: 3-105 cm

65%	nannos
20	clay
5	forams
5	carb. unspec.
2	diatoms
1	dolomite
1	pyrite
tr	quartz
tr	mica

Smear slide of pyrite-filled
worm burrow:

PYRITIZED MARLY OOZE

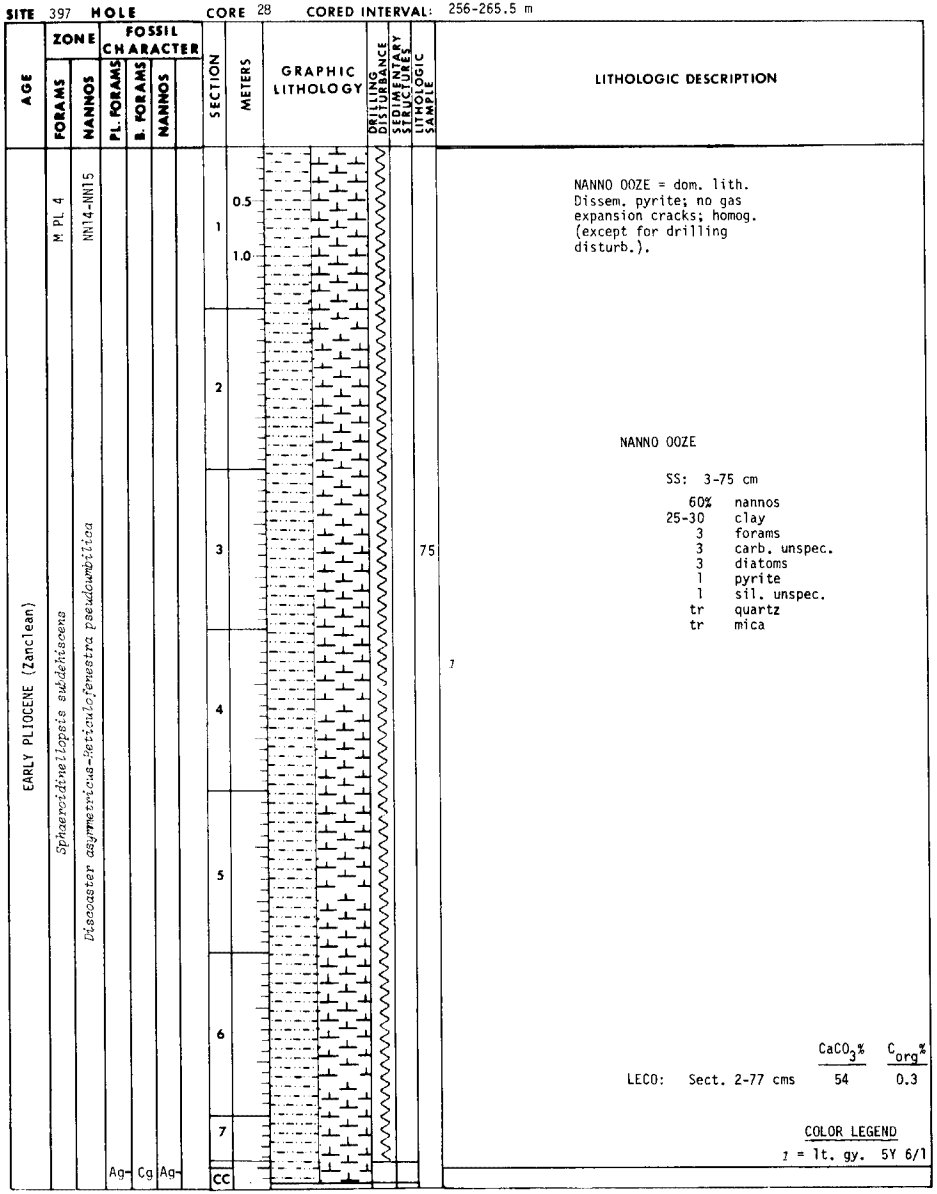
SS: 3-50 cm

45-50%	nannos
30-35	clay
5	carb. unspec.
3	forams
2	diatoms
tr	dolomite
tr	quartz
tr	mica

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3- 58 cms	73	0.2
CARB. BOMB:	Sect. 3-111 to 113 cms	83	

COLOR LEGEND
1 = lt. gy. 5Y 7/1

SITE 397 HOLE CORE 28 CORED INTERVAL: 256-265.5 m



NANNO OOZE = dom. lith.
Dissem. pyrite; no gas
expansion cracks; homog.
(except for drilling
disturb.).

NANNO OOZE

SS: 3-75 cm

60%	nannos
25-30	clay
3	forams
3	carb. unspec.
3	diatoms
1	pyrite
1	sil. unspec.
tr	quartz
tr	mica

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-77 cms	54	0.3

COLOR LEGEND
1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 29 CORED INTERVAL: 265.5-275 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS
EARLY PLIOCENE (Zanclean)	M PL 4 *Sphaeroidinellopsis subdehiscens*	NN14-NN15 *Discoaster asymmetricus-Reticulofenestra pseudoumbilica*	Ag-Cm		Ag-

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

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

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID

LITHOLOGIC SAMPLE: 1, 134

LITHOLOGIC DESCRIPTION

NANNO OOZE = dom. lith. Pyrite dissem. throughout; some small burrowing, but not extensive.

NANNO OOZE

SS: 6-134 cm

60%	nannos
25-30	clay
5	carb. unspec.
3	forams
3	diatoms
1	quartz
1	pyrite
tr	mica
tr	sil. unspec.

← Geochem. Samp.

CARB. BOMB: Sect. 6-134 to 136 — $CaCO_3$% = 73

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 30 CORED INTERVAL: 275-284.5 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS
EARLY PLIOCENE (Zanclean)	M PL 4 *Sphaeroidinellopsis subdehiscens*	NN14-NN15 *Discoaster asymmetricus-Reticulofenestra pseudoumbilica*			

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

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

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID, VOID

LITHOLOGIC SAMPLE: 74, 1

LITHOLOGIC DESCRIPTION

NANNO OOZE = dom. lith. Considerable coring and drilling disturb.; gas expansion cracks in Sects. 2 to 4; dissem. pyrite throughout.

NANNO OOZE

SS: 3-74 cm

50%	nannos
25-30	clay
8	forams
5	carb. unspec.
5	diatoms
2	pyrite
1	quartz
1	sil. unspec.
tr	dolomite
tr	glauc.
tr	mica

Large, broken mollusk-bivalve(?) shell frags. (≈1 cm x 1 cm).

LECO: Sect. 3-75 cms — $CaCO_3$% = 71 — C_{org}% = 0.2

COLOR LEGEND

1 = lt. gy. 5Y 7/1

SITE 397 HOLE CORE 31 CORED INTERVAL: 284.5-294 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS
EARLY PLIOCENE (Zanclean)	M PL 4 *Sphaeroidinellopsis subdehiscens*	NN14-NN15 *Discoaster asymmetricus-Reticulofenestra pseudoumbilica*			

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

SECTION 1 (0.5, 1.0); 2; 3; 4; CC

VOID

106

1

MARLY NANNO OOZE = dom. lith. Pyrite dissem. throughout; considerable drilling disturb.

MARLY NANNO OOZE

SS: 2-106 cm

55%	nannos
30	clay
5	forams
5	carb. unspec.
3	diatoms
1	quartz
1	pyrite
1	sil. unspec.
tr	dolomite
tr	mica
tr	glauc.
tr	heavy mins. (tourmaline)

LECO: Sect. 3-32 cms $CaCO_3$% = 41 C_{org}% = 0.3

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 32 CORED INTERVAL: 294-303.5 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS
EARLY PLIOCENE (Zanclean)	*Globorotalia margaritae/G. puncticulata*	NN14-NN15 *Discoaster asymmetricus-Reticulofenestra pseudoumbilica*			

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

SECTION 1 (0.5, 1.0); 2; 3; 4; CC

Geochem. Samp.

Geochem. Samp.

131

48

1

MARLY NANNO OOZE = dom. lith. Dissem. pyrite throughout; coring disturb.

MARLY NANNO OOZE

SS: 3-131 cm

60%	nannos
30	clay
3	forams
3	carb. unspec.
3	diatoms
1	sil. unspec.
tr	quartz
tr	mica
tr	pyrite
tr	sponge spics.

MARLY FORAM NANNO OOZE in small bleb.

SS: 4-48 cm

35%	clay
32	nannos
20	forams
10	carb. unspec.
5	quartz
2	pyrite
1	dolomite
tr	feldspar
tr	heavy mins.

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 33 CORED INTERVAL: 303.5-313 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS
EARLY PLIOCENE (Zanclean)	M PL 3	NN14-NN15			

Globorotalia margaritae/G. punticulata

Discoaster asymmetricus-Reticulofenestra pseudoumbilica

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

MARLY FORAM NANNO OOZE = dom. lith.
Dissem. pyrite throughout.

MARLY FORAM NANNO OOZE

SS: 3-92 cm, 4-52 cm

40-45%	nannos
30	clay
20	forams
5	carb. unspec. (SS: 3-92 cm)
5	quartz
tr	dolomite
tr	feldspar
tr	pyrite

1 with mottles of *2*.

92

1 & *2*

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-91 cms	64	0.3
CARB. BOMB:	Sect. 4-80 to 82 cms	70	

52

Indistinct lam. ~1 cm or less.

COLOR LEGEND

1 = lt. gy. 5Y 6/1
2 = lt. gy. 5Y 7/1

SITE 397 HOLE CORE 34 CORED INTERVAL: 313-322.5 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS
EARLY PLIOCENE (Zanclean)	M PL 3	NN14-NN15			

Globorotalia margaritae/G. punticulata

Discoaster asymmetricus-Reticulofenestra pseudoumbilica

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

~4 mm lam. burrowed with small hor. burrows, black, contains pyrite.

NANNO FORAM SILTY SAND

SS: 1-48 cm

50%	forams
25	nannos
20	clay
3	quartz
2	feldspar

9 cm layer, appears graded, void area beneath layer may be washed, base of unit composed of forams.

148

ZEOLITIC FORAM NANNO OOZE

SS: 2-133 cm

35%	zeolite (euhedral, some twinned)
25	nannos
15	forams
10	clay
10	pyrite
5	vol. glass

~2 mm layer, black, some small burrows (alt. vol. ash?).

133

Foram-pyrite silty sd. layer; burrowed with black filling in burrows, burrows extend 1 cm below layer.

99

1

MARLY NANNO OOZE = dom. lith. In gen. numerous small hor. burrows, and indistinct lam. (only a few with sharp contacts) of gy., ol. gy. & grn. gy.; pyrite dissem. throughout, often filling burrows; entire sequence of alt. soft and more indurated mat'l.

Silty-sdy. clay layer

Silty-sdy. clay layers

MARLY NANNO OOZE

SS: 3-99 cm

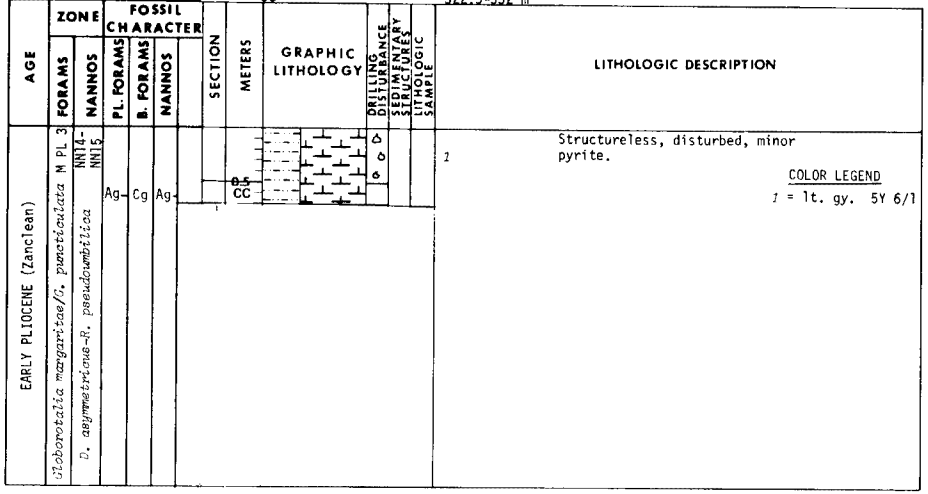
54%	nannos
30	clay
5	forams
5	carb. unspec.
3	mica
2	feldspar
1	dolomite

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3- 83 cms	64	0.2
CARB. BOMB:	Sect. 1-148 to 150 cms	80	

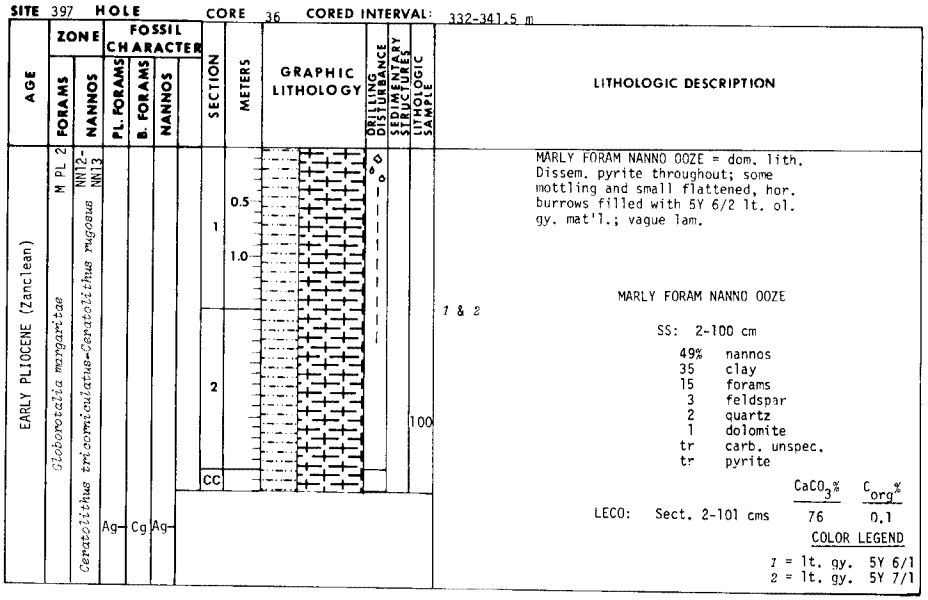
COLOR LEGEND

1 = lt. gy. 5Y 6/1

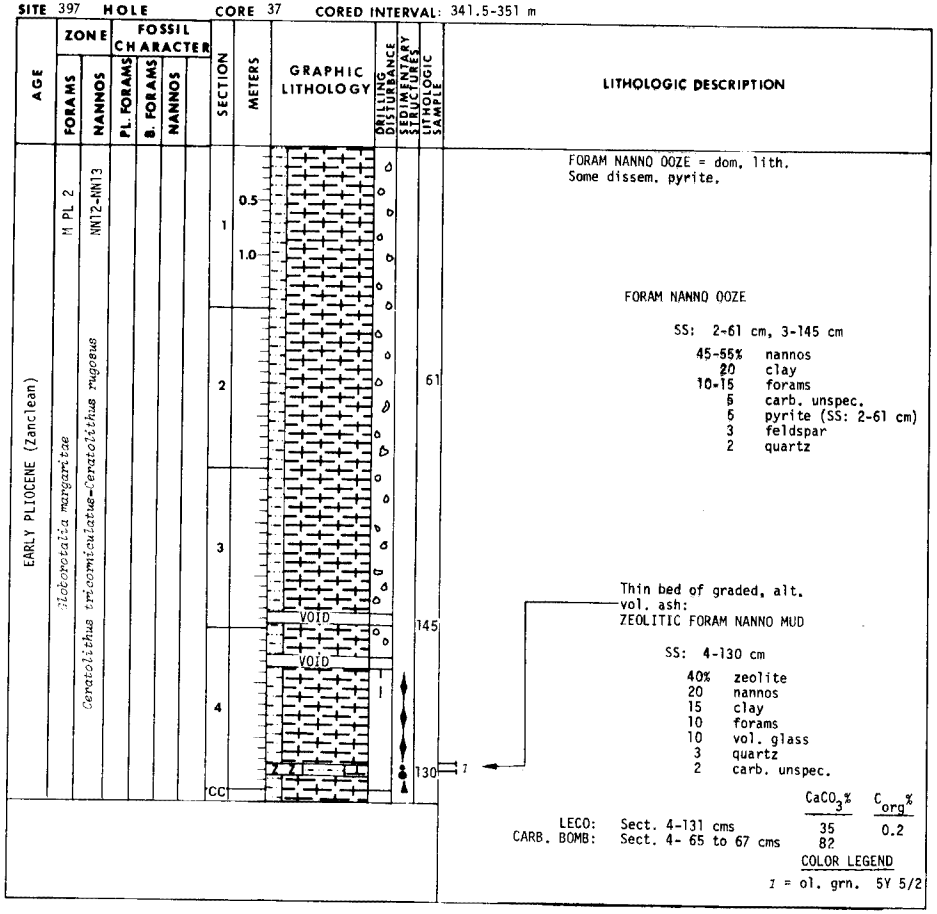
SITE 397 HOLE CORE 35 CORED INTERVAL: 322.5-332 m



SITE 397 HOLE CORE 36 CORED INTERVAL: 332-341.5 m



SITE 397 HOLE CORE 37 CORED INTERVAL: 341.5-351 m



SITE 397 HOLE CORE 38 CORED INTERVAL: 351-360.5 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS
EARLY PLIOCENE (Zanclean)	M PL 2	NN12-NN13	*Globorotalia margaritae*	*Ceratolithus tricorniculatus-Ceratolithus rugosus*	

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

Dissem. pyrite, occ. in blebs.

MARLY FORAM NANNO OOZE = dom. lith. Mottled with 5Y 6/2 in mottles (lt. ol. gy.); small, flattened hor. burrows (1-2 mm) numerous and filled with pyrite; occ. lam. of pyrite & organic-rich mat'l. of 5Y 7/1 lt. gy.

MARLY FORAM NANNO OOZE

SS: 3-87 cm, 5-70 cm

42-45%	nannos
35	clay
10	forams
5	carb. unspec.
2- 5	quartz
2- 3	feldspar
1	dolomite (SS: 5-70 cm)
tr	pyrite (SS: 5-70 cm)

Lam. mat'l.:
FORAM NANNO OOZE

SS: 5-106 cm

45%	nannos
25	clay
15	forams
7	quartz
5	feldspar
2	pyrite
1	dolomite

		$CaCO_3$%	C_{org}%
LECO:	Sect. 5-130 cms	73	0.2
CARB. BOMB:	Sect. 6- 73 to 75 cms	66	

COLOR LEGEND
1 = lt. gy. 5Y 7/1
2 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 39 CORED INTERVAL: 360.5-370 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS
EARLY PLIOCENE (Zanclean)	M PL 2	NN12-NN13	*Globorotalia margaritae*	*Ceratolithus tricorniculatus-Ceratolithus rugosus*	

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

MARLY NANNO OOZE = dom. lith. Mod. mottled; indistinct lam.; burrows filled with pyrite; pyrite also dissem. throughout as blebs - below 110 cm (Sect. 2) mottling, burrows and pyrite decreases.

MARLY NANNO OOZE

SS: 3-64 cm, 4-43 cm

40-55%	nannos
25	clay
5-15	forams
5- 8	carb. unspec.
3- 5	feldspar
2- 3	quartz
tr- 2	pyrite
1	dolomite (SS: 3-64 cm)

Distinct lam. ~3 mm thick of 5Y 4/4 dk. ol. grn.: MARLY NANNO OOZE

SS: 5-130 cm

48%	nannos
30	clay
10	carb. unspec.
5	forams
5	quartz
2	feldspar
tr	dolomite
tr	pyrite

		$CaCO_3$%	C_{org}%
LECO:	Sect. 5-130 cms	44	0.2
CARB. BOMB:	Sect. 4-127 to 129 cms	75	

COLOR LEGEND
1 = lt. gy. 5Y 6/1
2 = lt. gy. 5Y 7/1

SITE 397 HOLE CORE 40 CORED INTERVAL: 370-379.5 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
EARLY PLIOCENE (Zanclean)	*Globorotalia margaritae*	NN12-NN13 *Ceratolithus tricorniculatus-C. rugosus*	Ag	Cg	Ag	1	0.5					Drilling breccia - no samples or smears taken due to disturb.
							1.0					
						2						
						3						

LECO: Sect. 3-48 cms — $CaCO_3$% = 66; C_{org}% = 0.2

COLOR LEGEND

1 = lt. gy. 5Y 7/1

SITE 397 HOLE CORE 41 CORED INTERVAL: 379.5-389 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTIO
EARLY PLIOCENE (Zanclean)	NN17/NN19	NN12-NN13 *Ceratolithus tricorniculatus-Ceratolithus rugosus*	Ag	Cg	Ag	1	0.5					MARLY NANNO OOZE = dom. lith Numerous small burrows, hor. somewhat flattened, and ofte with fillings of pyrite bleb some with halos.
							1.0					
						2						MARLY NANNO OOZE
						3						SS: 5-43 cm-81 cm
						4		VOID				50-70% nnos 50 ay 5 eb. unspc. (SS: 6-8 cm) 4-5 rams 3-5 ldspar 2 artz tr-2 rite tr comite
						5		VOID				1 with some alt. of 2.
						6		VOID VOID				43 81
						7						
						CC						

LECO: Sect. 6-88 cms — $CaCO_3$% = 58; C_{org}% = 0.1

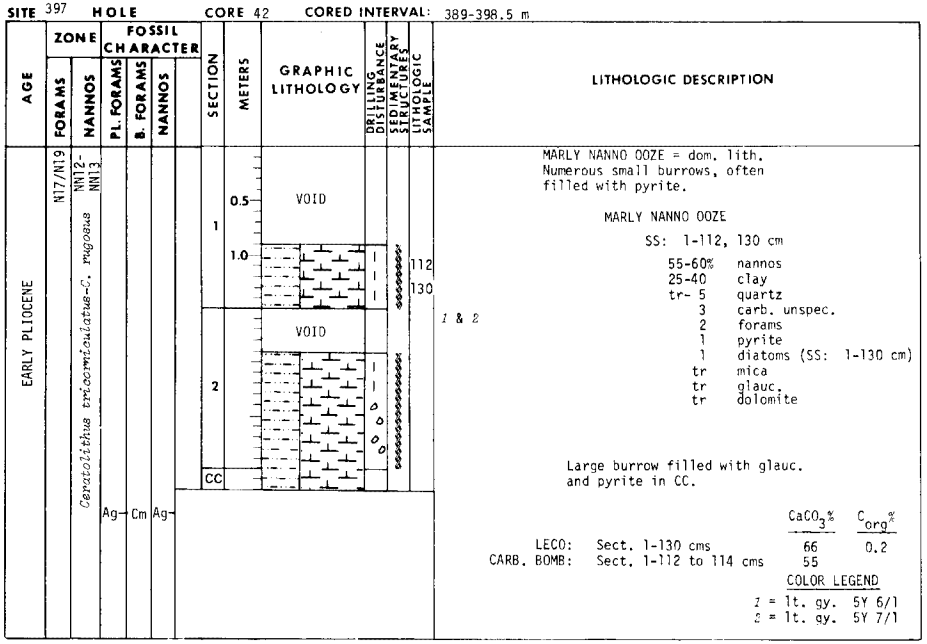
CARB. BOMB: Sect. 6-33 to 3[illegible] cms — $CaCO_3$% = 73

COLOR LEGEND

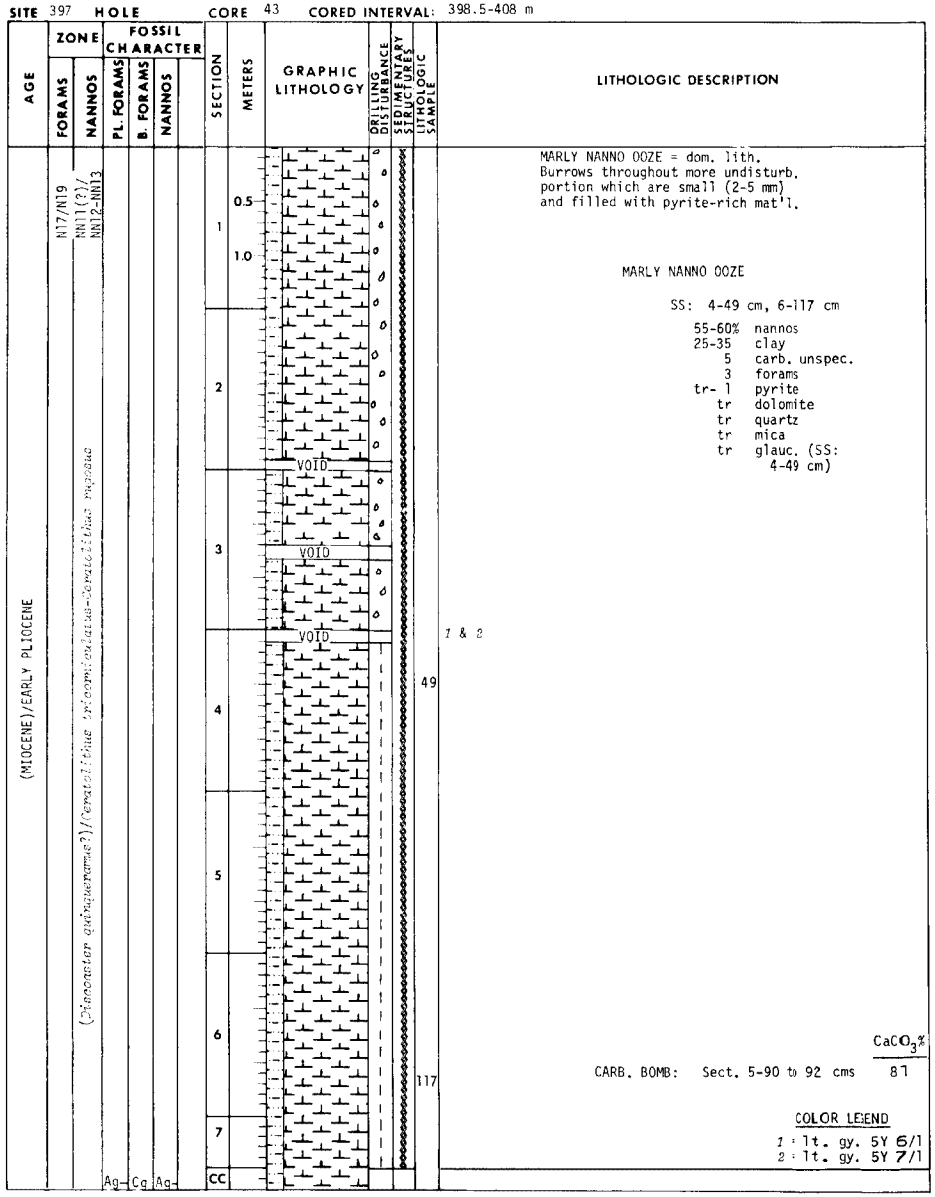
1 = lt. gy. 5Y 6/1

2 = lt. gy. 5Y 7/1

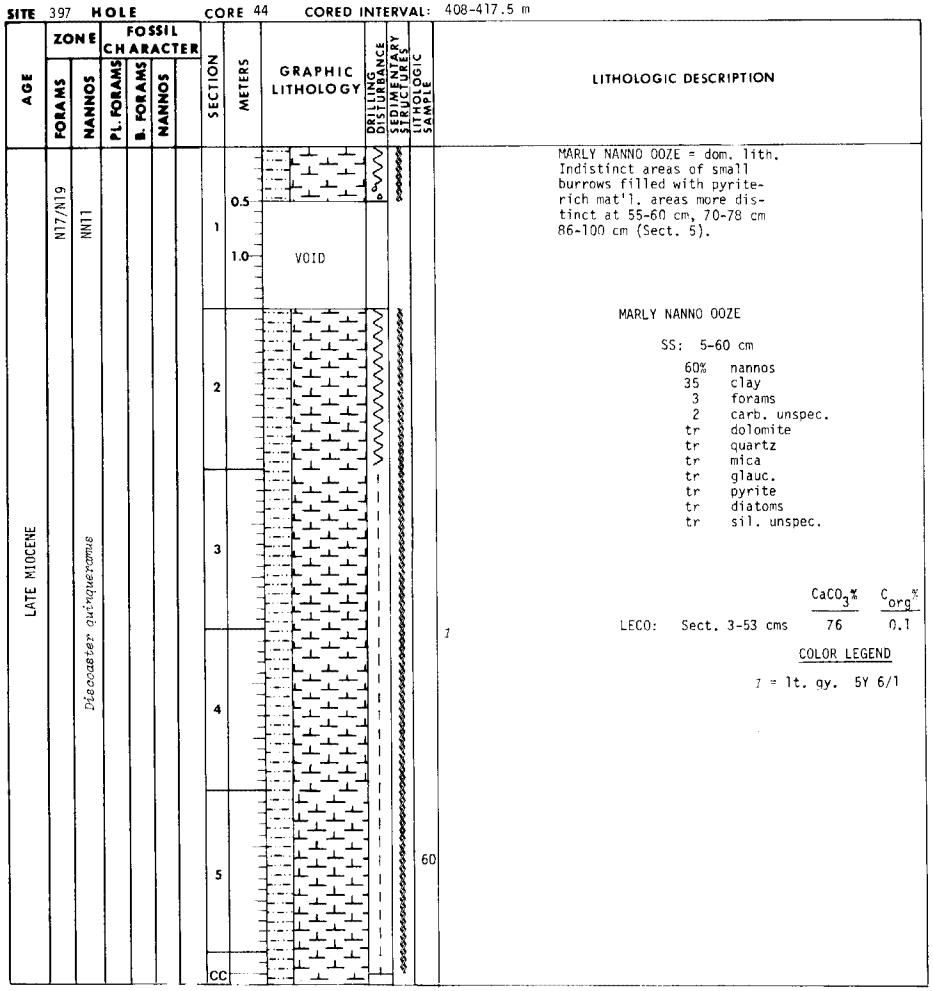
SITE 397 HOLE CORE 42 CORED INTERVAL: 389-398.5 m



SITE 397 HOLE CORE 43 CORED INTERVAL: 398.5-408 m



SITE 397 HOLE CORE 44 CORED INTERVAL: 408-417.5 m



MARLY NANNO OOZE = dom. lith. Indistinct areas of small burrows filled with pyrite-rich mat'l. areas more distinct at 55-60 cm, 70-78 cm 86-100 cm (Sect. 5).

MARLY NANNO OOZE

SS: 5-60 cm

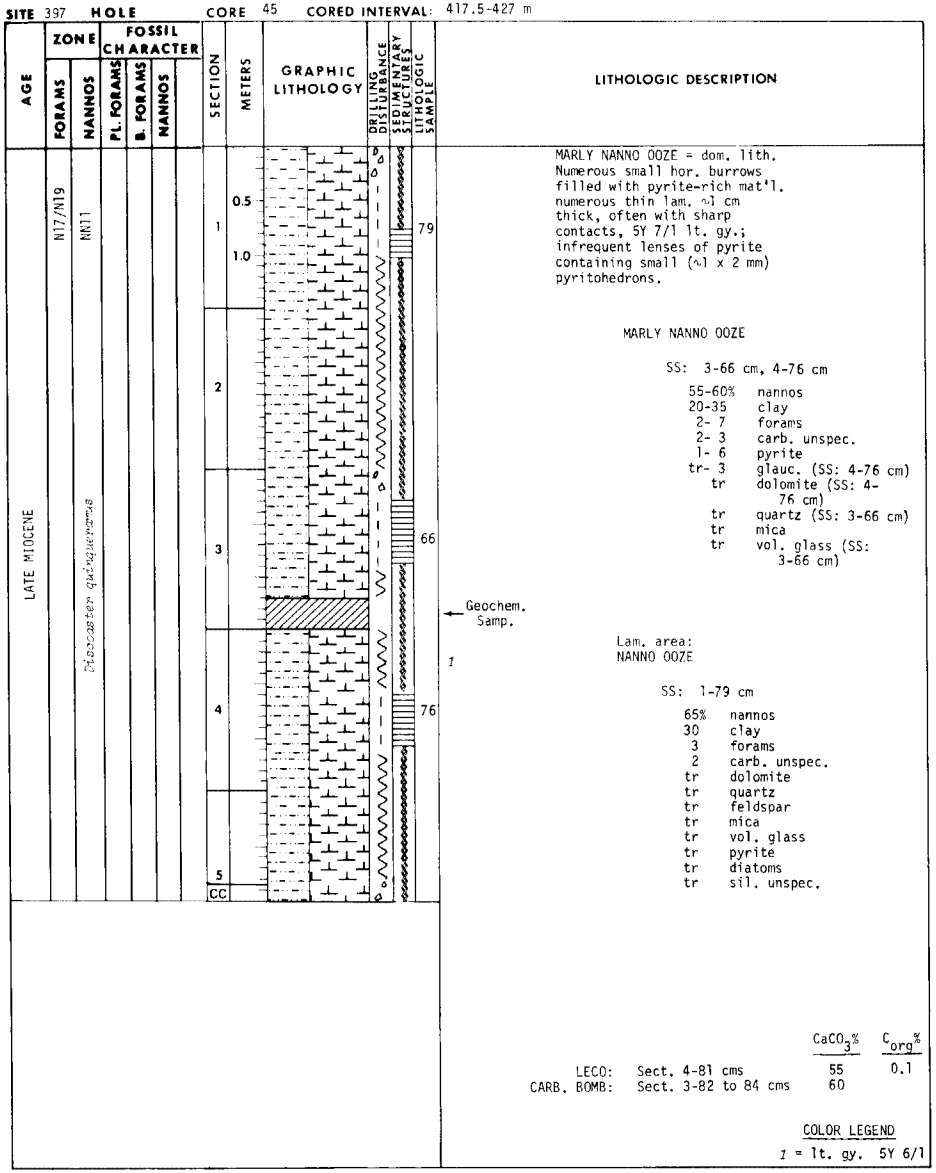
60%	nannos
35	clay
3	forams
2	carb. unspec.
tr	dolomite
tr	quartz
tr	mica
tr	glauc.
tr	pyrite
tr	diatoms
tr	sil. unspec.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-53 cms	76	0.1

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 45 CORED INTERVAL: 417.5-427 m



MARLY NANNO OOZE = dom. lith. Numerous small hor. burrows filled with pyrite-rich mat'l. numerous thin lam. ~1 cm thick, often with sharp contacts, 5Y 7/1 lt. gy.; infrequent lenses of pyrite containing small (~1 x 2 mm) pyritohedrons.

MARLY NANNO OOZE

SS: 3-66 cm, 4-76 cm

55-60%	nannos
20-35	clay
2- 7	forams
2- 3	carb. unspec.
1- 6	pyrite
tr- 3	glauc. (SS: 4-76 cm)
tr	dolomite (SS: 4-76 cm)
tr	quartz (SS: 3-66 cm)
tr	mica
tr	vol. glass (SS: 3-66 cm)

Lam. area: NANNO OOZE

SS: 1-79 cm

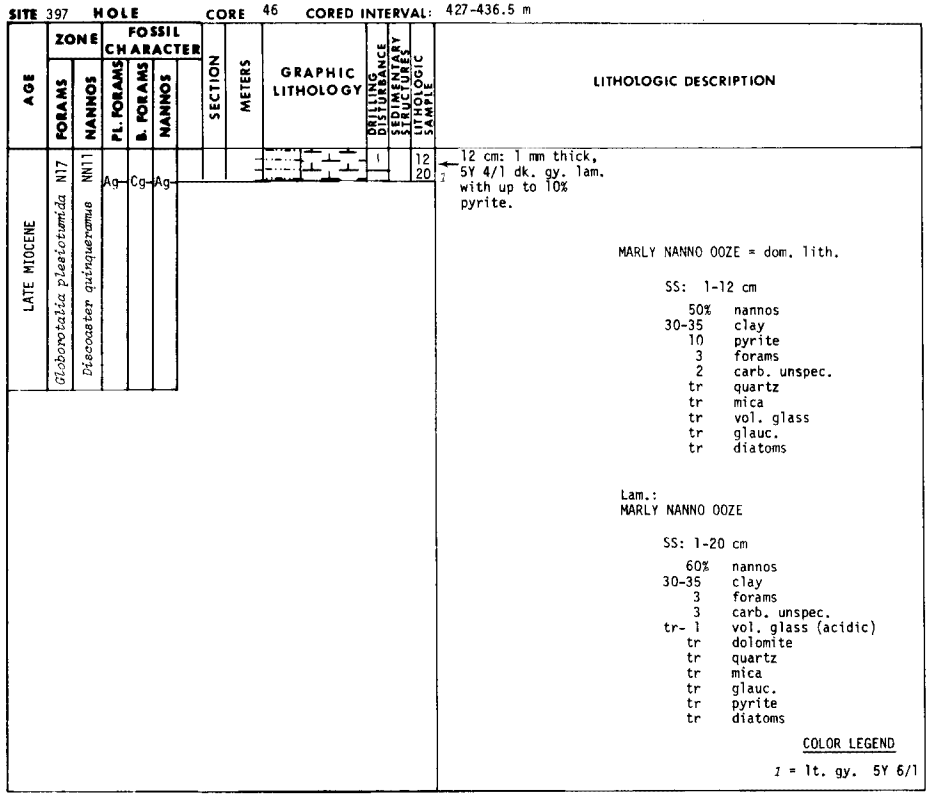
65%	nannos
30	clay
3	forams
2	carb. unspec.
tr	dolomite
tr	quartz
tr	feldspar
tr	mica
tr	vol. glass
tr	pyrite
tr	diatoms
tr	sil. unspec.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 4-81 cms	55	0.1
CARB. BOMB:	Sect. 3-82 to 84 cms	60	

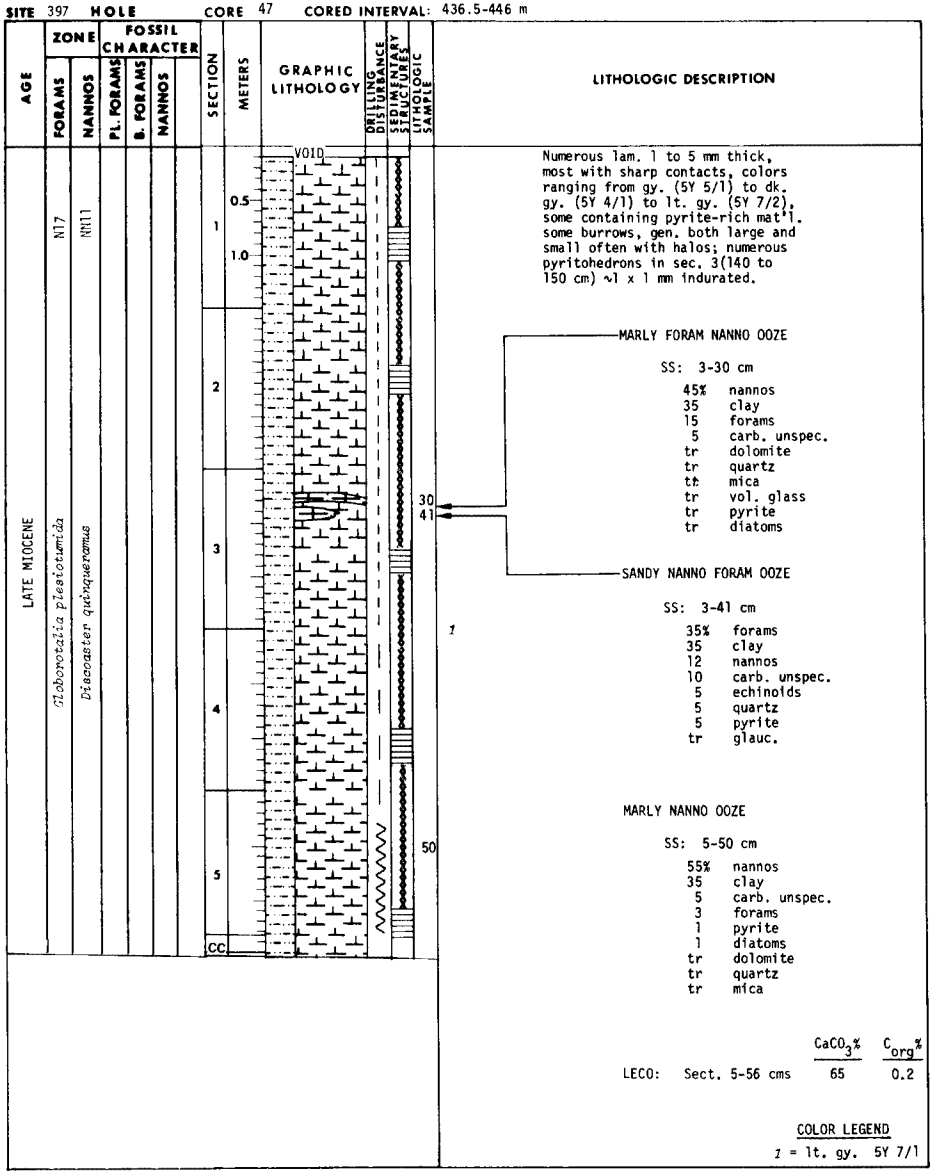
COLOR LEGEND

1 = lt. gy. 5Y 6/1

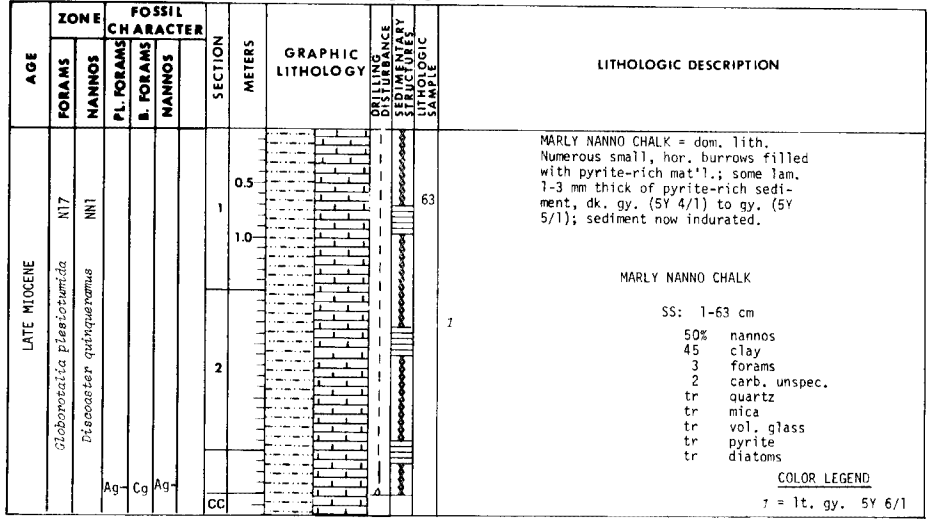
SITE 397 HOLE CORE 46 CORED INTERVAL: 427-436.5 m



SITE 397 HOLE CORE 47 CORED INTERVAL: 436.5-446 m



SITE 397 HOLE CORE 48 CORED INTERVAL: 446-455.5 m



MARLY NANNO CHALK = dom. lith. Numerous small, hor. burrows filled with pyrite-rich mat'l.; some lam. 1-3 mm thick of pyrite-rich sediment, dk. gy. (5Y 4/1) to gy. (5Y 5/1); sediment now indurated.

MARLY NANNO CHALK

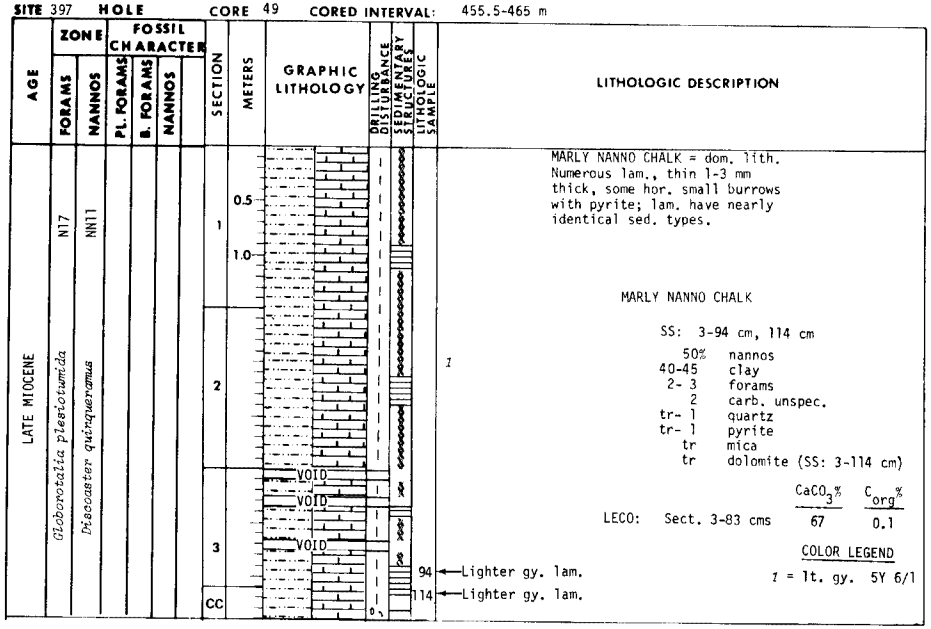
SS: 1-63 cm

50%	nannos
45	clay
3	forams
2	carb. unspec.
tr	quartz
tr	mica
tr	vol. glass
tr	pyrite
tr	diatoms

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 49 CORED INTERVAL: 455.5-465 m



MARLY NANNO CHALK = dom. lith. Numerous lam., thin 1-3 mm thick, some hor. small burrows with pyrite; lam. have nearly identical sed. types.

MARLY NANNO CHALK

SS: 3-94 cm, 114 cm

50%	nannos
40-45	clay
2- 3	forams
2	carb. unspec.
tr- 1	quartz
tr- 1	pyrite
tr	mica
tr	dolomite (SS: 3-114 cm)

LECO: Sect. 3-83 cms — $CaCO_3$% = 67 — C_{org}% = 0.1

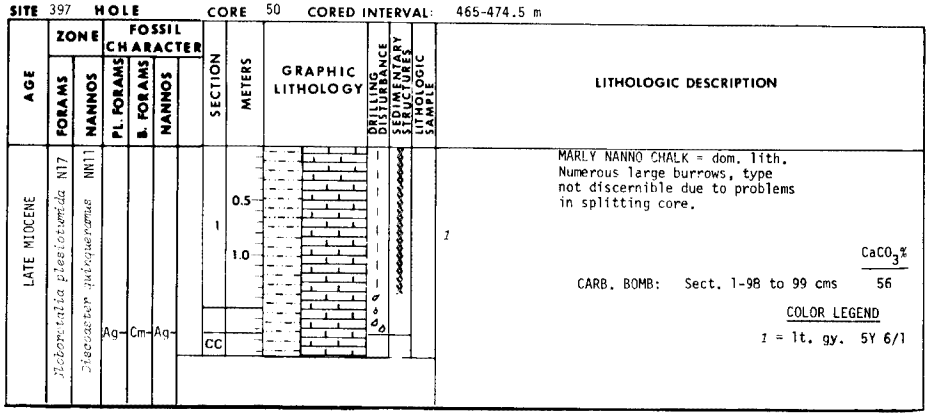
94 ←Lighter gy. lam.

114 ←Lighter gy. lam.

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 50 CORED INTERVAL: 465-474.5 m



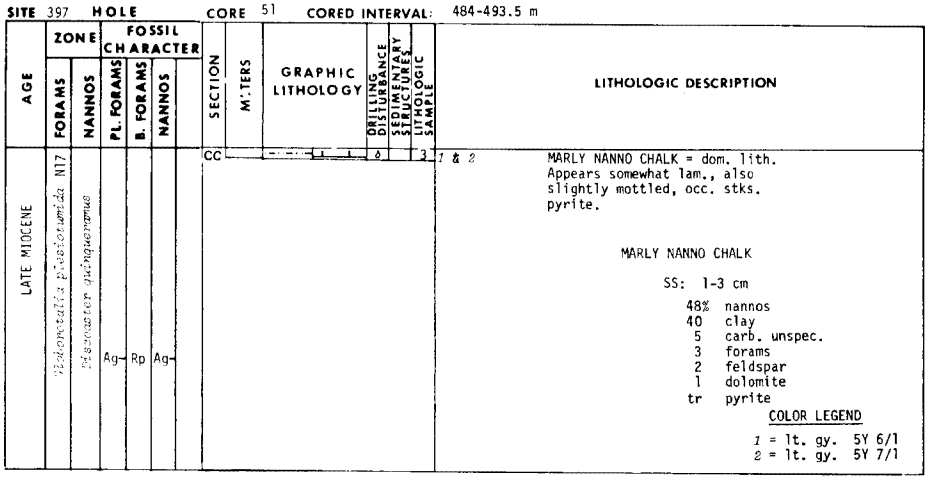
MARLY NANNO CHALK = dom. lith. Numerous large burrows, type not discernible due to problems in splitting core.

CARB. BOMB: Sect. 1-98 to 99 cms — $CaCO_3$% = 56

COLOR LEGEND

1 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 51 CORED INTERVAL: 484-493.5 m



MARLY NANNO CHALK = dom. lith. Appears somewhat lam., also slightly mottled, occ. stks. pyrite.

MARLY NANNO CHALK

SS: 1-3 cm

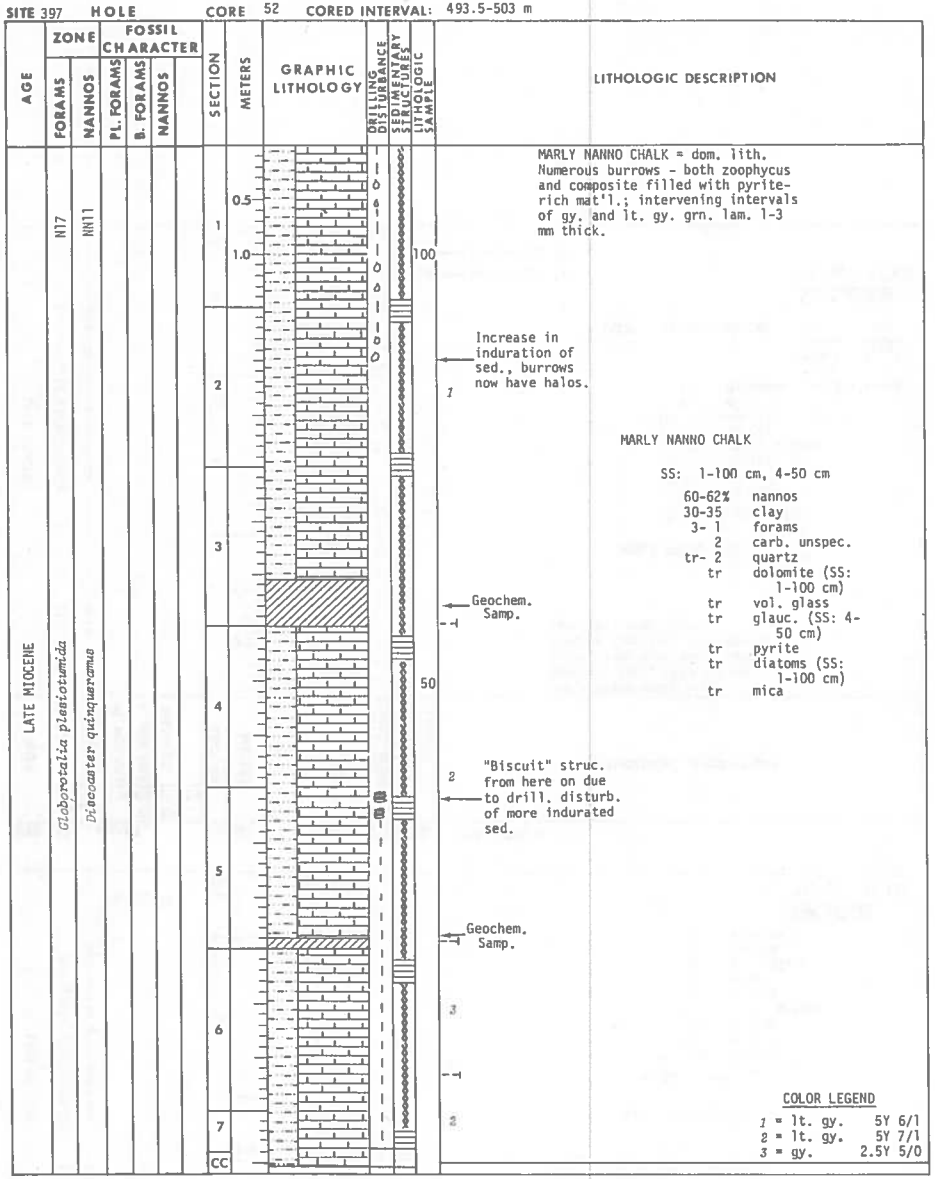
48%	nannos
40	clay
5	carb. unspec.
3	forams
2	feldspar
1	dolomite
tr	pyrite

COLOR LEGEND

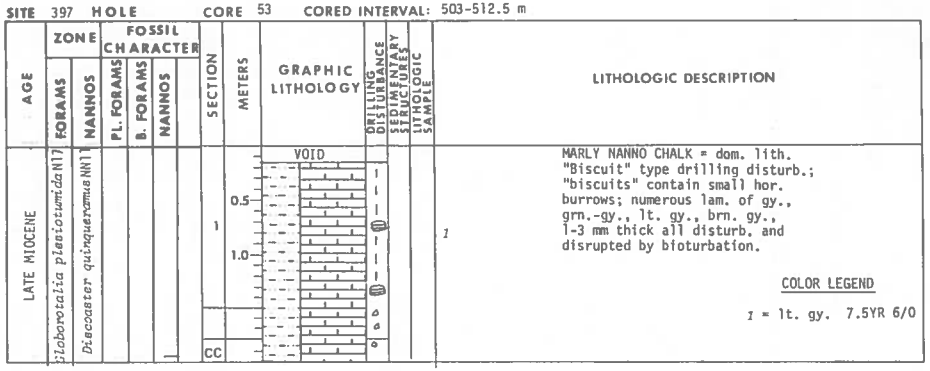
1 = lt. gy. 5Y 6/1

2 = lt. gy. 5Y 7/1

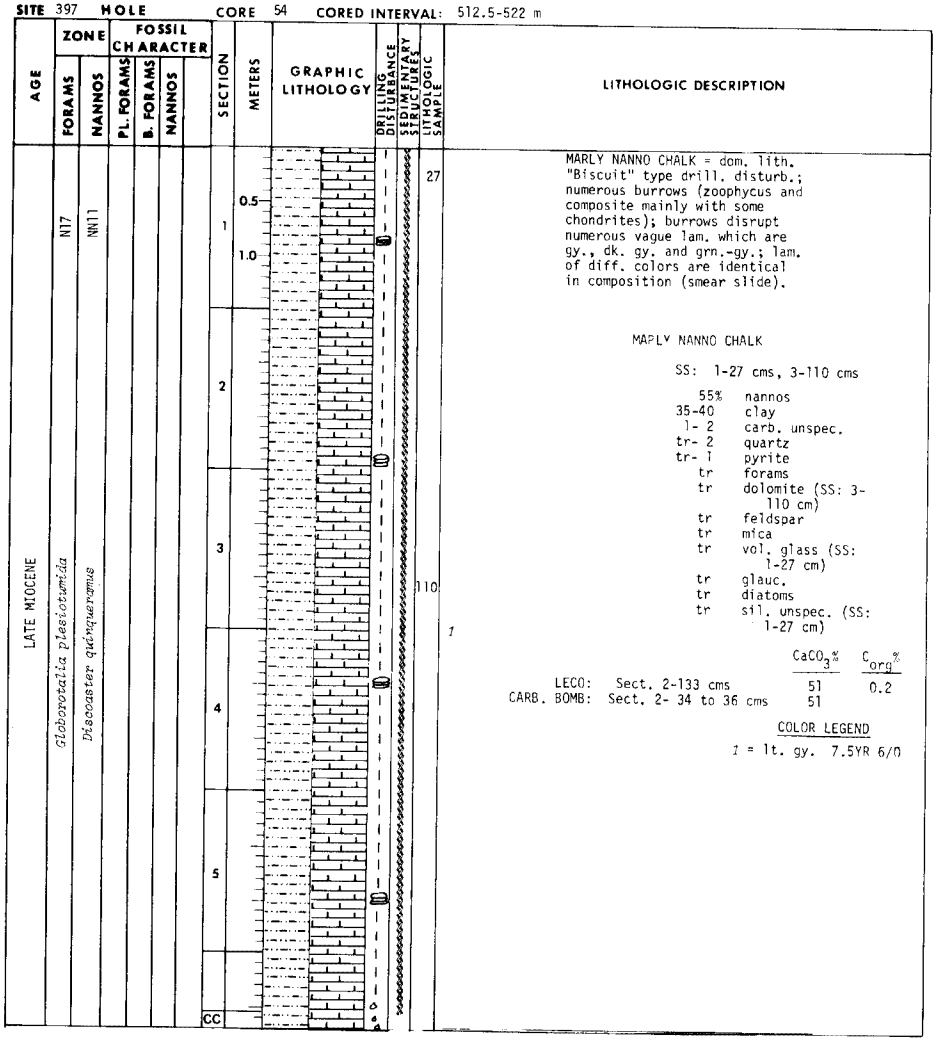
SITE 397 HOLE CORE 52 CORED INTERVAL: 493.5-503 m



SITE 397 HOLE CORE 53 CORED INTERVAL: 503-512.5 m



SITE 397 HOLE CORE 54 CORED INTERVAL: 512.5-522 m



MARLY NANNO CHALK = dom. lith. "Biscuit" type drill. disturb.; numerous burrows (zoophycus and composite mainly with some chondrites); burrows disrupt numerous vague lam. which are gy., dk. gy. and grn.-gy.; lam. of diff. colors are identical in composition (smear slide).

MARLY NANNO CHALK

SS: 1-27 cms, 3-110 cms

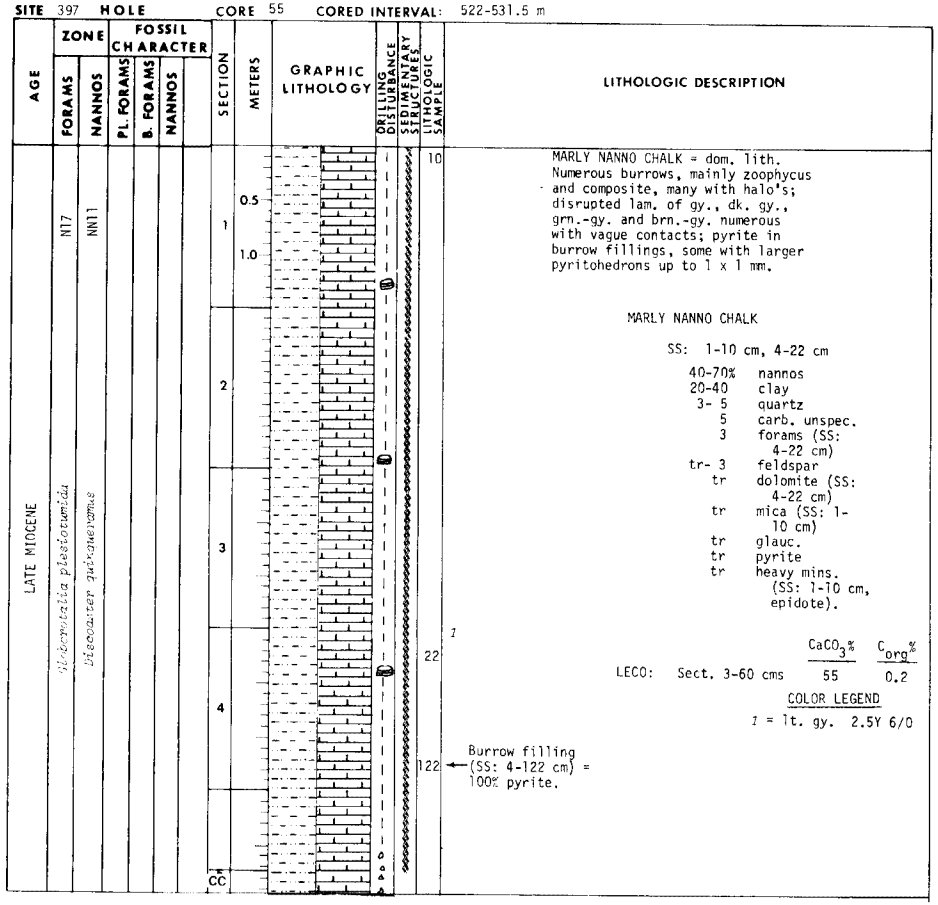
55%	nannos
35-40	clay
1- 2	carb. unspec.
tr- 2	quartz
tr- 1	pyrite
tr	forams
tr	dolomite (SS: 3-110 cm)
tr	feldspar
tr	mica
tr	vol. glass (SS: 1-27 cm)
tr	glauc.
tr	diatoms
tr	sil. unspec. (SS: 1-27 cm)

	Sect.	$CaCO_3$%	C_{org}%
LECO:	2-133 cms	51	0.2
CARB. BOMB:	2- 34 to 36 cms	51	

COLOR LEGEND

1 = lt. gy. 7.5YR 6/0

SITE 397 HOLE CORE 55 CORED INTERVAL: 522-531.5 m



MARLY NANNO CHALK = dom. lith. Numerous burrows, mainly zoophycus and composite, many with halo's; disrupted lam. of gy., dk. gy., grn.-gy. and brn.-gy. numerous with vague contacts; pyrite in burrow fillings, some with larger pyritohedrons up to 1 x 1 mm.

MARLY NANNO CHALK

SS: 1-10 cm, 4-22 cm

40-70%	nannos
20-40	clay
3- 5	quartz
5	carb. unspec.
3	forams (SS: 4-22 cm)
tr- 3	feldspar
tr	dolomite (SS: 4-22 cm)
tr	mica (SS: 1-10 cm)
tr	glauc.
tr	pyrite
tr	heavy mins. (SS: 1-10 cm, epidote).

	Sect.	$CaCO_3$%	C_{org}%
LECO:	3-60 cms	55	0.2

COLOR LEGEND

1 = lt. gy. 2.5Y 6/0

Burrow filling (SS: 4-122 cm) = 100% pyrite.

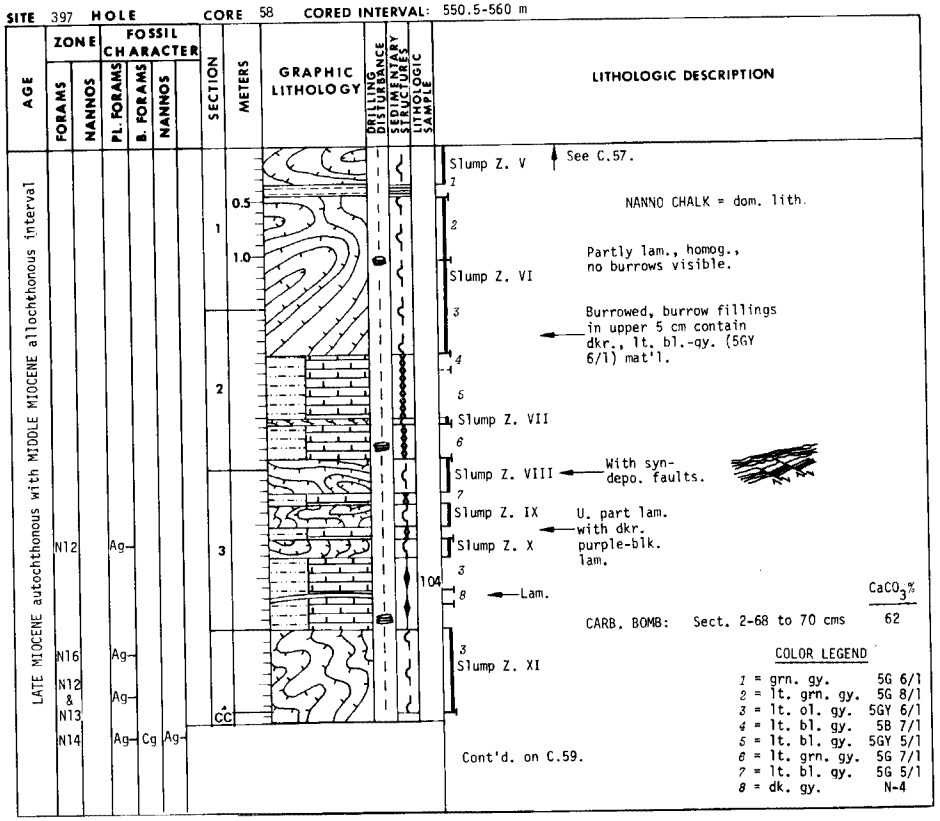
SITE 397 HOLE CORE 56 CORED INTERVAL: 531.5-541 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE	N17 *Globorotalia plesiotumida*	NN11 *Discoaster quinqueramus*				1 2 3 CC	0.5 1.0				1	MARLY NANNO CHALK = dom. lith. Numerous burrows, mainly multiple type with some zoophycus, most with halos, lam. considerably disrupted by bioturbation, lam. are gy., grn.-gy. and gy. brn. COLOR LEGEND 1 = gy. 2.5Y 5/0

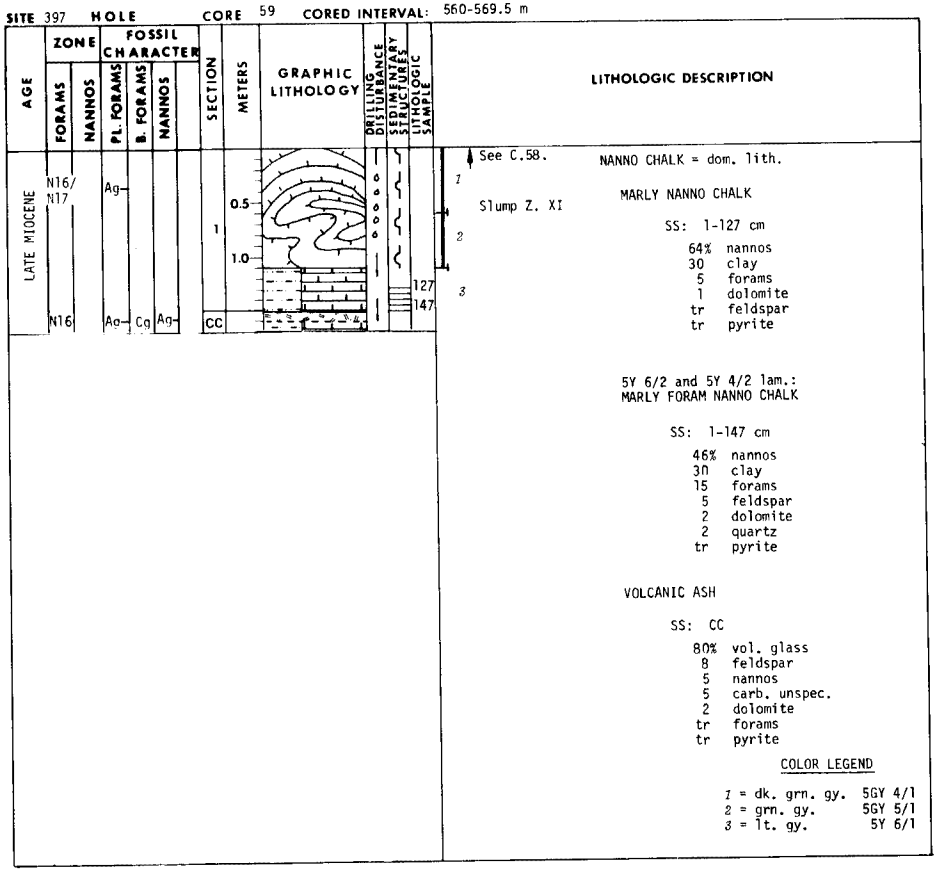
SITE 397 HOLE CORE 57 CORED INTERVAL: 541-550.5 m

AGE	ZONE FORAMS	ZONE NANNOS	FOSSIL CHARACTER PL. FORAMS	FOSSIL CHARACTER B. FORAMS	FOSSIL CHARACTER NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE autochthonous with MIDDLE MIOCENE allochthonous interval		NN 17	Ag	Ag		1 2 3 4 5 CC	0.5 1.0	VOID			1 2	NANNO CHALK = dom. lith. Extensively bioturbated. Burrows are predom. a composite-type or oval types with halos (ovals 5 mm to 8 mm long along minor axis), some chrondrites; "biscuit" type drill. disturb. NANNO CHALK SS: 2-36 cm 60% nannos 20 clay 5 forams 5 carb. unspec. 4 feldspar 3 quartz 3 pyrite tr dolomite Alt. vol. ash(?): ZEOLITIC FORAM NANNO CHALK SS: 3-90 cm 35% zeolite 30 nannos 15 clay 10 forams 5 carb. unspec. 4 feldspar 1 quartz VOLCANIC ASH SS: 4-140 cm 58% vol. glass 20 feldspar 20 pyrite 2 nannos CLAYSTONE SS: 5-8 cm 88% clay 5 nannos 5 feldspar 2 quartz NANNO FORAM CHALK SS: 5-34 cm 43% nannos 20 forams 20 clay 5 carb. unspec. 2 feldspar 41 36 78 86 Slump Z. I 90 94 116 Black pyrite layer with hollow pyritohedron ~2 mm. 46 Slump Z. II 135 140 8 Slump Z. III 34 Slump Z. IV 98 2 Slump Z. V Cont'd. on C.58 COLOR LEGEND 1 = lt. gy. 2.5Y 6/0 2 = grn. gy. 5G 6/1

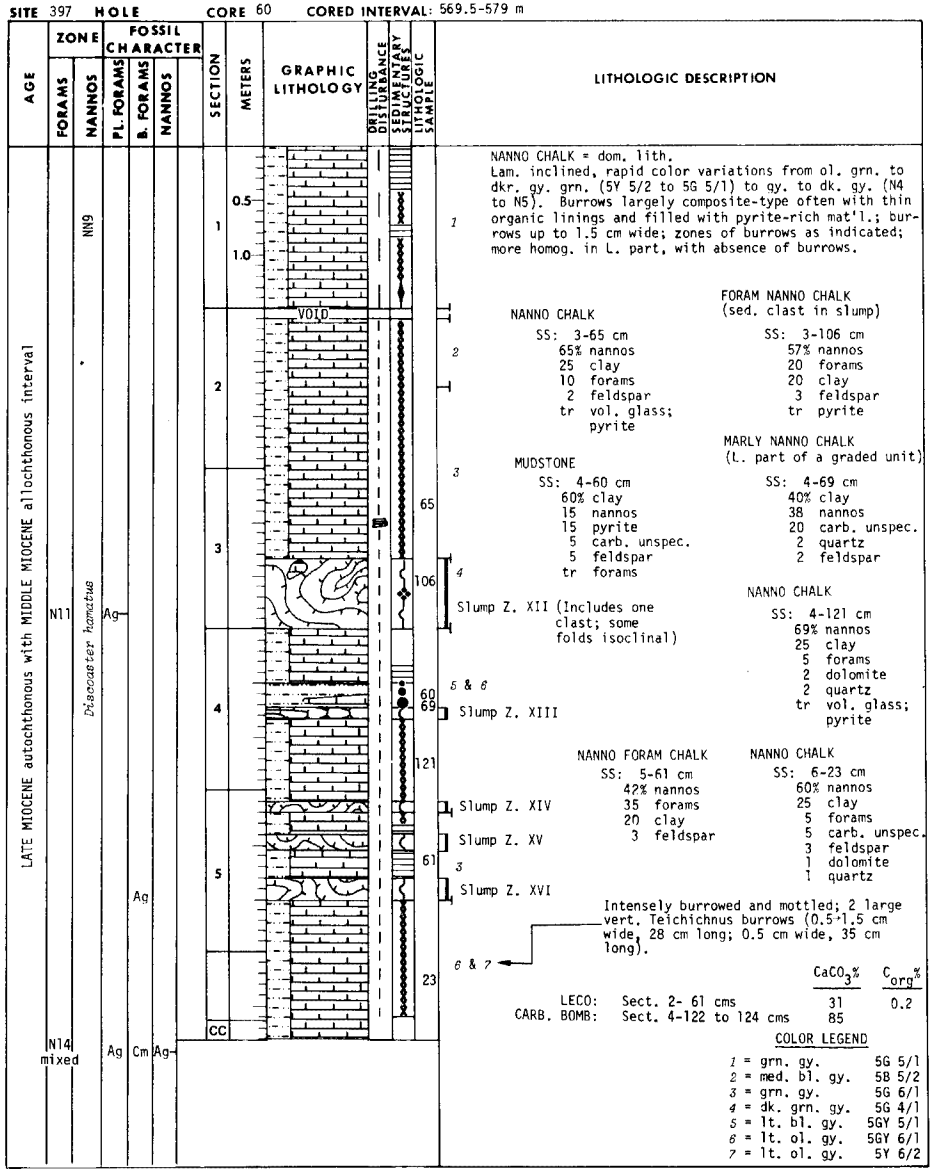
SITE 397 HOLE CORE 58 CORED INTERVAL: 550.5-560 m



SITE 397 HOLE CORE 59 CORED INTERVAL: 560-569.5 m



SITE 397 HOLE CORE 60 CORED INTERVAL: 569.5-579 m



NANNO CHALK = dom. lith.
Lam. inclined, rapid color variations from ol. grn. to dkr. gy. grn. (5Y 5/2 to 5G 5/1) to gy. to dk. gy. (N4 to N5). Burrows largely composite-type often with thin organic linings and filled with pyrite-rich mat'l.; burrows up to 1.5 cm wide; zones of burrows as indicated; more homog. in L. part, with absence of burrows.

NANNO CHALK
SS: 3-65 cm
65% nannos
25 clay
10 forams
2 feldspar
tr vol. glass; pyrite

MUDSTONE
SS: 4-60 cm
60% clay
15 nannos
15 pyrite
5 carb. unspec.
5 feldspar
tr forams

Slump Z. XII (Includes one clast; some folds isoclinal)

FORAM NANNO CHALK (sed. clast in slump)
SS: 3-106 cm
57% nannos
20 forams
20 clay
3 feldspar
tr pyrite

MARLY NANNO CHALK (L. part of a graded unit)
SS: 4-69 cm
40% clay
38 nannos
20 carb. unspec.
2 quartz
2 feldspar

NANNO CHALK
SS: 4-121 cm
69% nannos
25 clay
5 forams
2 dolomite
2 quartz
tr vol. glass; pyrite

Slump Z. XIII

NANNO FORAM CHALK
SS: 5-61 cm
42% nannos
35 forams
20 clay
3 feldspar

Slump Z. XIV
Slump Z. XV
Slump Z. XVI

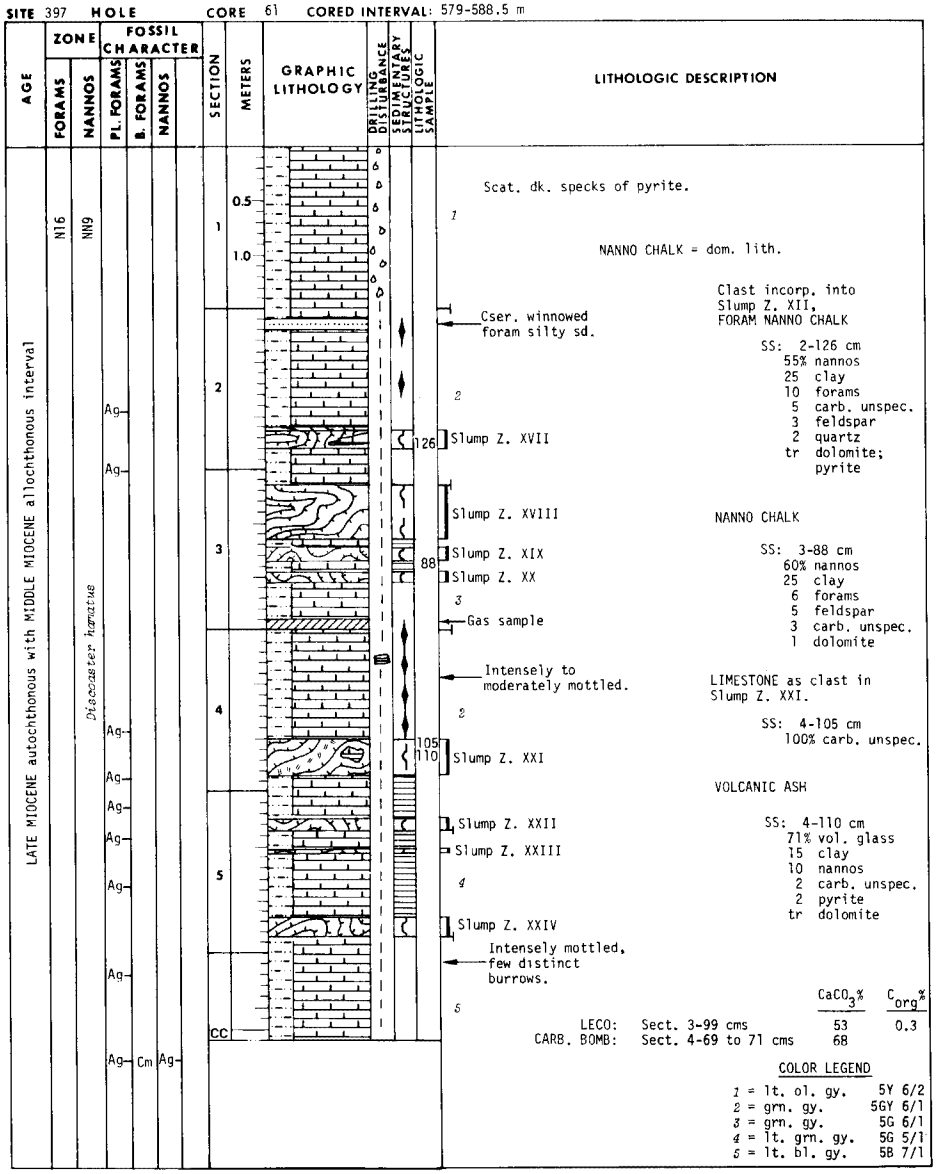
NANNO CHALK
SS: 6-23 cm
60% nannos
25 clay
5 forams
5 carb. unspec.
3 feldspar
1 dolomite
1 quartz

Intensely burrowed and mottled; 2 large vert. Teichichnus burrows (0.5-1.5 cm wide, 28 cm long; 0.5 cm wide, 35 cm long).

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2- 61 cms	31	0.2
CARB. BOMB:	Sect. 4-122 to 124 cms	85	

COLOR LEGEND
1 = grn. gy. 5G 5/1
2 = med. bl. gy. 5B 5/2
3 = grn. gy. 5G 6/1
4 = dk. grn. gy. 5G 4/1
5 = lt. bl. gy. 5GY 5/1
6 = lt. ol. gy. 5GY 6/1
7 = lt. ol. gy. 5Y 6/2

SITE 397 HOLE CORE 61 CORED INTERVAL: 579-588.5 m



Scat. dk. specks of pyrite.

NANNO CHALK = dom. lith.

Cser. winnowed foram silty sd.

Slump Z. XVII
Slump Z. XVIII
Slump Z. XIX
Slump Z. XX

Gas sample

Intensely to moderately mottled.

Slump Z. XXI
Slump Z. XXII
Slump Z. XXIII
Slump Z. XXIV

Intensely mottled, few distinct burrows.

Clast incorp. into Slump Z. XII, FORAM NANNO CHALK
SS: 2-126 cm
55% nannos
25 clay
10 forams
5 carb. unspec.
3 feldspar
2 quartz
tr dolomite; pyrite

NANNO CHALK
SS: 3-88 cm
60% nannos
25 clay
6 forams
5 feldspar
3 carb. unspec.
1 dolomite

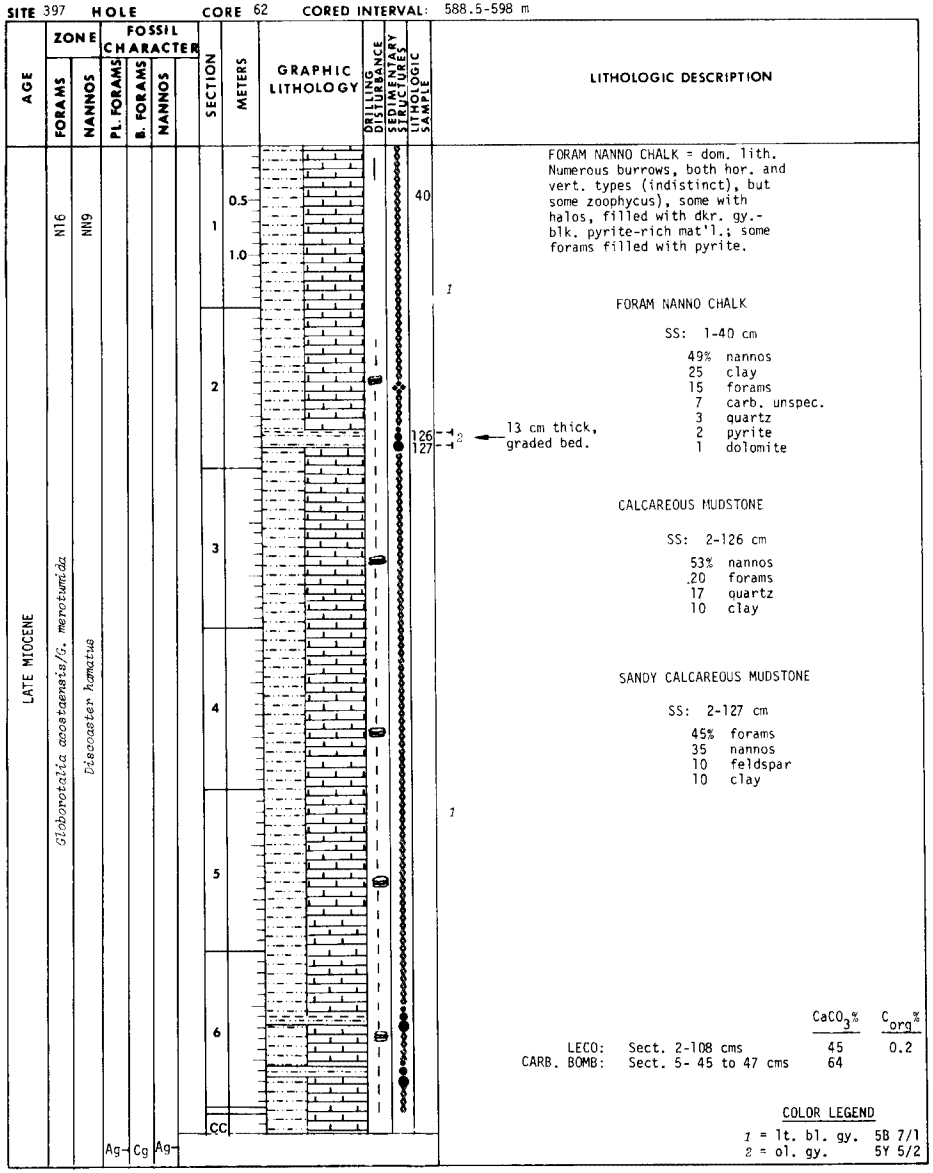
LIMESTONE as clast in Slump Z. XXI.
SS: 4-105 cm
100% carb. unspec.

VOLCANIC ASH
SS: 4-110 cm
71% vol. glass
15 clay
10 nannos
2 carb. unspec.
2 pyrite
tr dolomite

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-99 cms	53	0.3
CARB. BOMB:	Sect. 4-69 to 71 cms	68	

COLOR LEGEND
1 = lt. ol. gy. 5Y 6/2
2 = grn. gy. 5GY 6/1
3 = grn. gy. 5G 6/1
4 = lt. grn. gy. 5G 5/1
5 = lt. bl. gy. 5B 7/1

SITE 397 HOLE CORE 62 CORED INTERVAL: 588.5-598 m



FORAM NANNO CHALK = dom. lith. Numerous burrows, both hor. and vert. types (indistinct), but some zoophycus), some with halos, filled with dkr. gy.-blk. pyrite-rich mat'l.; some forams filled with pyrite.

FORAM NANNO CHALK

SS: 1-40 cm

49%	nannos
25	clay
15	forams
7	carb. unspec.
3	quartz
2	pyrite
1	dolomite

13 cm thick, graded bed.

CALCAREOUS MUDSTONE

SS: 2-126 cm

53%	nannos
20	forams
17	quartz
10	clay

SANDY CALCAREOUS MUDSTONE

SS: 2-127 cm

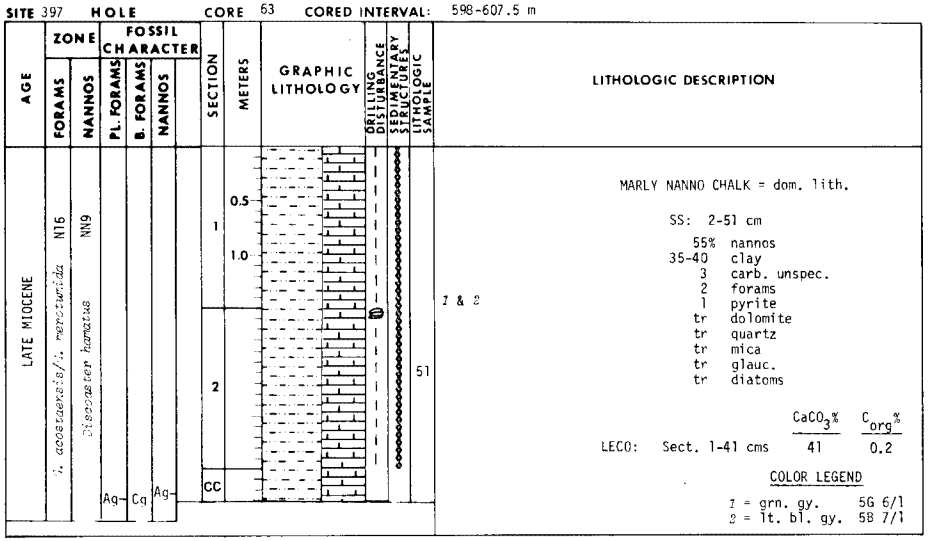
45%	forams
35	nannos
10	feldspar
10	clay

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-108 cms	45	0.2
CARB. BOMB:	Sect. 5- 45 to 47 cms	64	

COLOR LEGEND

1 = lt. bl. gy. 5B 7/1
2 = ol. gy. 5Y 5/2

SITE 397 HOLE CORE 63 CORED INTERVAL: 598-607.5 m



MARLY NANNO CHALK = dom. lith.

SS: 2-51 cm

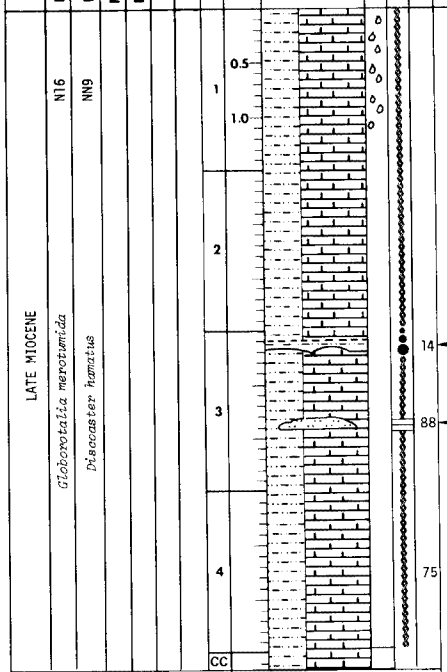
55%	nannos
35-40	clay
3	carb. unspec.
2	forams
1	pyrite
tr	dolomite
tr	quartz
tr	mica
tr	glauc.
tr	diatoms

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-41 cms	41	0.2

COLOR LEGEND

1 = grn. gy. 5G 6/1
2 = lt. bl. gy. 5B 7/1

SITE 397 HOLE CORE 64 CORED INTERVAL: 607.5-617 m



LITHOLOGIC DESCRIPTION

MARLY NANNO CHALK = dom. lith. Intensely burrowed, burrows filled with ol. grn.-blk. sed.; some zoophycus, composite types common from Sect. 3, 100 cms down.

Graded unit:
MARLY NANNO CHALK

SS: 3-14 cm

35-40%	clay
25-30	nannos
15	quartz
8	forams
5	carb. unspec.
3	glauc.
2	feldspar
1	mica
1	pyrite

Glauc. foram sd. with internal lam. & pyrite.

GLAUCONITIC SANDY MUD

SS: 3-88 cm

30%	glauc.
20	clay
20	quartz
15	forams
10	nannos
3	carb. unspec.
2	feldspar
2	pyrite
1	mica
tr	heavy mins.

MARLY NANNO CHALK

SS: 4-75 cm

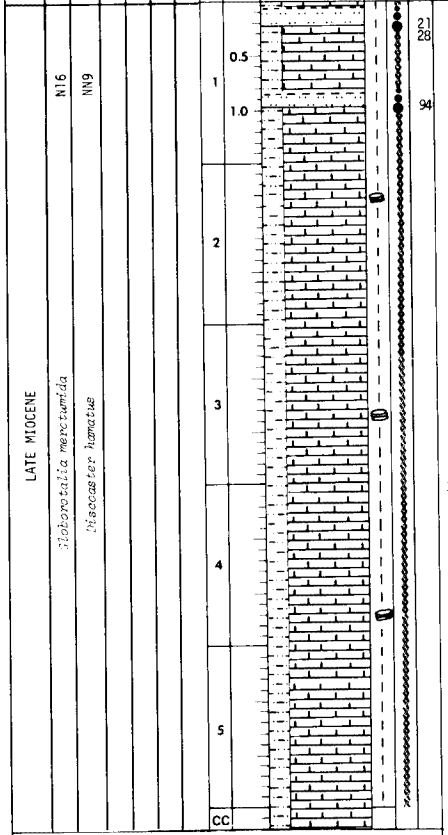
40-50%	nannos
40-45	clay
tr- 5	forams
5	carb. unspec.
2	quartz
tr	feldspar
tr	vol. glass
tr	glauc.

CARB. BOMB: Sect. 3-56 to 58 cms — $CaCO_3$% 55

COLOR LEGEND

1 = grn. gy. 5GY 6/1

SITE 397 HOLE CORE 65 CORED INTERVAL: 617-626.5 m



LITHOLOGIC DESCRIPTION

NANNO CHALK = dom. lith. Numerous burrows & bioturbation; type of burrow difficult to distinguish due to coring disturbances.

FORAM NANNO CHALK

SS: 1-21 cm

60%	nannos
40	clay
2	carb. unspec.
1	forams
tr- 1	pyrite
tr- 1	quartz
tr	feldspar
tr	glauc.
tr	diatoms
tr	mica
tr	vol. glass

FORAM NANNO CHALK

SS: 1-28 cm

30%	nannos
30	forams
30	pyrite
5	carb. unspec.
tr- 3	feldspar
2	glauc.
tr	fish debris

FORAM NANNO CHALK

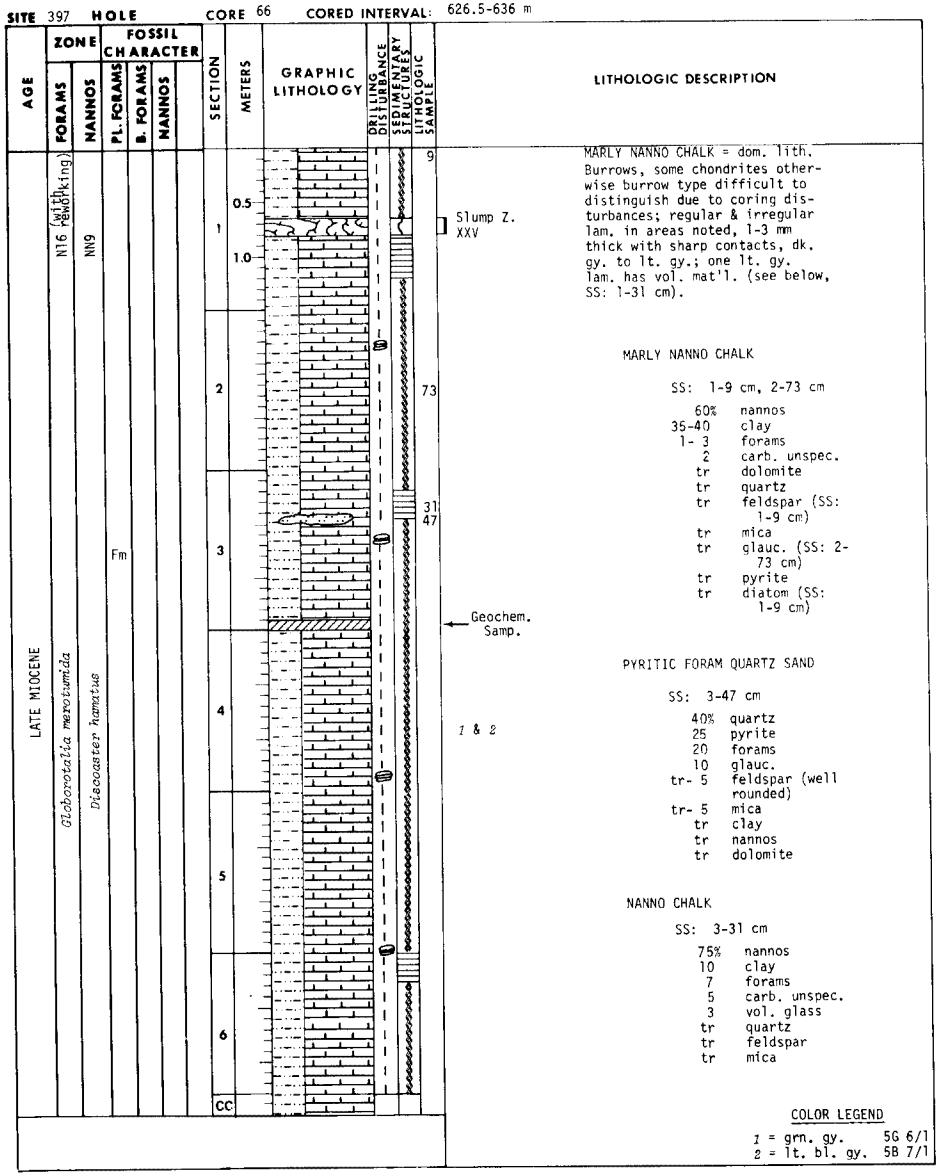
SS: 1-94 cm

40%	forams
30	nannos
21	clay
5	carb. unspec.
2	quartz
1	glauc.
1	pyrite
tr	feldspar
tr	mica
tr	diatoms

COLOR LEGEND

1 = grn. gy. 5G 6/1
2 = lt. bl. gy. 5B 7/1

SITE 397 HOLE CORE 66 CORED INTERVAL: 626.5-636 m



MARLY NANNO CHALK = dom. lith. Burrows, some chondrites otherwise burrow type difficult to distinguish due to coring disturbances; regular & irregular lam. in areas noted, 1-3 mm thick with sharp contacts, dk. gy. to lt. gy.; one lt. gy. lam. has vol. mat'l. (see below, SS: 1-31 cm).

MARLY NANNO CHALK

SS: 1-9 cm, 2-73 cm

60%	nannos
35-40	clay
1- 3	forams
2	carb. unspec.
tr	dolomite
tr	quartz
tr	feldspar (SS: 1-9 cm)
tr	mica
tr	glauc. (SS: 2-73 cm)
tr	pyrite
tr	diatom (SS: 1-9 cm)

PYRITIC FORAM QUARTZ SAND

SS: 3-47 cm

40%	quartz
25	pyrite
20	forams
10	glauc.
tr- 5	feldspar (well rounded)
tr- 5	mica
tr	clay
tr	nannos
tr	dolomite

NANNO CHALK

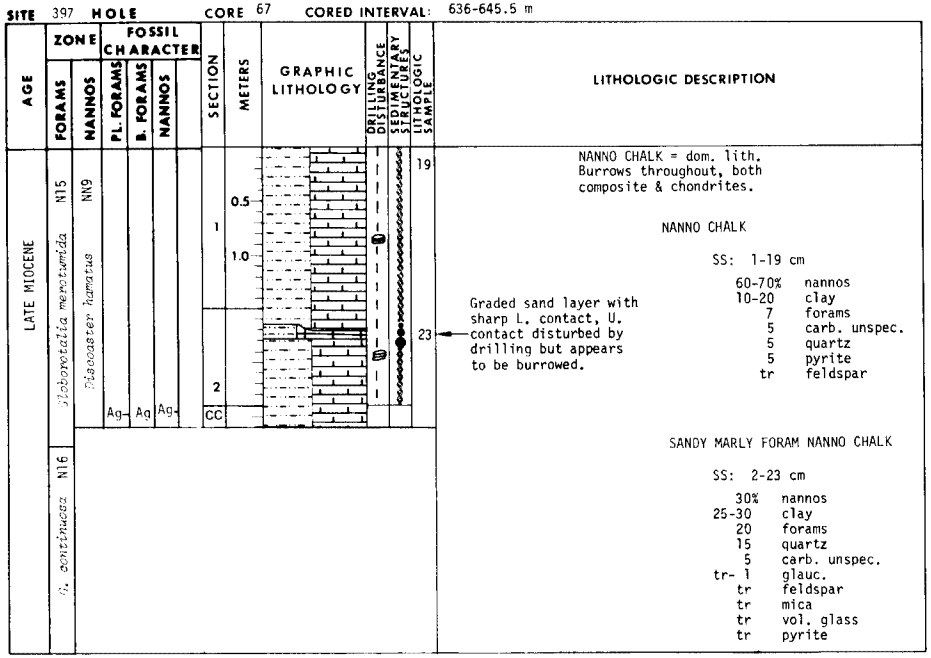
SS: 3-31 cm

75%	nannos
10	clay
7	forams
5	carb. unspec.
3	vol. glass
tr	quartz
tr	feldspar
tr	mica

COLOR LEGEND

1 = grn. gy. 5G 6/1
2 = lt. bl. gy. 5B 7/1

SITE 397 HOLE CORE 67 CORED INTERVAL: 636-645.5 m



NANNO CHALK = dom. lith. Burrows throughout, both composite & chondrites.

NANNO CHALK

SS: 1-19 cm

60-70%	nannos
10-20	clay
7	forams
5	carb. unspec.
5	quartz
5	pyrite
tr	feldspar

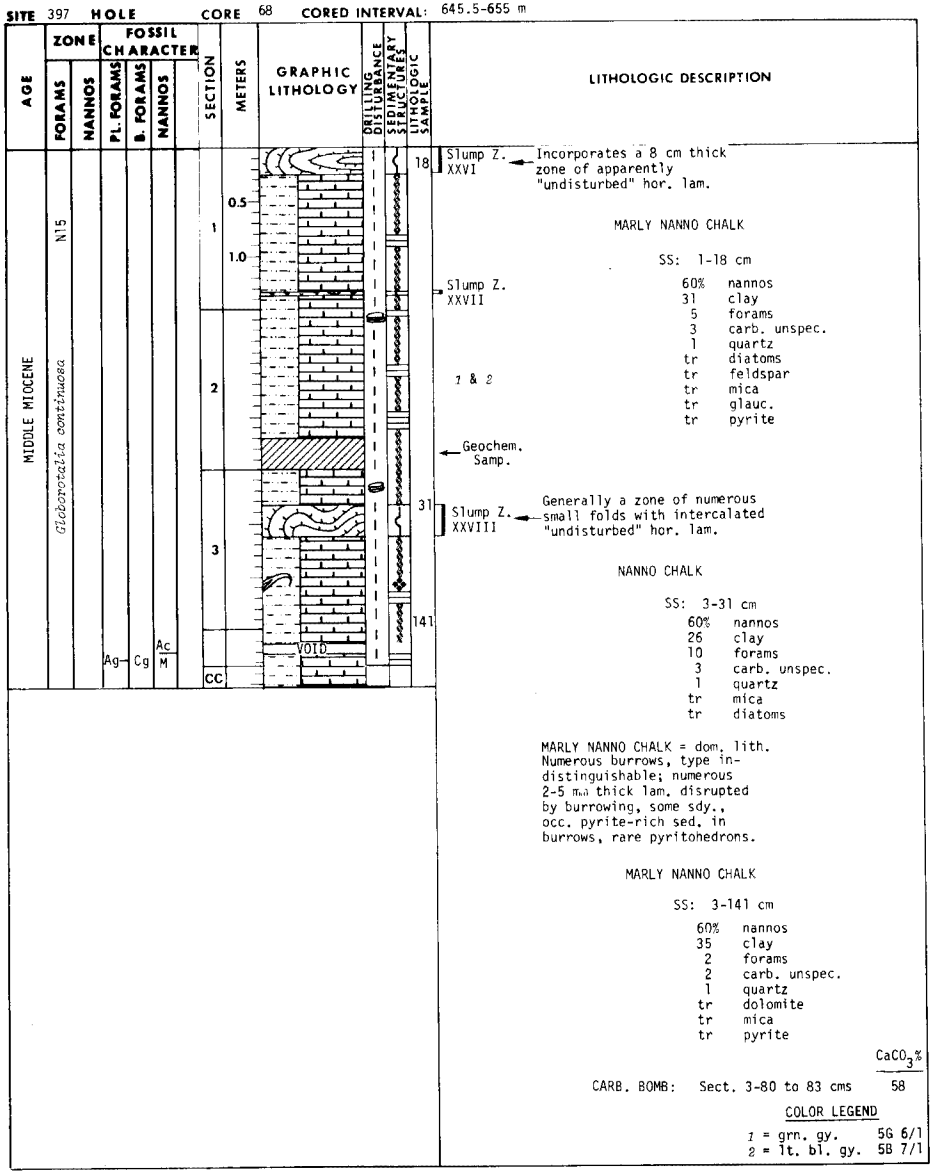
Graded sand layer with sharp L. contact, U. contact disturbed by drilling but appears to be burrowed.

SANDY MARLY FORAM NANNO CHALK

SS: 2-23 cm

30%	nannos
25-30	clay
20	forams
15	quartz
5	carb. unspec.
tr- 1	glauc.
tr	feldspar
tr	mica
tr	vol. glass
tr	pyrite

SITE 397 HOLE CORE 68 CORED INTERVAL: 645.5-655 m



LITHOLOGIC DESCRIPTION

Slump Z. XXVI ← Incorporates a 8 cm thick zone of apparently "undisturbed" hor. lam.

MARLY NANNO CHALK

SS: 1-18 cm

60%	nannos
31	clay
5	forams
3	carb. unspec.
1	quartz
tr	diatoms
tr	feldspar
tr	mica
tr	glauc.
tr	pyrite

Slump Z. XXVII

1 & 2

← Geochem. Samp.

Slump Z. XXVIII ← Generally a zone of numerous small folds with intercalated "undisturbed" hor. lam.

NANNO CHALK

SS: 3-31 cm

60%	nannos
26	clay
10	forams
3	carb. unspec.
1	quartz
tr	mica
tr	diatoms

MARLY NANNO CHALK = dom. lith. Numerous burrows, type indistinguishable; numerous 2-5 mm thick lam. disrupted by burrowing, some sdy., occ. pyrite-rich sed. in burrows, rare pyritohedrons.

MARLY NANNO CHALK

SS: 3-141 cm

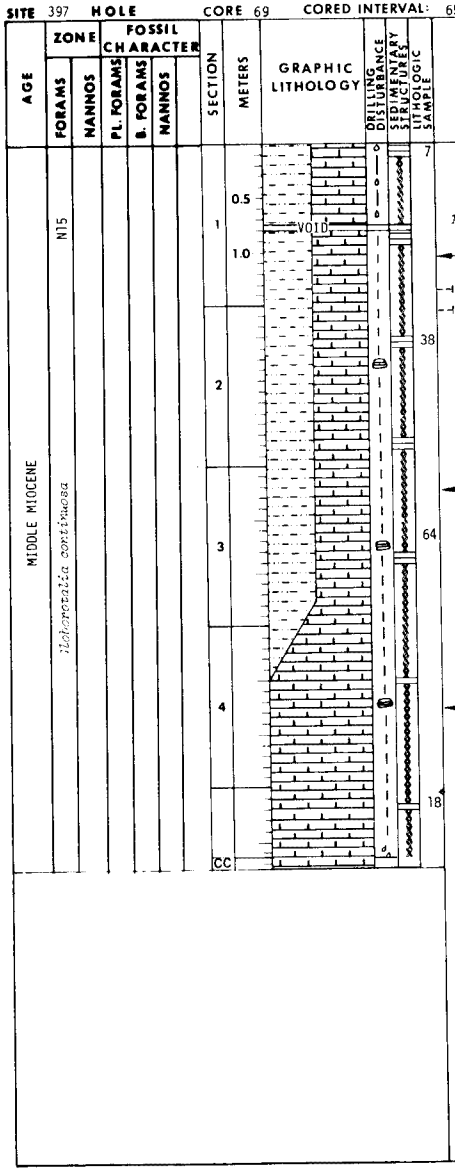
60%	nannos
35	clay
2	forams
2	carb. unspec.
1	quartz
tr	dolomite
tr	mica
tr	pyrite

	$CaCO_3$%
CARB. BOMB: Sect. 3-80 to 83 cms	58

COLOR LEGEND

1 = grn. gy. 5G 6/1
2 = lt. bl. gy. 5B 7/1

SITE 397 HOLE CORE 69 CORED INTERVAL: 655-664.5 m



LITHOLOGIC DESCRIPTION

MARLY NANNO CHALK

SS: 1-7 cm

65%	nannos
35-40	clay
2	forams
2	carb. unspec.
1	pyrite
tr	quartz
tr	feldspar
tr	mica
tr	diatoms

1 & 2

Types of Deformation:

1
3

Sect. 1-103 to 107 cms. No disruption of individual lam.

NANNO CHALK

SS: 2-38 cm

75%	nannos
10	forams
7	clay
5	carb. unspec.
3	vol. glass
tr	dolomite
tr	quartz
tr	feldspar
tr	pyrite

← Sect. 3-3 to 25 cms.

1 & 2

MARLY NANNO CHALK & NANNO CHALK = dom. lith. Gen. a sequence of burrows & lam.; lam. are 1-4 mm thick, wht., lt. gy., gy., grn. gy.; lam. decrease below Sect. 3-90 cms.

MARLY NANNO CHALK-NANNO CHALK

SS: 3-64 cm

55%	nannos
35-40	clay
3	forams
2	carb. unspec.
1	quartz
1	pyrite
tr	dolomite
tr	mica
tr	glauc.
tr	diatoms

← Sect. 4-127 to 130 cms.

SS: 4-18 cm

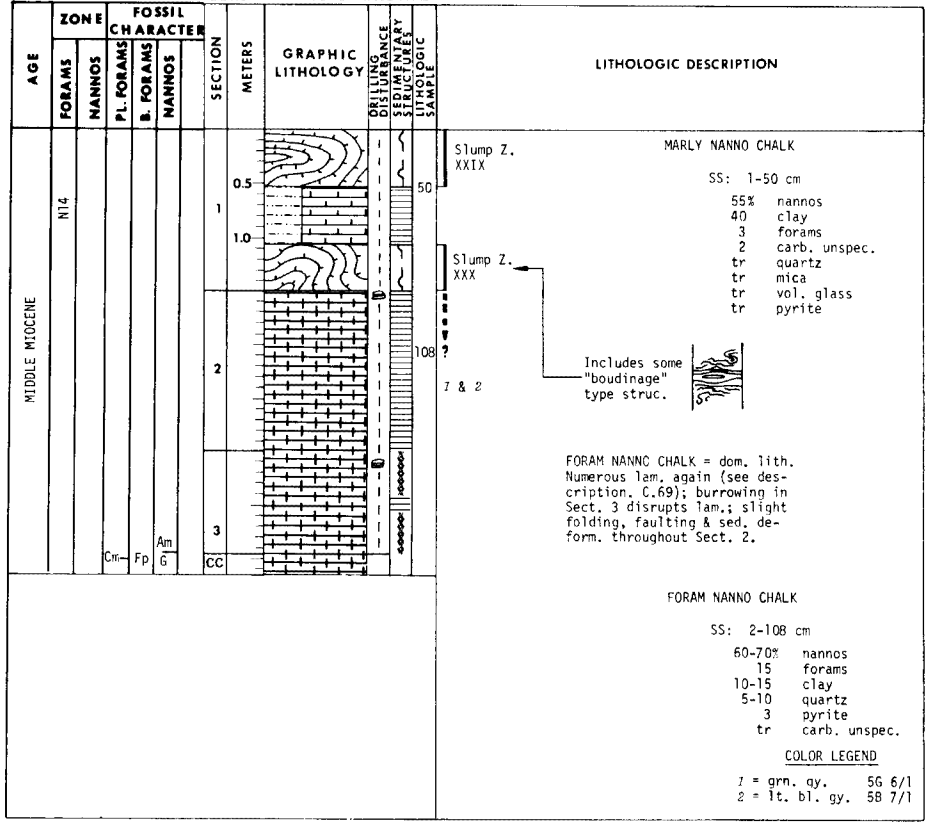
85%	nannos
5	carb. unspec.
5	clay
tr- 5	forams
tr	dolomite
tr	quartz
tr	feldspar
tr	mica
tr	heavy mins. (apatite)
tr	diatoms

	$CaCO_3$%
CARB. BOMB: Sect. 3-58 to 60 cms	52

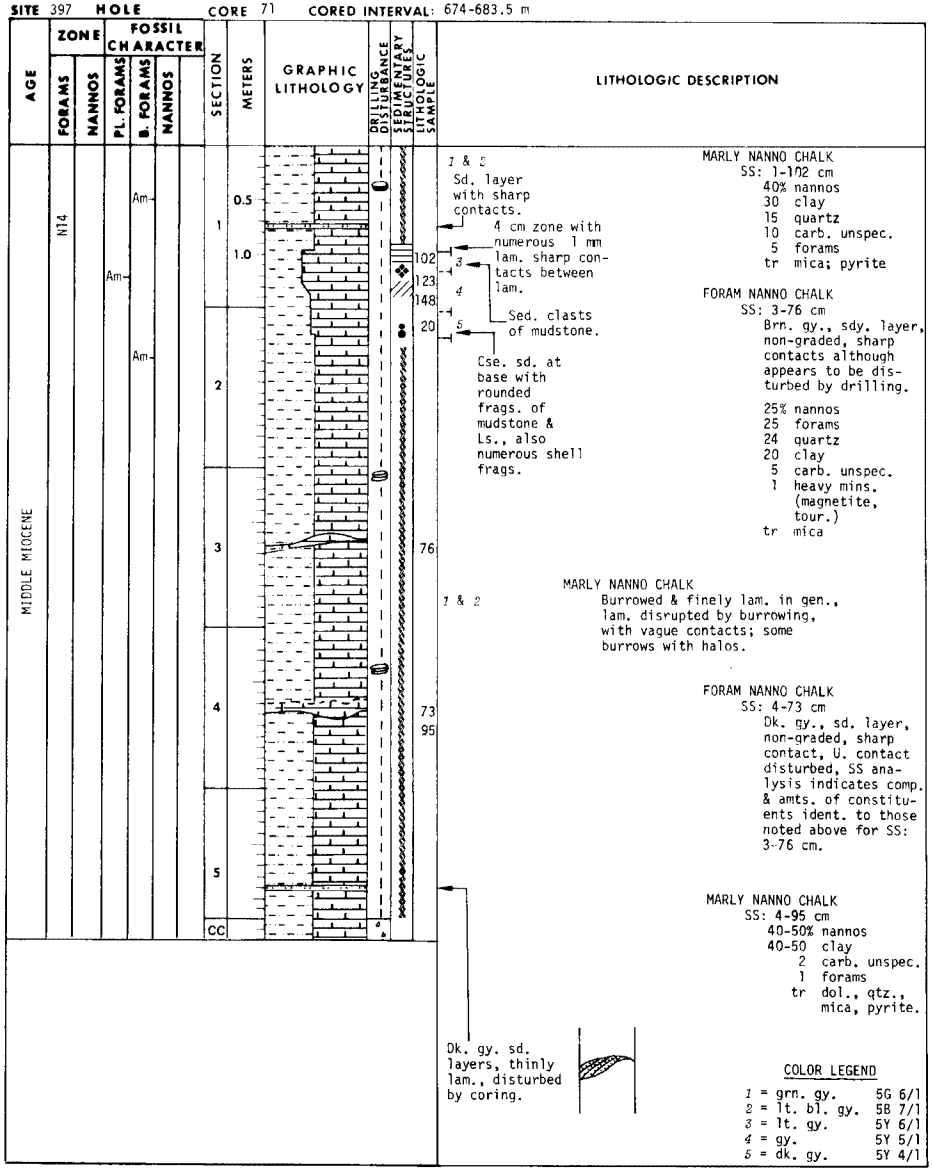
COLOR LEGEND

1 = grn. gy. 5G 6/1
2 = lt. bl. gy. 5B 7/1
3 = lt. gy. 5Y 6/1

SITE 397 HOLE CORE 70 CORED INTERVAL: 664.5-674 m



SITE 397 HOLE CORE 71 CORED INTERVAL: 674-683.5 m



SITE 397 HOLE CORE 72 CORED INTERVAL: 683.5-693 m

AGE: MIDDLE MIOCENE

ZONE — FORAMS: N14; NANNOS: NN9

FOSSIL CHARACTER — PL. FORAMS: Ag; B. FORAMS: —; NANNOS: —

no zonal assignment

Diaeocaster hamatus

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

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE: 80, 95, 139, 40, 85, 91, 38, 81

LITHOLOGIC DESCRIPTION

MARLY NANNO CHALK = dom. lith.
Burrows, predom. composite type often with halos, size varies from 1 mm to 1 cm (measured along minor axis of their oval shape).

Sd. lense, ~6 mm thick, appears disturbed, non-graded.

Sd. layer ~2 cm thick, sharp contacts, non-graded.

Slump Z. XXXI: [Base of this slump z. indef. (somewhere between 0 & 70 cm in Sect. 3) due to smaller-scale deform. features & inter-bedded burrowed sed.]

Flame struc. at base ~2 cm high:

Brn. mudstone sed. clast.

Burrowed segment, zoophycus particularly in U. part, sed. with wht. carb. grains.

MARLY NANNO CHALK
SS: 1-80 cm
60% nannos
39 clay
1 forams
tr carb. unspec., qtz. mica, glauc., pyrite.

MARLY FORAM NANNO CHALK
SS: 2-95 cm
Graded sdy. layer, some internal strat., L. contact sharp, U. contact grad.
30% nannos
30 forams
30 clay
5 carb. unspec.
5 quartz
tr mica, glauc., pyrite.

CALCAREOUS QUARTZ SANDY MUD
SS: 2-139 cm
Disrupted sd. layer on left - sd. layer on right is a blk. sd.
30% nannos
30 clay
25 quartz
10 forams
5 carb. unspec.
1 dolomite
1 glauc.
tr feldspar, mica, pyrite, heavy mins. (magnetite, tour.)

QUARTZ FORAM SAND
3-85 to 4-20 cms
Graded sd. unit, appears to have 4 graded units, contains numerous sed. clasts including large blk. mudstone clast (120 cm) cse. fract. has ech. tests; broken worm tubes; bryozoan frags.; forams; broken pelecy. shells; shallow-water benthonic foram tests; rnded. pol. wht. & pink qtz. grains; glauc.; some pyrite.

CARB. BOMB:		$CaCO_3$%
	Sect. 3-55 to 57 cms	50
	Sect. 4-62 to 64 cms	26

COLOR LEGEND

1 = lt. gy.	5Y 6/1
2 = ol. gy.	5Y 5/2
3 = dk. gy.	5Y 4/1
4 = very dk. gy.	5Y 3/1
5 = lt. gy.	7.5YR 7/0
6 = dk. gy. brn.	2.5Y 4/2

SITE 397 HOLE CORE 73 CORED INTERVAL: 693-702.5 m

AGE: MIDDLE MIOCENE

ZONE — FORAMS: N12; NANNOS: NN8 (NN7-base)

FOSSIL CHARACTER — PL. FORAMS: Ag, Cm, Cp; B. FORAMS: Rp; NANNOS: A, Pm

Globorotalia fohsi

Discoaster kugleri - base *Catinaster coalitus*

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0

VOID

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE: 48, 93, 94, 125

LITHOLOGIC DESCRIPTION

NANNO CHALK = dom. lith.
Gen. num. burrows, frequently with halos (1.5 cm & lam. for one), often filled with pyrite-rich sed.

Sd., darker gy., 5mm thick, some Fe oxides and angular to rnded. grains in clay matrix.

Sdy. silt, darker gy., 2.5cm thick.

Sd., bioturbated, 1cm thick.

Sd. and silt layers, <5mm thick.

FORAM CHALK
SS: 1-48 cm
40% clay
25 forams
20 quartz
15 nannos
5 carb. unspec.
4 pyrite
tr glauc.

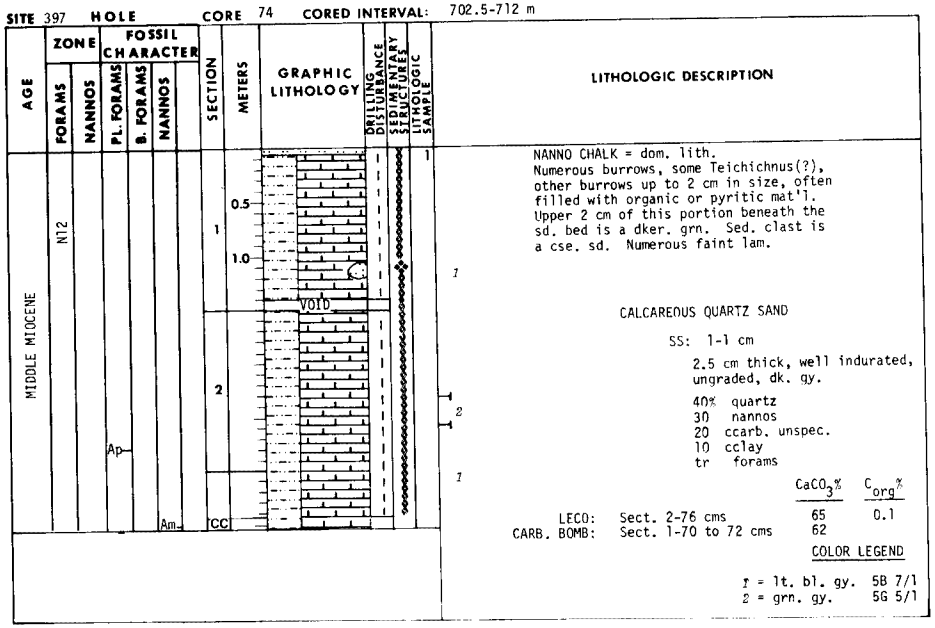
VOLCANIC ASH
SS: 1-93, 94 cms
90-93% vol. glass
5-10 pyrite
2 diatoms (pyritized in SS: 1-94 cm)
tr nannos (SS: 1-94 cm)
tr forams (SS: 1-93 cm)
tr carb. unspec. (SS: 1-94 cm)
tr dolomite (SS: 1-94 cm)

NANNO CHALK
SS: 1-125 cm
63% nannos
20 clay
15 forams
2 quartz
tr vol. glass
tr pyrite
tr diatom (pyritized)

COLOR LEGEND

1 = ol.	5Y 4/4
2 = lt. bl. gy.	5B 7/1
3 = grn. blk.	5G 2/1
4 = grn. gy.	5G 6/1
5 = med. bl. gy.	5B 5/1

SITE 397 HOLE CORE 74 CORED INTERVAL: 702.5-712 m



NANNO CHALK = dom. lith.
Numerous burrows, some Teichichnus(?), other burrows up to 2 cm in size, often filled with organic or pyritic mat'l. Upper 2 cm of this portion beneath the sd. bed is a dker. grn. Sed. clast is a cse. sd. Numerous faint lam.

CALCAREOUS QUARTZ SAND

SS: 1-1 cm

2.5 cm thick, well indurated, ungraded, dk. gy.

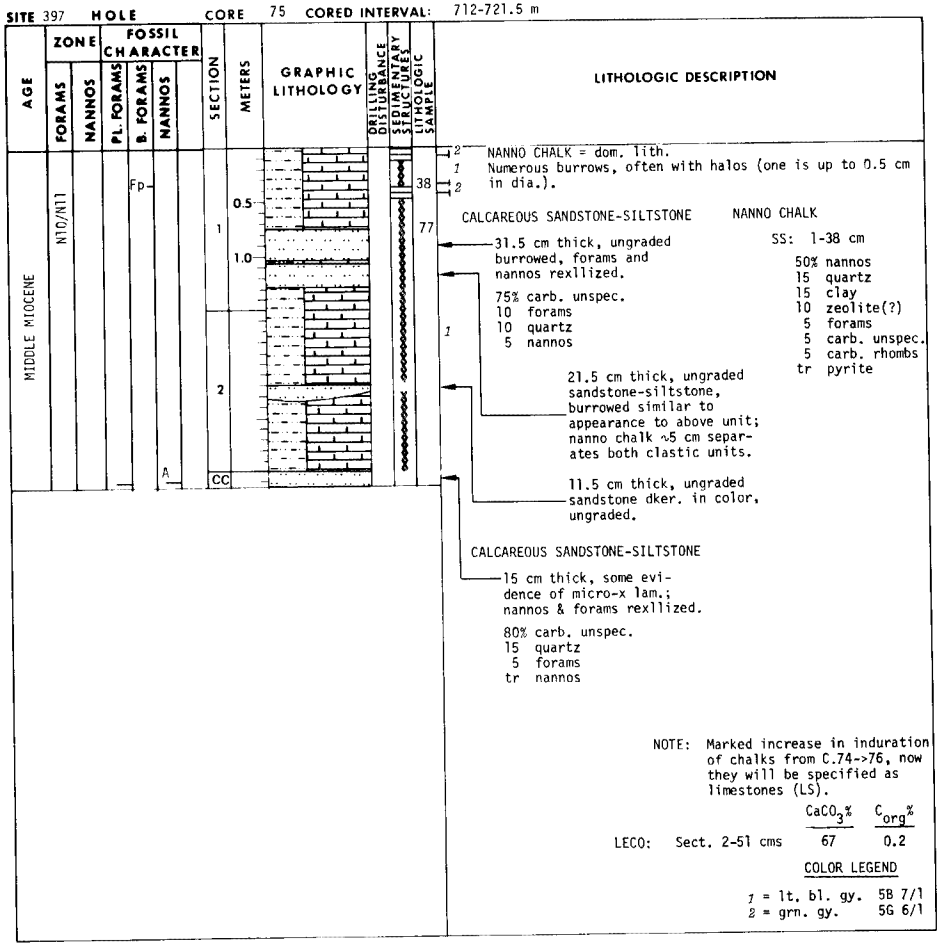
40% quartz
30 nannos
20 ccarb. unspec.
10 cclay
tr forams

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-76 cms	65	0.1
CARB. BOMB:	Sect. 1-70 to 72 cms	62	

COLOR LEGEND

1 = lt. bl. gy. 5B 7/1
2 = grn. gy. 5G 5/1

SITE 397 HOLE CORE 75 CORED INTERVAL: 712-721.5 m



NANNO CHALK = dom. lith.
Numerous burrows, often with halos (one is up to 0.5 cm in dia.).

CALCAREOUS SANDSTONE-SILTSTONE

31.5 cm thick, ungraded burrowed, forams and nannos rexllized.

75% carb. unspec.
10 forams
10 quartz
5 nannos

NANNO CHALK

SS: 1-38 cm

50% nannos
15 quartz
15 clay
10 zeolite(?)
5 forams
5 carb. unspec.
5 carb. rhombs
tr pyrite

21.5 cm thick, ungraded sandstone-siltstone, burrowed similar to appearance to above unit; nanno chalk ~5 cm separates both clastic units.

11.5 cm thick, ungraded sandstone dker. in color, ungraded.

CALCAREOUS SANDSTONE-SILTSTONE

15 cm thick, some evidence of micro-x lam.; nannos & forams rexllized.

80% carb. unspec.
15 quartz
5 forams
tr nannos

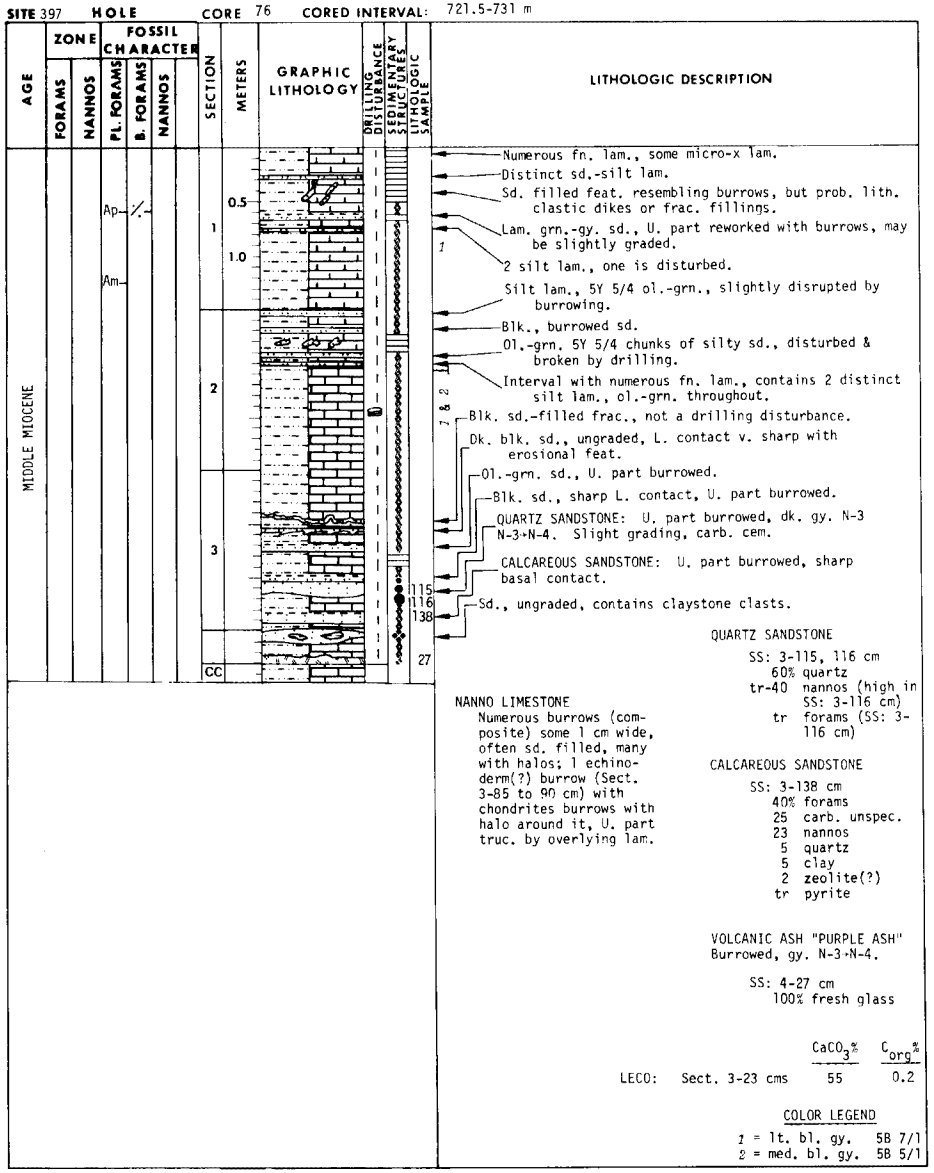
NOTE: Marked increase in induration of chalks from C.74->76, now they will be specified as limestones (LS).

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-51 cms	67	0.2

COLOR LEGEND

1 = lt. bl. gy. 5B 7/1
2 = grn. gy. 5G 6/1

SITE 397 HOLE CORE 76 CORED INTERVAL: 721.5-731 m



NANNO LIMESTONE
Numerous burrows (composite) some 1 cm wide, often sd. filled, many with halos; 1 echinoderm(?) burrow (Sect. 3-85 to 90 cm) with chondrites burrows with halo around it, U. part truc. by overlying lam.

QUARTZ SANDSTONE
SS: 3-115, 116 cm
60% quartz
tr-40 nannos (high in SS: 3-116 cm)
tr forams (SS: 3-116 cm)

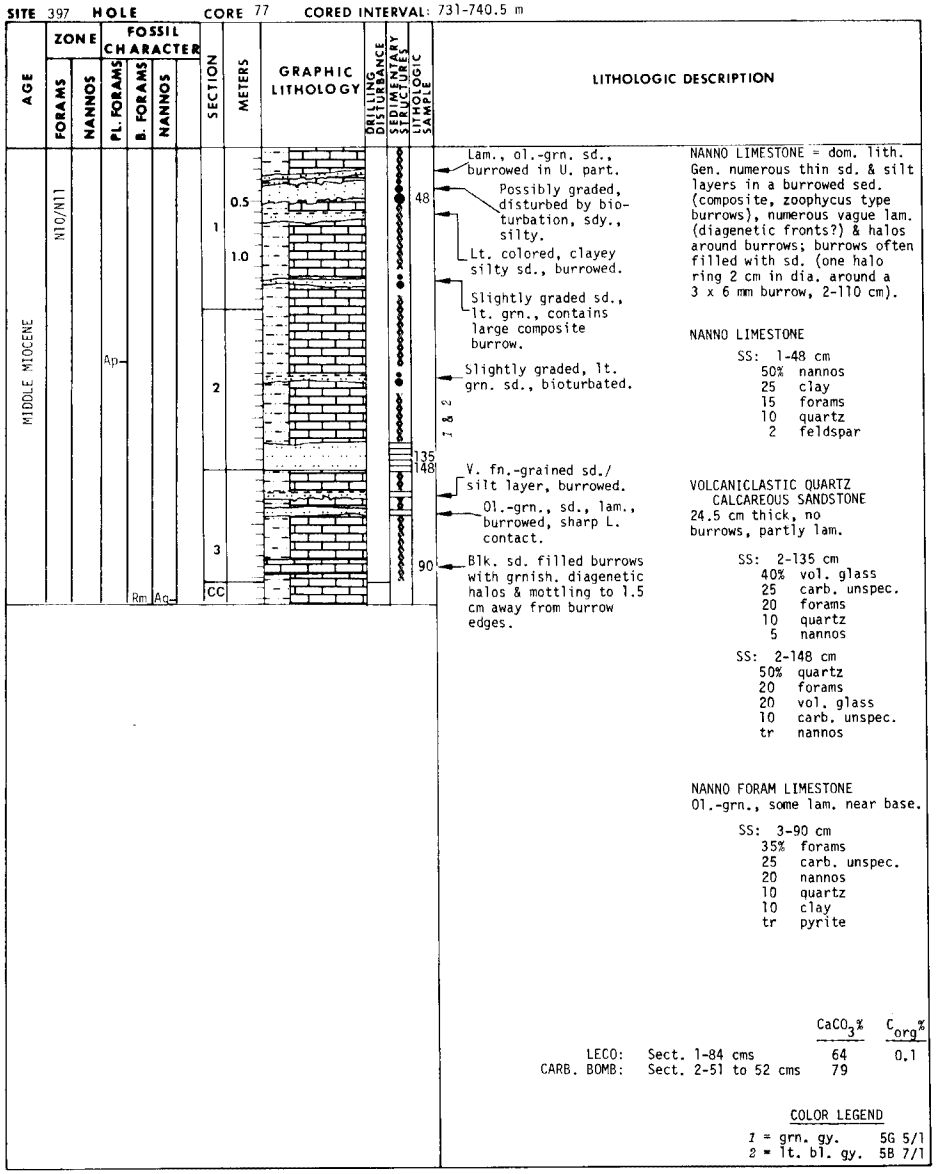
CALCAREOUS SANDSTONE
SS: 3-138 cm
40% forams
25 carb. unspec.
23 nannos
5 quartz
5 clay
2 zeolite(?)
tr pyrite

VOLCANIC ASH "PURPLE ASH"
Burrowed, gy. N-3+N-4.
SS: 4-27 cm
100% fresh glass

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-23 cms	55	0.2

COLOR LEGEND
1 = lt. bl. gy. 5B 7/1
2 = med. bl. gy. 5B 5/1

SITE 397 HOLE CORE 77 CORED INTERVAL: 731-740.5 m



NANNO LIMESTONE = dom. lith. Gen. numerous thin sd. & silt layers in a burrowed sed. (composite, zoophycus type burrows), numerous vague lam. (diagenetic fronts?) & halos around burrows; burrows often filled with sd. (one halo ring 2 cm in dia. around a 3 x 6 mm burrow, 2-110 cm).

NANNO LIMESTONE
SS: 1-48 cm
50% nannos
25 clay
15 forams
10 quartz
2 feldspar

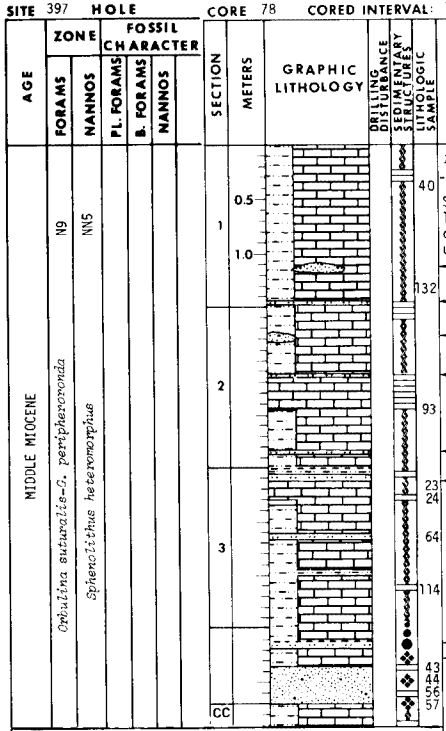
VOLCANICLASTIC QUARTZ CALCAREOUS SANDSTONE
24.5 cm thick, no burrows, partly lam.
SS: 2-135 cm
40% vol. glass
25 carb. unspec.
20 forams
10 quartz
5 nannos
SS: 2-148 cm
50% quartz
20 forams
20 vol. glass
10 carb. unspec.
tr nannos

NANNO FORAM LIMESTONE
Ol.-grn., some lam. near base.
SS: 3-90 cm
35% forams
25 carb. unspec.
20 nannos
10 quartz
10 clay
tr pyrite

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-84 cms	64	0.1
CARB. BOMB:	Sect. 2-51 to 52 cms	79	

COLOR LEGEND
1 = grn. gy. 5G 5/1
2 = lt. bl. gy. 5B 7/1

SITE 397 HOLE CORE 78 CORED INTERVAL: 740.5-750 m



LITHOLOGIC DESCRIPTION

MARLY NANNO LIMESTONE = dom. lith.

Numerous burrows (comp. zoophycus), often with halos, filled with a variety of sed. types, some large (0.5-0.7 cm wide); numerous color changes.

Sd. layer, 1.5 cm thick disturbed, ungraded.

Silt layer, lam. or fissle at base.

Disturbed sd., ungraded.

Sd., 1 cm thick, lam., ungraded.

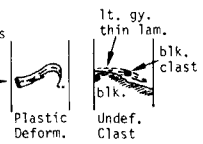
Sd., unlam.

Sdy. to clayey, lam. at base, U. part burrowed.

Graded sd. layer, sharp L. contact, grad. U. contact.

V. dk. gy. sequence (4-17 to 20 cm), above lt. bl. gy. with rip-up clasts of gy. & wht. sandstone & many specks of carb. filled forams.

Mudstone debris flows intercal. with LS layers. Debris flow matrix contains cse., rnded., frosted, pitted qtz. grains, worm tube frags. & 1 Melvin* (see SS: 1-40, 132 cms for comp. descript.). Debris flow clasts of nanno marly mudstone & foram LS. Class either undeform. or plastic, deform. See diagram:



MUDSTONE
SS: 1-40, 132 cms
60% clay
20 nannos
10 forams
5 quartz
3 feldspar
(SS: 1-132 cm)
2 carb. unspec.
tr pyrite

FORAM LIMESTONE
(graded, burrowed at top, lam. at base.
SS: 3-23 cm
55% forams
15 carb. unspec.
15 clay
8 quartz
5 nannos
2 feldspar
tr pyrite

FORAM LIMESTONE
(fnly. lam., poss. a winnowed foram sd. originally)
SS: 2-93 cm
75% forams
15 quartz
10 clay
2 nannos
tr pyrite

MARLY NANNO LIMESTONE
Lt. grn. gy., dkr. at base, may be slightly graded, numerous foram tests filled with carb. ("wht. specks").
SS: 3-24 cm
50% nannos
35-40 clay
5 qtz.
2 carb. unspec.
1 pyrite
tr mica; vol. glass; glauc.

CALCAREOUS SILTSTONE
Dk. gy., no grading, L. contact sharp.
SS: 3-64 cm
75% carb. unspec.
10 clay
8 quartz
5 forams
2 feldspar
tr nannos; pyrite

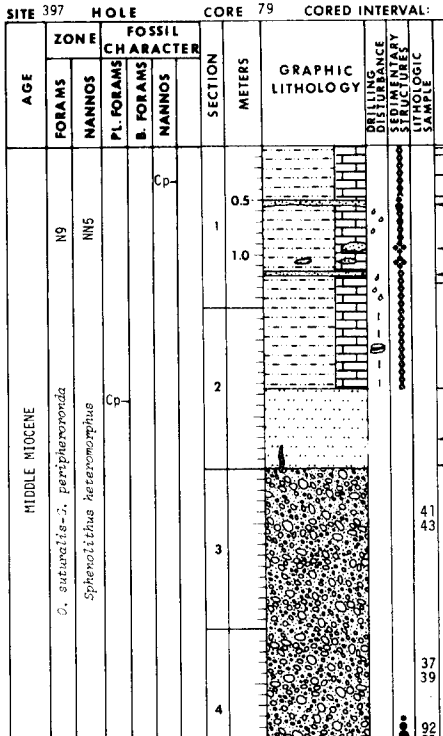
		$CaCO_3$%
CARB. BOMB:	Sect. 1-121 to 122 cms	69
	3- 72 to 73 cms	60
	82 to 83 cms	44
	118 to 120 cms	38

COLOR LEGEND

1 = med. bl. gy. 5B 5/1
2 = lt. bl. gy. 5B 7/1
3 = grn. gy. 5G 6/1

*Melvin = carb. grain 1 x 0.7 cm, with concentric layers (oncolite?)

SITE 397 HOLE CORE 79 CORED INTERVAL: 750-759.5 m



LITHOLOGIC DESCRIPTION

Graded, wht. sandstone.

Sed. clasts of fn. grain qtz. sandstone.

Sdy. silt layer.

NANNO MUDSTONE in Sect. 1 & U. 1/2 Sect. 2.

Poorly sd. cse.-grned. volcaniclastic mud

Thin (1 mm wide) calc. vein.

Approx. aver. clast size
2-3 mm
4-5 mm
5-7 mm

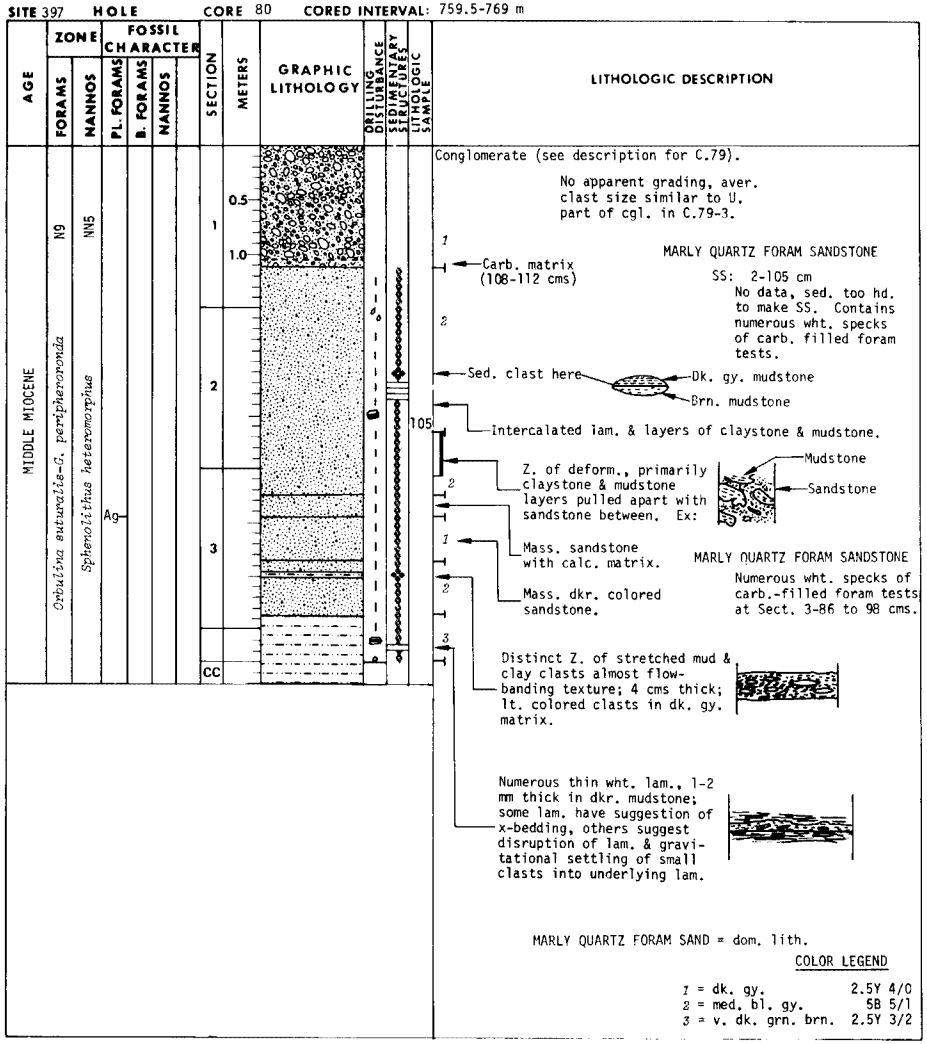
CONGLOMERATE = dom. lith. A poorly-so. mixture of angular and sub-angular LS clasts and vol. rx. (see thin-section data for Sects. 3-41 to 43 cms; 4-37 to 40 cms; 4-92 to 93 cms & CC). 50% of clasts with grn. to grn. contact, the remainder floating in dk. gy. mudstone matrix; largest clast size: 3.5 cm x 6 cm; 1 internal mold of a gastropod in Sect. 4-26 cms.

		$CaCO_3$%
CARB. BOMB:	Sect. 2-31 to 34 cms	30

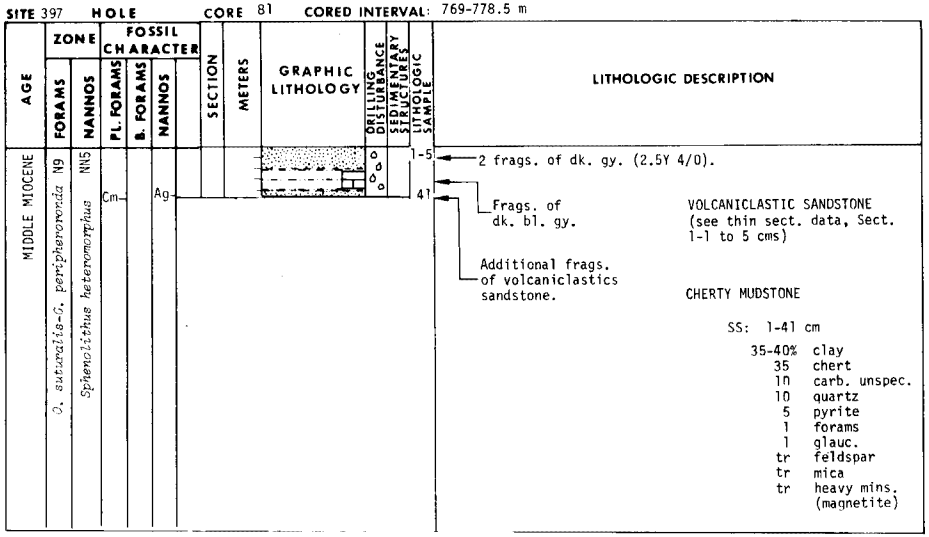
COLOR LEGEND

1 = dk. grn. brn. 2.5Y 4/2
2 = med. bl. gy. 5B 5/1
3 = dk. gy. 2.5Y 4/0

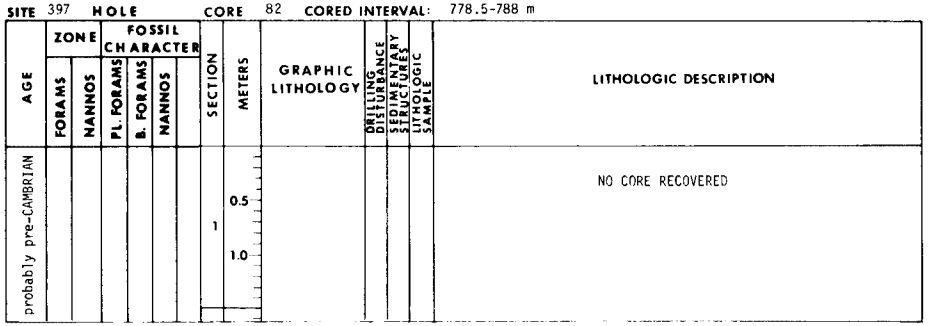
SITE 397 HOLE CORE 80 CORED INTERVAL: 759.5-769 m



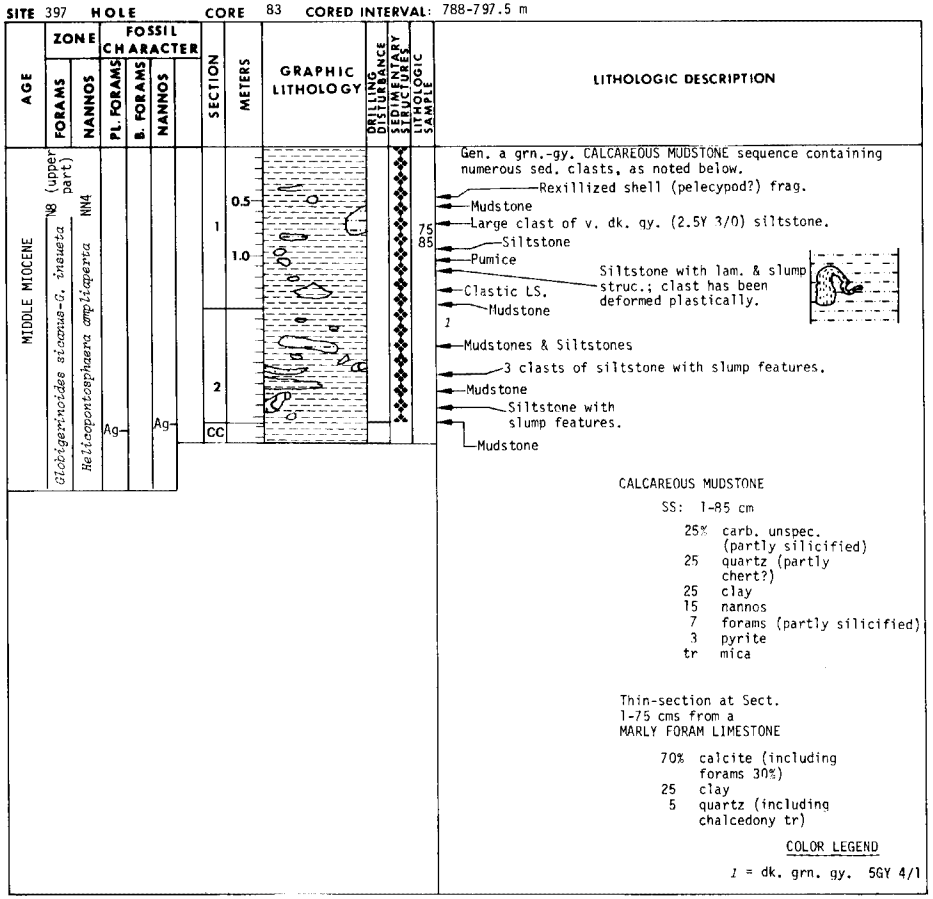
SITE 397 HOLE CORE 81 CORED INTERVAL: 769-778.5 m



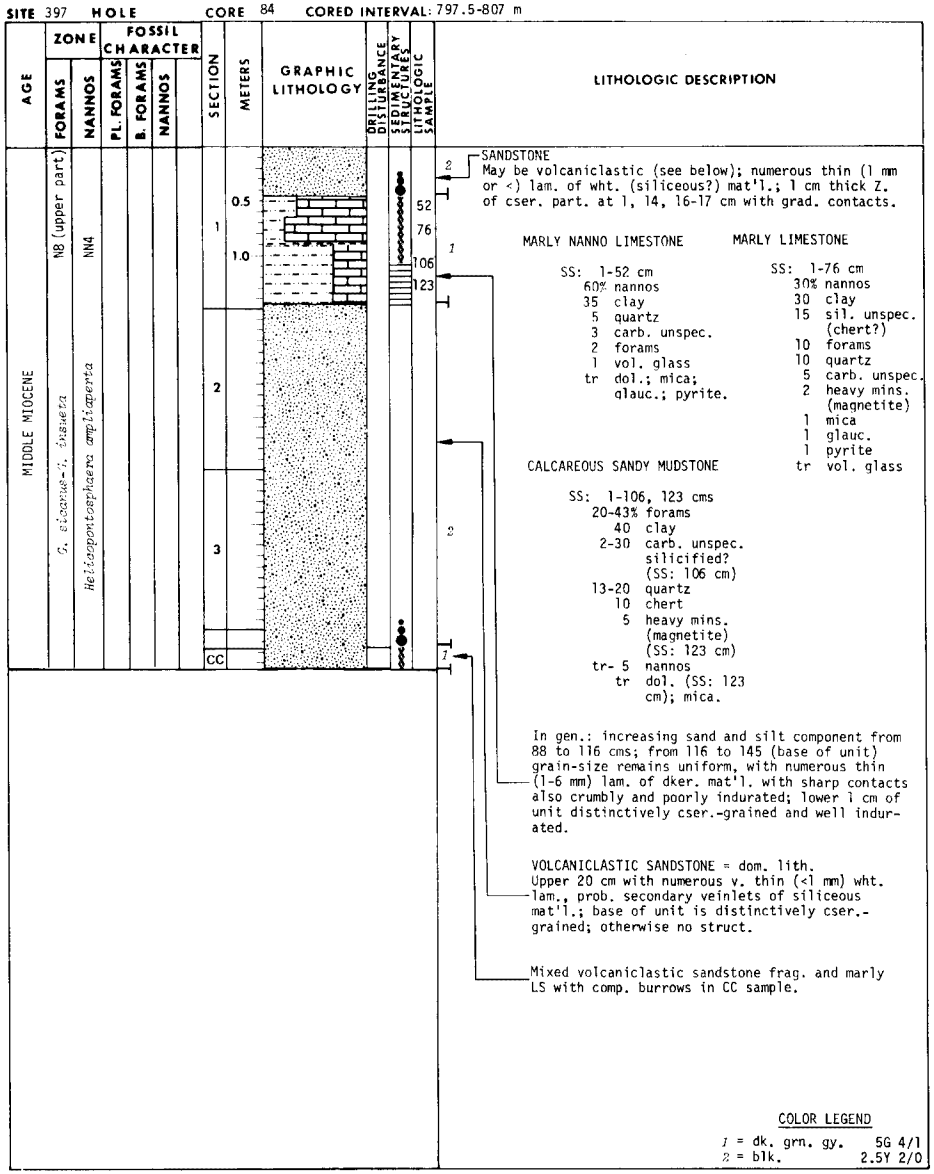
SITE 397 HOLE CORE 82 CORED INTERVAL: 778.5-788 m



SITE 397 HOLE CORE 83 CORED INTERVAL: 788-797.5 m



SITE 397 HOLE CORE 84 CORED INTERVAL: 797.5-807 m



SITE 397 HOLE CORE 85 CORED INTERVAL: 807-816.5 m

AGE: EARLY MIOCENE

ZONE: FORAMS: N8 (lower part) *Globigerinoides altiaperturus-Globigerinatella insueta*; NANNOS: NN4 *Helicopontosphaera ampliaperta*

FOSSIL CHARACTER: PL. FORAMS; B. FORAMS; NANNOS

SECTION; METERS; GRAPHIC LITHOLOGY; DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE

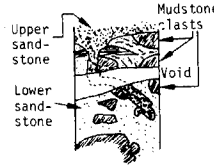
LITHOLOGIC DESCRIPTION

Blk. VOLCANICLASTIC SANDSTONE = dom. lith. No struct. here except for suggestion of some lam. from 20 to 24 cms; at 24 to 35 cms blk. clay fillings suggest internal molds of pelecy. shells.

Grnish. gy. (5G 6/1) mudstone at burrows; not clear if this is a clast or an interlayer within sandstone; SS: 1-75 cms indicates this is a LS.

Mudstone clast.

Contact between sandstones; U. unit injected into L. unit; L. part of U. sandstone contains many blk. small frags. in whtish. matrix forming "salt & pepper" appearance; numerous sed. clasts along U. part of sandstone, fine lam. (see diagram).



Bl.-grn. mudstone - may be sed. clast or a layer within sandstone; smaller clasts of mudstone showing some plastic deform. or imbrication.

VOLCANICLASTIC MUSTONE
SS: 3-68 cms indicates qtz. & rock frags. in sil. cement; thin-sect. of clasts at Sect. 3-62 to 66 cms are marly LS.

MARLY NANNO LIMESTONE
SS: 4-5 cm
40% nannos
30 clay
20 carb. unspec.
10 quartz
tr mica; glauc.; pyrite; sil. unspec. (chert?); heavy mins. (mag.).

QUARTZ CALCAREOUS SANDSTONE
SS: 4-20 cm
50% carb. unspec. (silicified?)
35 qtz. (well rnded.)
15 forams (partly filled with pyrite)
tr feldspar; mica

CALCAREOUS SANDY MUDSTONE
SS: 5-50 cm
30% nannos
20 clay
25 forams
15 quartz
10 carb. unspec.
tr mica; heavy mins. (mag.; tour.).

Chaotic breccia with numerous sed. clasts, many showing deform. struc., some slump feat. & folds in the breccia; matrix indicates flowage & folding around clasts; L. part with burrows.

$CaCO_3$ %

CARB. BOMB: Sect. 3-140 to 142 cms = 58

COLOR LEGEND
1 = blk. 2.5Y 6/0
2 = med. bl. gy. 5B 5/1

SITE 397 HOLE CORE 86 CORED INTERVAL: 816.5-826 m

AGE: EARLY MIOCENE

ZONE: FORAMS: no zonal assignment; NANNOS: NN4 *Helicopontosphaera ampliaperta*

FOSSIL CHARACTER: PL. FORAMS: Rm; B. FORAMS: C; NANNOS: Mg

SECTION; METERS; GRAPHIC LITHOLOGY; DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

MARLY NANNO LIMESTONE = dom. lith. Numerous burrows (zoophycus, composite) often with halos, filled with blk. mud, sd. or silt; lower portion of core (below Sect. 1-80 cms) is an alt. irregular (in thickness) sequence of dk. & lt. layers.

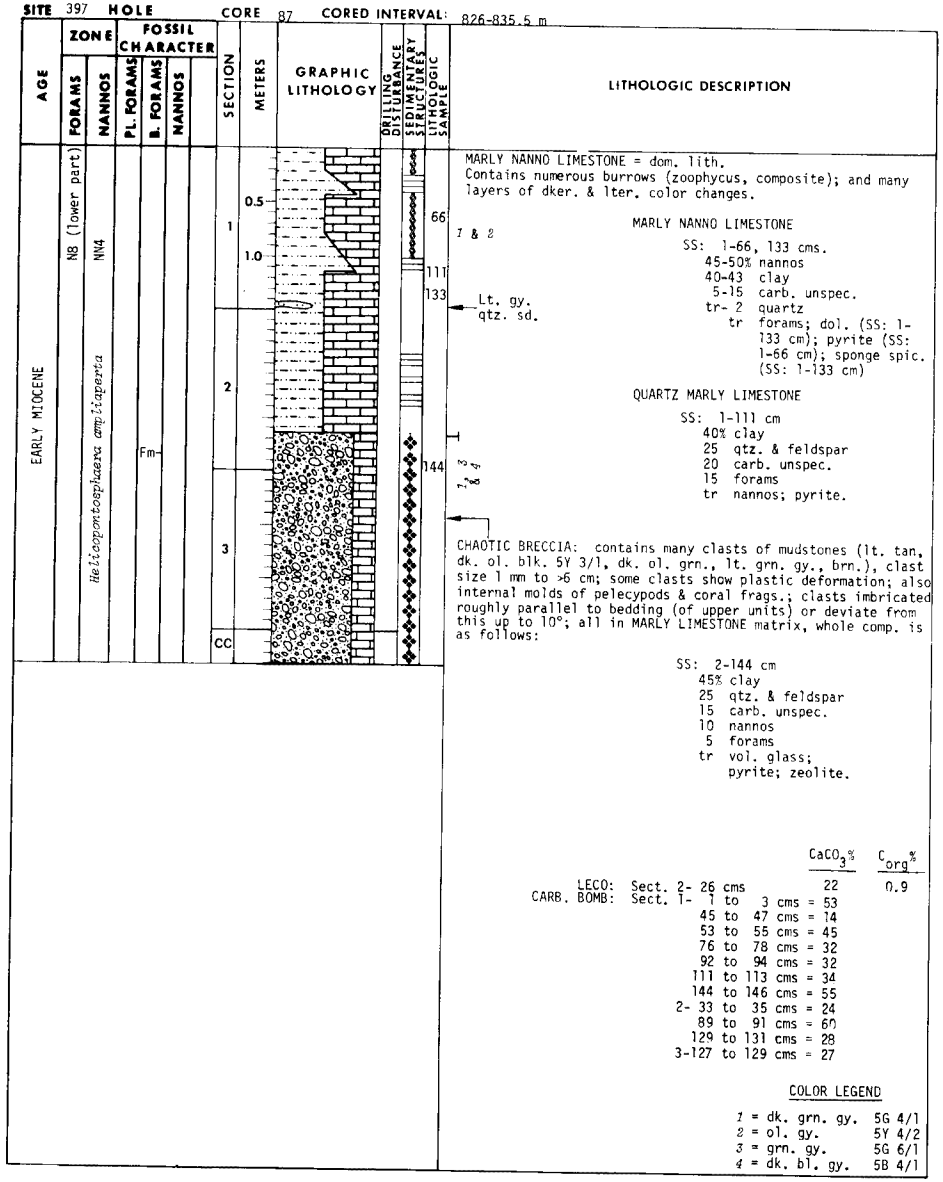
19 cm thick, ol. grn. SS.

5 cm thick dkr. 5GY 4/1 mudstone with burrows.

11 cm thick, med. gy. (5B 7/1) qtz. SS with calc. cement; broken & disturbed by drilling.

COLOR LEGEND
1 = grn. gy. 5G 5/1
2 = grn. gy. 5G 6/1
3 = dk. grn. gy. 5G 4/1

SITE 397 HOLE CORE 87 CORED INTERVAL: 826-835.5 m



MARLY NANNO LIMESTONE = dom. lith.
Contains numerous burrows (zoophycus, composite); and many layers of dker. & lter. color changes.

MARLY NANNO LIMESTONE

SS: 1-66, 133 cms.
45-50% nannos
40-43 clay
5-15 carb. unspec.
tr-2 quartz
tr forams; dol. (SS: 1-133 cm); pyrite (SS: 1-66 cm); sponge spic. (SS: 1-133 cm)

QUARTZ MARLY LIMESTONE

SS: 1-111 cm
40% clay
25 qtz. & feldspar
20 carb. unspec.
15 forams
tr nannos; pyrite.

CHAOTIC BRECCIA: contains many clasts of mudstones (lt. tan, dk. ol. blk. 5Y 3/1, dk. ol. grn., lt. grn. gy., brn.), clast size 1 mm to >6 cm; some clasts show plastic deformation; also internal molds of pelecypods & coral frags.; clasts imbricated roughly parallel to bedding (of upper units) or deviate from this up to 10°; all in MARLY LIMESTONE matrix, whole comp. is as follows:

SS: 2-144 cm
45% clay
25 qtz. & feldspar
15 carb. unspec.
10 nannos
5 forams
tr vol. glass; pyrite; zeolite.

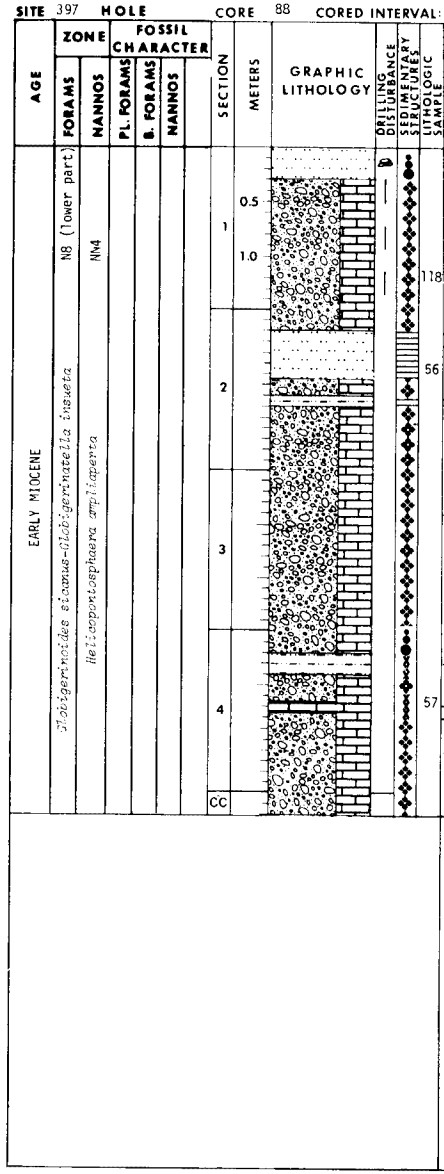
		$CaCO_3$%	C_{org}%
LECO:	Sect. 2- 26 cms	22	0.9

CARB. BOMB:
Sect. 1- 1 to 3 cms = 53
45 to 47 cms = 14
53 to 55 cms = 45
76 to 78 cms = 32
92 to 94 cms = 32
111 to 113 cms = 34
144 to 146 cms = 55
2- 33 to 35 cms = 24
89 to 91 cms = 60
129 to 131 cms = 28
3-127 to 129 cms = 27

COLOR LEGEND

1 = dk. grn. gy. 5G 4/1
2 = ol. gy. 5Y 4/2
3 = grn. gy. 5G 6/1
4 = dk. bl. gy. 5B 4/1

SITE 397 HOLE CORE 88 CORED INTERVAL: 835.5-845 m



Qtz. sd., wht. to gy., some grading, rip-up clasts at base of unit are a grn. mudstone resembling underlying mat'l.

BRECCIA-CONGLOMERATE = dom. lith.
Rnded. mudstones clasts, dk. ol. brn. (5Y 4/3-5Y 3/1), some plastic. deformed esp. those of lter. grn., sizes to 6 cm, with suggestion of slight imbrication; also rugose coral frags., pelecypods to 4 cm as internal molds; matrix is MARLY LIMESTONE.

SS: 1-118 cm
30% clay
25 nannos
15 forams
15 qtz. & feldspar
15 carb. unspec.

Calc. sandstone, with ∿25° dip, containing numerous mudstone lam., siltstones & LS.

Sdy.-clay layer (5GY 4/1) with lam.

SS: 2-56 cm
70% carb. unspec.
10 nannos
10 qtz. & feldspar
10 clay
2 pyrite
tr dolomite

Breccia-Cgl.; clasts of rnded. mudstones, brn., ol. brn., lt. grn., & ol. grn., with some clasts having grn. coating over a brn. nucleus, clast size to 11 cm with size increase down to 4 to 20 cms, some clasts plastic. deformed; also solitary coral frags., pelecypod shell frags., broken worm tubes, LS clasts, and a concen. of ∿1 cm calc. shell frags. between Sect. 3-40 to 50 cms.

Mudstone, numerous burrows.

LS containing few small clasts.

Breccia-cgl. as above, except with smaller clasts, the largest clast is 2 cm; abund. small (<5mm) shell frags.; matrix is a LIMESTONE.

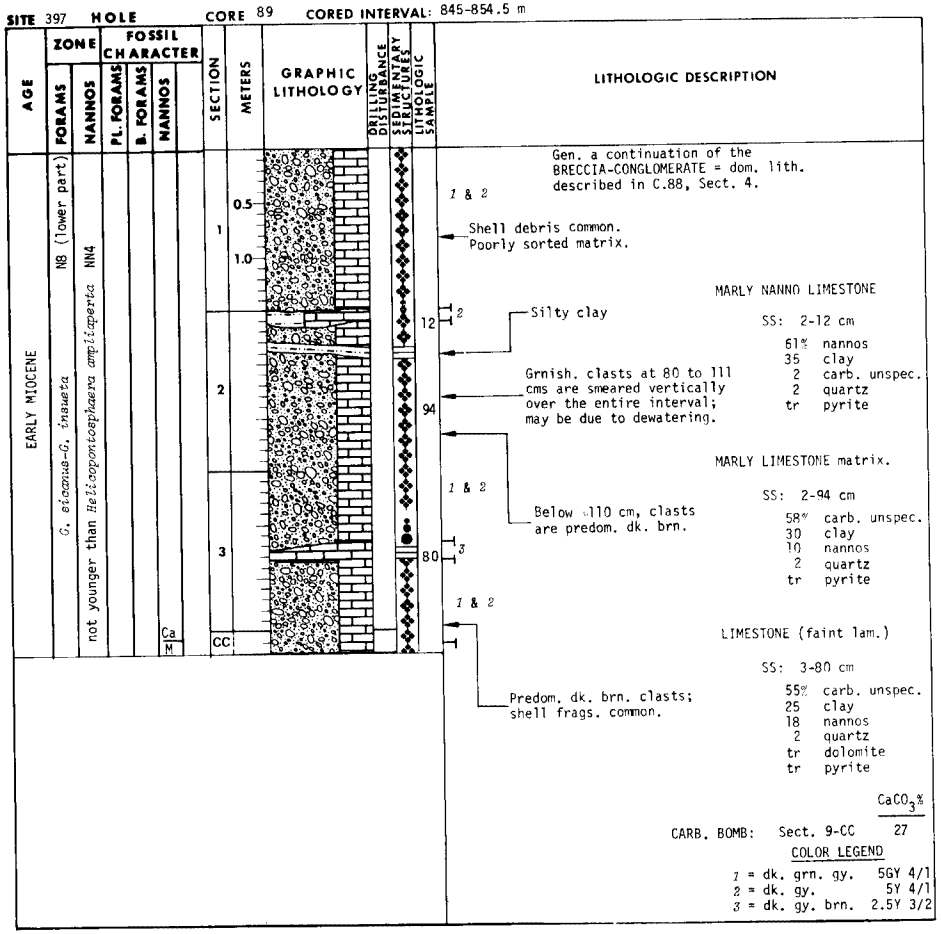
SS: 4-57 cm
25% nannos
25 carb. unspec.
20 clay
15 forams
15* qtz. & feldspar
tr pyrite
tr zeolite(?)

*Qtz. grains in 2 size fractions: 37-75μ & 182-350μ

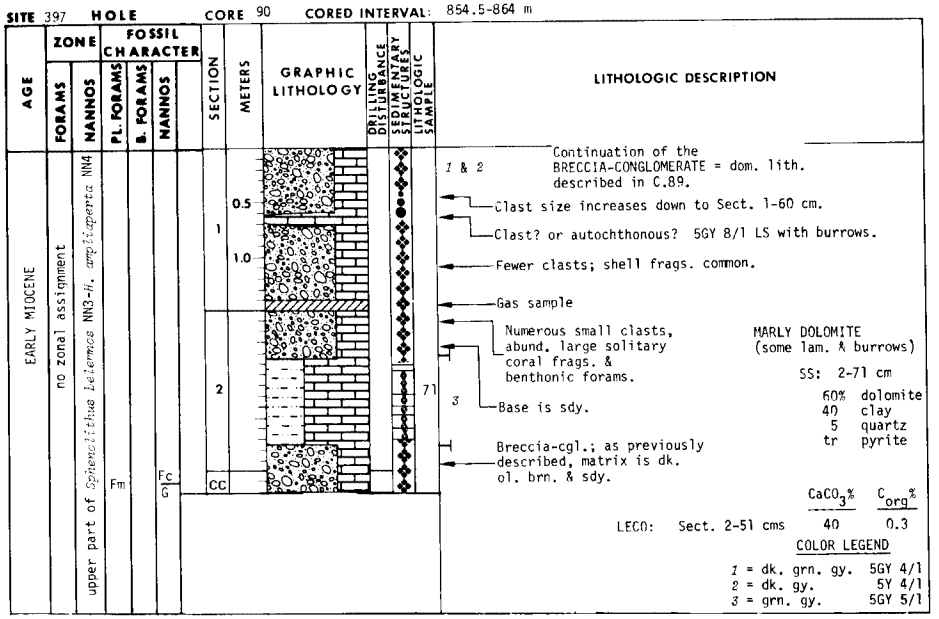
COLOR LEGEND

1 = dk. gy. 5Y 4/1
2 = pale ol. 5Y 6/3
3 = ol. 5Y 5/3
4 = lt. grn. gy. 5GY 7/1

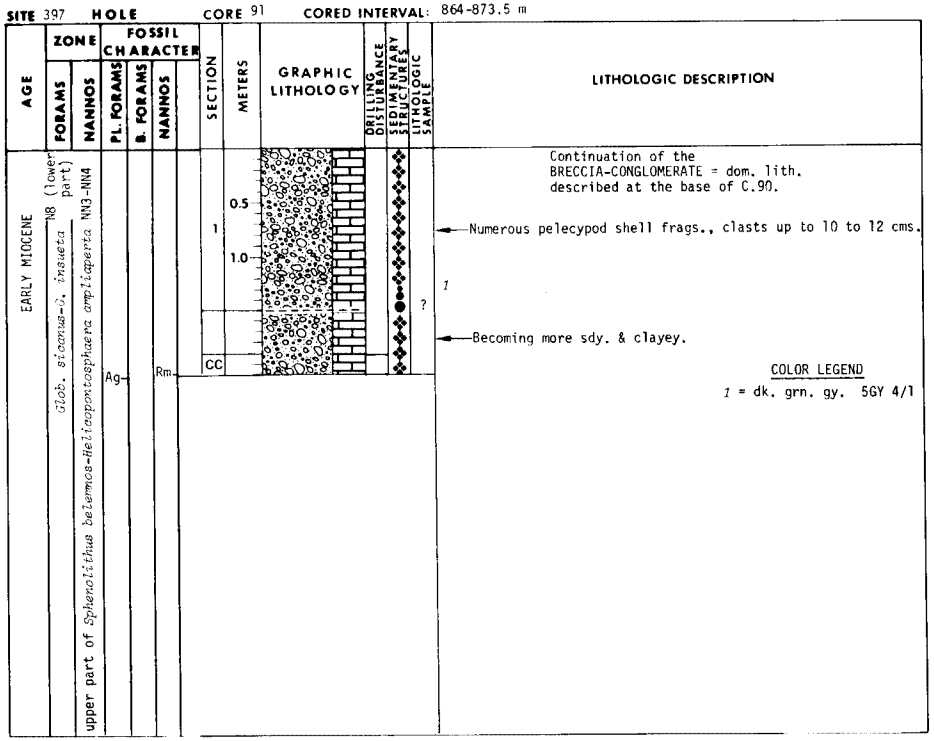
SITE 397 HOLE CORE 89 CORED INTERVAL: 845-854.5 m



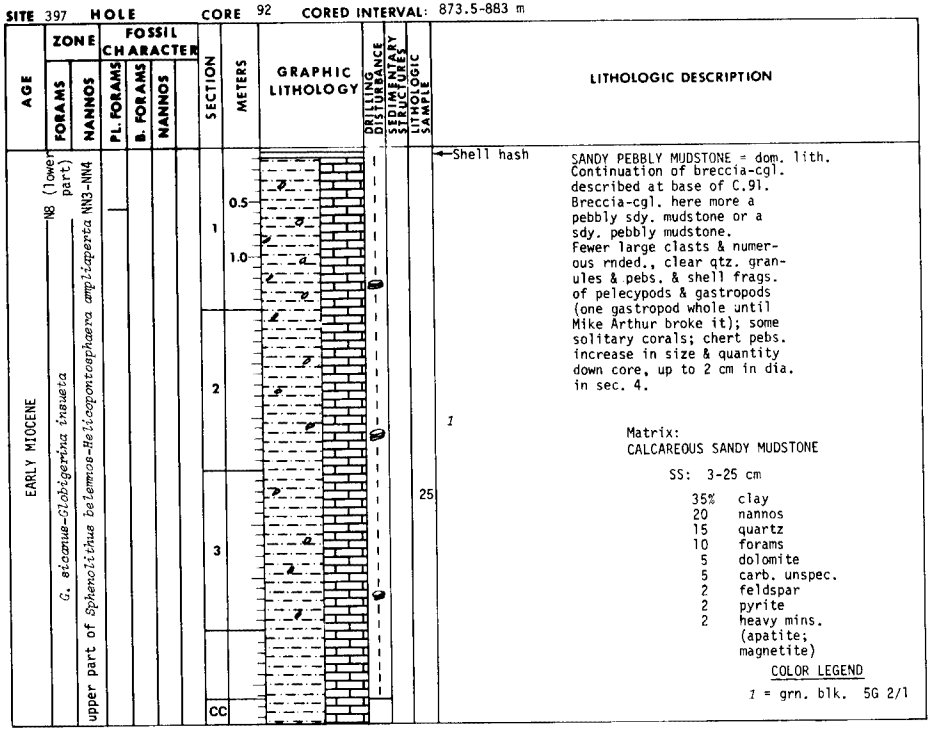
SITE 397 HOLE CORE 90 CORED INTERVAL: 854.5-864 m



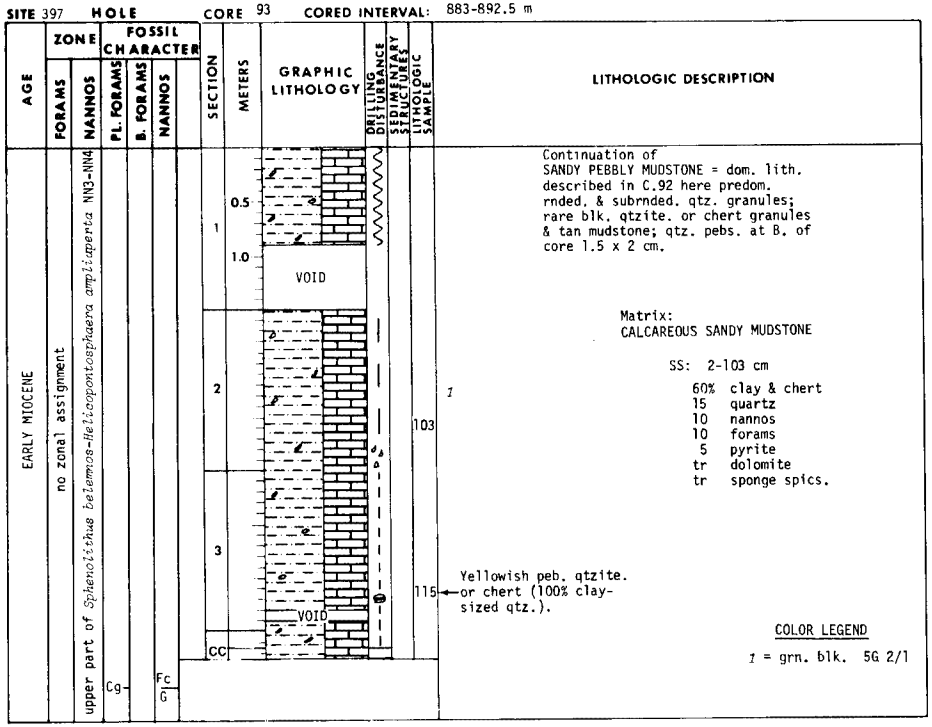
SITE 397 HOLE CORE 91 CORED INTERVAL: 864-873.5 m



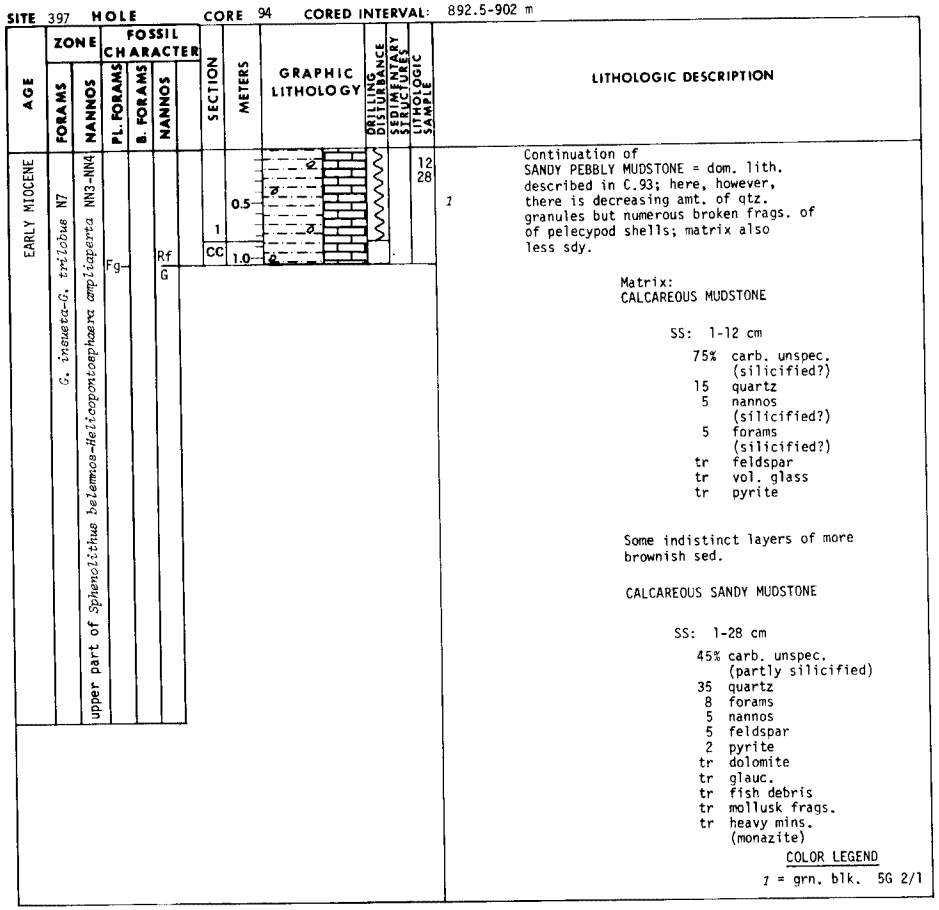
SITE 397 HOLE CORE 92 CORED INTERVAL: 873.5-883 m



SITE 397 HOLE CORE 93 CORED INTERVAL: 883-892.5 m



SITE 397 HOLE CORE 94 CORED INTERVAL: 892.5-902 m



Continuation of SANDY PEBBLY MUDSTONE = dom. lith. described in C.93; here, however, there is decreasing amt. of qtz. granules but numerous broken frags. of of pelecypod shells; matrix also less sdy.

Matrix:
CALCAREOUS MUDSTONE

SS: 1-12 cm

75%	carb. unspec. (silicified?)
15	quartz
5	nannos (silicified?)
5	forams (silicified?)
tr	feldspar
tr	vol. glass
tr	pyrite

Some indistinct layers of more brownish sed.

CALCAREOUS SANDY MUDSTONE

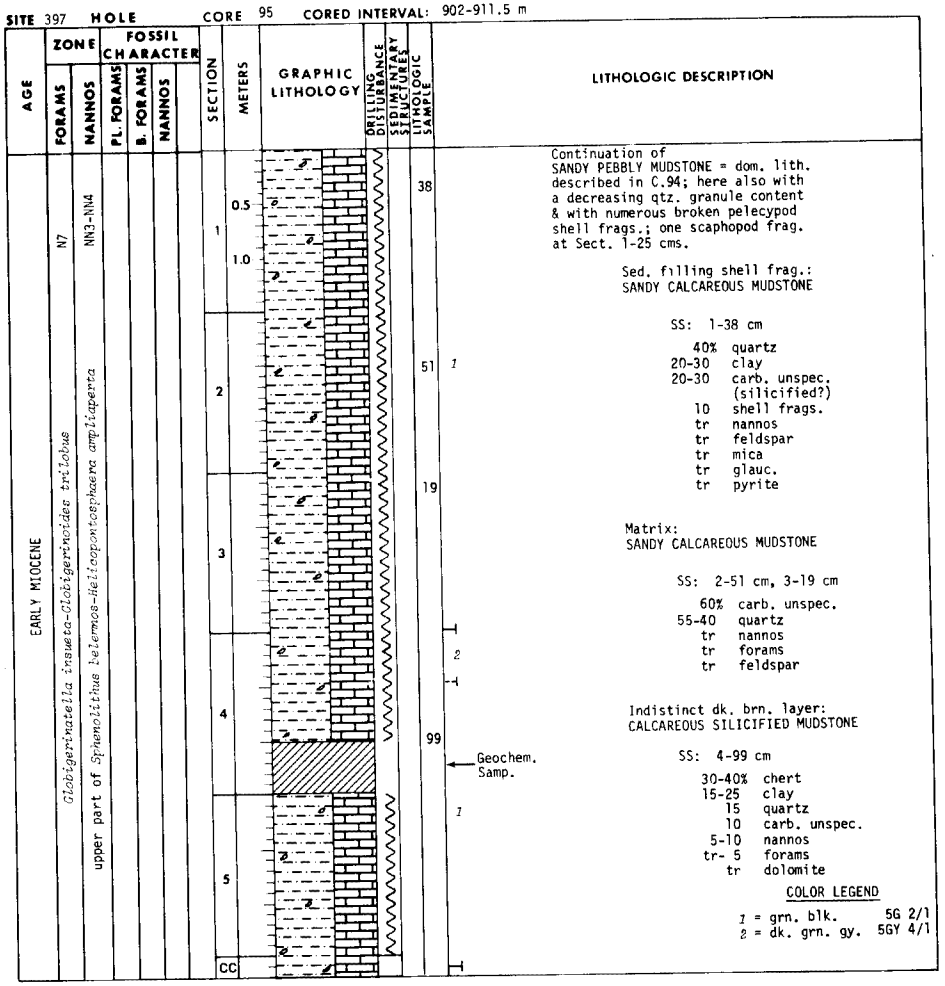
SS: 1-28 cm

45%	carb. unspec. (partly silicified)
35	quartz
8	forams
5	nannos
5	feldspar
2	pyrite
tr	dolomite
tr	glauc.
tr	fish debris
tr	mollusk frags.
tr	heavy mins. (monazite)

COLOR LEGEND

1 = grn. blk. 5G 2/1

SITE 397 HOLE CORE 95 CORED INTERVAL: 902-911.5 m



Continuation of SANDY PEBBLY MUDSTONE = dom. lith. described in C.94; here also with a decreasing qtz. granule content & with numerous broken pelecypod shell frags.; one scaphopod frag. at Sect. 1-25 cms.

Sed. filling shell frag.:
SANDY CALCAREOUS MUDSTONE

SS: 1-38 cm

40%	quartz
20-30	clay
20-30	carb. unspec. (silicified?)
10	shell frags.
tr	nannos
tr	feldspar
tr	mica
tr	glauc.
tr	pyrite

Matrix:
SANDY CALCAREOUS MUDSTONE

SS: 2-51 cm, 3-19 cm

60%	carb. unspec.
55-40	quartz
tr	nannos
tr	forams
tr	feldspar

Indistinct dk. brn. layer:
CALCAREOUS SILICIFIED MUDSTONE

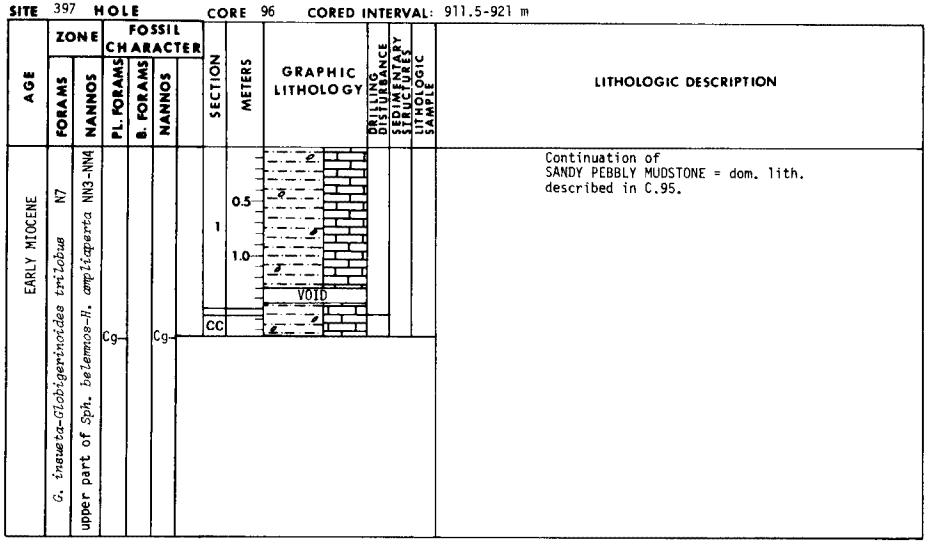
SS: 4-99 cm

30-40%	chert
15-25	clay
15	quartz
10	carb. unspec.
5-10	nannos
tr- 5	forams
tr	dolomite

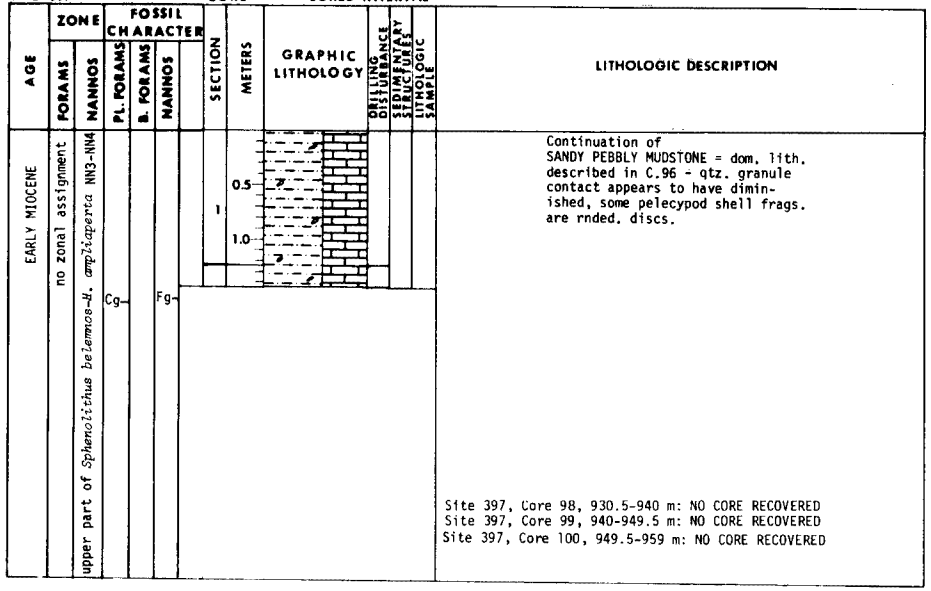
COLOR LEGEND

1 = grn. blk. 5G 2/1
2 = dk. grn. gy. 5GY 4/1

SITE 397 HOLE CORE 96 CORED INTERVAL: 911.5-921 m



SITE 397 HOLE CORE 97 CORED INTERVAL: 921-930.5 m



SITE 397 HOLE CORE 101 CORED INTERVAL: 968.5-978 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
EARLY MIOCENE	upper part of *Sph. belemnos-H. ampliaperta*	NN3-NN4	B		Rg	1 CC	0.5 1.0				96

LITHOLOGIC DESCRIPTION

Continuation of SANDY PEBBLY MUDSTONE = dom. lith. described in C.97

Matrix:
MUDSTONE

SS: 1-96 cm

65% feldspar & qtz.
35 clay
tr nannos
tr carb. unspec.

SITE 397 HOLE CORE 102 CORED INTERVAL: 978-987.5 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
EARLY MIOCENE	*G. insueta-Globigerinoides trilobus* N7 upper part of *Sph. belemnos-H. ampliaperta*	NN3-NN4	Rg		Fc M	CC					

LITHOLOGIC DESCRIPTION

Continuation of SANDY PEBBLY MUDSTONE = dom. lith. described in C.101.

Matrix:
MUDSTONE

SS: CC

70% clay
25 feldspar & qtz.
5 pyrite
tr nannos
tr forams
tr carb. unspec.
tr dolomite

SITE 397 HOLE CORE 103 CORED INTERVAL: 987.5-997 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
	upper part of *Sph. belemnos-H. ampliaperta*	NN3-NN4			Rp	CC					

LITHOLOGIC DESCRIPTION

Only CC recovered. Continuation of SANDY PEBBLY MUDSTONE = dom. lith. described in prev. cores.

Matrix:
MUDSTONE

SS: CC

65% clay
30 feldspar & qtz.
5 carb. unspec.
tr nannos
tr dolomite

Site 397, Core 104, 997-1000 m: NO CORE RECOVERED

SITE 397 HOLE A CORE 1 CORED INTERVAL: 707-760 m

AGE | ZONE: FORAMS, NANNOS | FOSSIL CHARACTER: PL. FORAMS, B. FORAMS, NANNOS | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE | LITHOLOGIC DESCRIPTION

NOTE: This 9.65 m core represents a 53 m cored interval.

CALCAREOUS MUDSTONE (qtz. is angular-subangular)

SS: 1-7 cm
45% clay
30 carb. unspec.
10 nannos
8 quartz
5 feldspar
1 forams
1 mica
tr heavy mins.

MUDSTONE

SS: 1-33 cm
70% clay
15 nannos
5 forams
5 carb. unspec.
5 quartz
tr pyrite

FORAM LIMESTONE

SS: 1-42 cm
30% forams
30 carb. unspec.
20 nannos
15 clay
5 quartz
tr heavy mins. (augite, apatite)
tr mica (muscovite, biotite)

LIMESTONE

SS: 1-76 cm
60% carb. unspec.
20 quartz
10 clay
5 nannos
5 forams
tr pyrite

NANNO LIMESTONE in burrow

SS: 1-91 cm
74% nannos
20 clay
3 carb. unspec.
2 quartz
1 forams
tr feldspar
tr mica

CALCAREOUS SANDSTONE

SS: 3-41 cm
61% carb. unspec.
25 mollusk shell frags.
12 forams
2 quartz
tr nannos
tr feldspar
tr heavy mins.
tr glauc.

Breccia with sdy. matrix; no size sorting or imbricated; clasts (size: 1 to 2.5 mm).

Numerous fn. lam. ≤ 1 mm thick of apparently diagenetic origin pass through burrows. Often concen. above & below sdy. or silty layers. Many burrows (fucoid & ellipsoidal, ~5 x 10-20 common with halos).

NANNO LIMESTONE

SS: 5-114 cm
85% nannos
5 clay
3-4 quartz
3 shell frags. (pelecypods)
1 feldspar
tr forams; carb. unspec.; mica; heavy mins.; Fe oxide.

CALCAREOUS SANDSTONE

SS: 6-49 cm
63% carb. unspec. (angular frags.)
20 forams
15 nannos
3 quartz
2 dolomite
tr feldspar; mica; heavy mins.; glauc.; pyrite.

CARB. BOMB: Sect. 2-72 to 74 cms — $CaCO_3$% = 23

COLOR LEGEND
1 = lt. bl. gy. 5B 7/1
2 = grn. gy. 5G 6/1
3 = gy. 5Y 6/1
4 = gy. 5YR 6/1

SITE 397 HOLE A CORE 2 CORED INTERVAL: 760-884 m

AGE | ZONE: FORAMS, NANNOS | FOSSIL CHARACTER: PL. FORAMS, B. FORAMS, NANNOS | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE | LITHOLOGIC DESCRIPTION

AGE: MIDDLE MIOCENE
FORAMS: N8 (upper part)
NANNOS: Sphenolithus heteromorphus-Helicopontosphaera ampliaperta
PL. FORAMS: Cm

NOTE: This 4.25 m core represents a 124 cm cored interval.

Breccia-cgl.; contains rnded. vol. clasts, lt. tan, dk. purple, & gy., to 2 cm in size; common rnded. calc. fossils.
Matrix is a carb. (74 to 82 cms).
Burrowed, with "wht. specks" of carb.-filled foram tests; some indistinct lam.
Dish struct. (dewatering?) in mudstone lam.
Seq. of med. lt. gy. (N6) & blk. (N1) lam. with sharp contacts; well-defined lam. (see comp. below).
Well defined x-bedding ("climbing ripple" struct.) with some dish struct. (dwatering?); lam., lt. gy. & blk. similar to vol. & calc. sdy. mudstones noted above.
Numerous thin lam. (~1 mm) blk. & grn.-gy. (5GY 6/1) with some x-bedding.
Wht. calc. sd.
Distinct zone, grn.-gy. (5G 4/1), of stretched, flattened, & pulled apart ("boudinage?") mud & clay clasts with almost flow-banding texture; 3 cm thick; lt. colored clasts in a dkr. matrix.
Graded sd., gy. ol. (10Y 4/2)
Sequence of sandstone units:
U.: wht.-lt. gy. calc. sandstone
M.: blk. (bolcaniclastic?) sandstone
L.: wht.-lt. gy. calc. sandstone

Blk. Lam.

VOLCANIC SANDY MUDSTONE

SS: 2-4 cm
60% vol. glass
15 heavy mins. (orthopyroxene)
15 opaques
5 feldspar
3 mica
2 clay
tr foram
tr zeolite

CALCAREOUS MUDSTONE

SS: 2-45, 123 cms
40% clay
25-40 nannos
5-10 quartz
2-10 feldspar
5 carb. unspec.
tr-5 forams
2-5 sil. unspec.
1-3 glauc.
1-3 org. mat'l.
1 vol. glass (SS: 2-45 cm)
tr mica (SS: 2-45 cm)
tr apatite? pyroxene?

Lt.-gy. Lam.

CALCAREOUS SANDY MUDSTONE

SS: 2-13 cm
45% clay (chert)
30 carb. unspec.
10 forams
7 pyrite
5 glauc.
2 quartz
2 feldspar
tr nannos
tr mica
tr fish debris

CALCAREOUS MUDSTONE = dom. lith.

CARB. BOMB: Sect. 3-46 to 48 cms — $CaCO_3$% = 48

COLOR LEGEND
1 = blk. 5Y 2/1
2 = grn. gy. 5GY 6/1
3 = med. bl. gy. 5B 5/1

SITE 397 HOLE A CORE 3 CORED INTERVAL: 884-915 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
EARLY MIOCENE	N8 (lower part) *Globigerinoides sicanus-Globigerinatella insueta*		Cg			1	0.5	VOID			
							1.0				
						2					
						3					125

NOTE: This 5.13 m core represents a 31 m cored interval.

MUDSTONE-PEBBLY MUDSTONE = dom. lith. Upper 20 cm is more a calc. sandstone (possibly a pebble?); entire unit contains clasts of LS & mudstone; sandier from 1-64 to 72 cms), becomes siltier from 2-64 cms downwards; numerous pelecypod shell frags. throughout; 1 large solitary coral frag. at 2-64 cm; lowermost 10 cm shows some deformation — also some deformation between 3-15 to 40 cms.

SS: 3-125 cm

60%	clay
20	quartz
10	nannos
5	feldspar
1	forams
1	carb. unspec.
1	glauc.
1	pyrite
tr	organic mat'l.
tr	heavy mins. (magnetite, monazite?)

COLOR LEGEND

1 = dk. grn. gy. 5GY 4/1

SITE 397 HOLE A CORE 4 CORED INTERVAL: 915-935 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
EARLY MIOCENE	N8 lower part of *Globigerinoides sicanus-Globigerinatella insueta* upper part of *Sphenolithus belemnos* to *Heliopontosphaera ampliapenta*	NN3-NN4	Cm			1	0.5				
							1.0				
						2					
						3					
						4					
						5					
			Cg			6					109
			Rg	Fm	Fc M	7					
						CC					

NOTE: This 9.75 m core represents a 20 m cored interval.

PEBBLY MUDSTONE = dom. lith. Upper 10 cm (Sect. 1) contains numerous large pelecypod shell frags.; numerous small shell frags. throughout; pelecypods, solitary corals, 1 complete shell 1.5 cm (*Marginella* sp.), & scaphopods; numerous clasts of mudstone, claystone & qtzite.; also granules of qtz. in L. part of unit (Sect. 6); some deformation between Sect. 5-5 to 35 cms around a blk. mudstone clast —

Matrix: MUDSTONE

SS: 4-109 cm

75%	clay
15	quartz
5	nannos
1	carb. unspec.
1	feldspar
1	glauc.
1	pyrite
1	sil. unspec.
tr-1	organic mat'l.

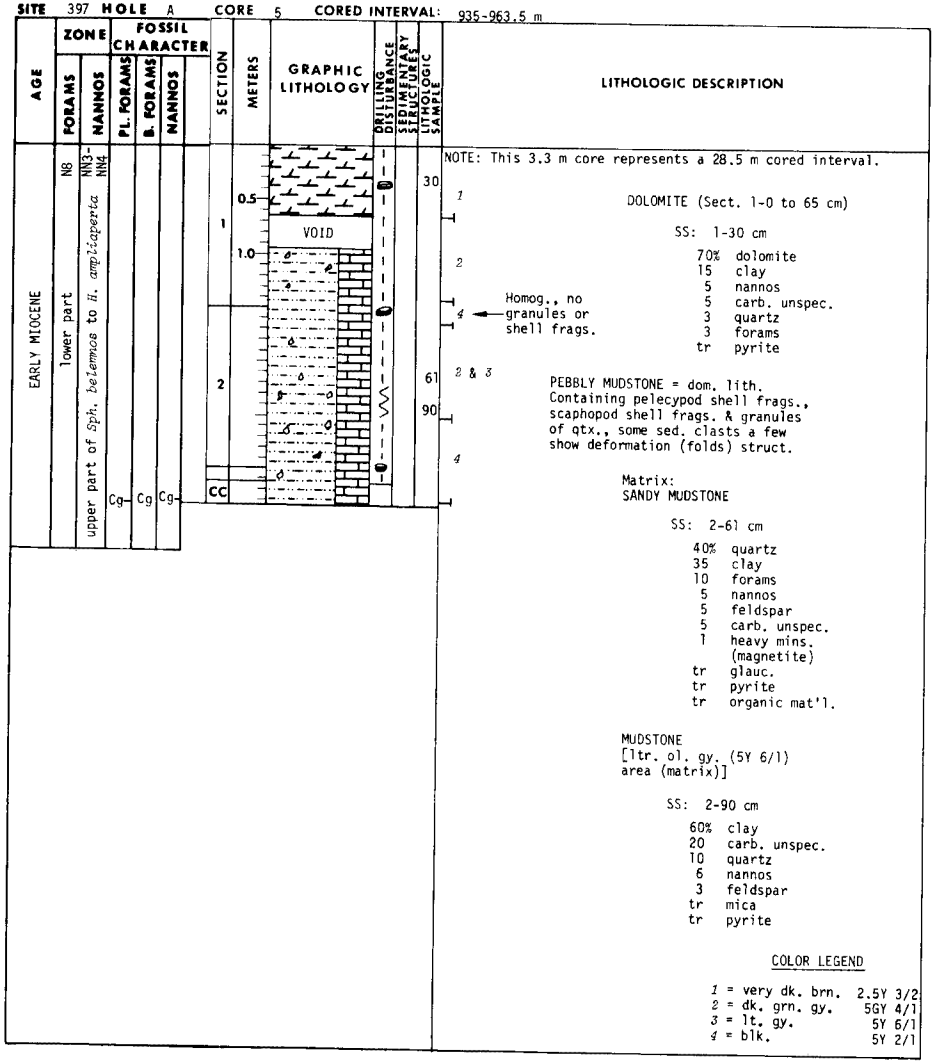
$CaCO_3$%

CARB. BOMB: Sect. 4-62 to 64 cms = 9

COLOR LEGEND

1 = dk. grn. gy. 5GY 4/1

SITE 397 HOLE A CORE 5 CORED INTERVAL: 935-963.5 m



LITHOLOGIC DESCRIPTION

NOTE: This 3.3 m core represents a 28.5 m cored interval.

DOLOMITE (Sect. 1-0 to 65 cm)

SS: 1-30 cm

70%	dolomite
15	clay
5	nannos
5	carb. unspec.
3	quartz
3	forams
tr	pyrite

Homog., no granules or shell frags.

PEBBLY MUDSTONE = dom. lith. Containing pelecypod shell frags., scaphopod shell frags. & granules of qtx., some sed. clasts a few show deformation (folds) struct.

Matrix:
SANDY MUDSTONE

SS: 2-61 cm

40%	quartz
35	clay
10	forams
5	nannos
5	feldspar
5	carb. unspec.
1	heavy mins. (magnetite)
tr	glauc.
tr	pyrite
tr	organic mat'l.

MUDSTONE
[ltr. ol. gy. (5Y 6/1) area (matrix)]

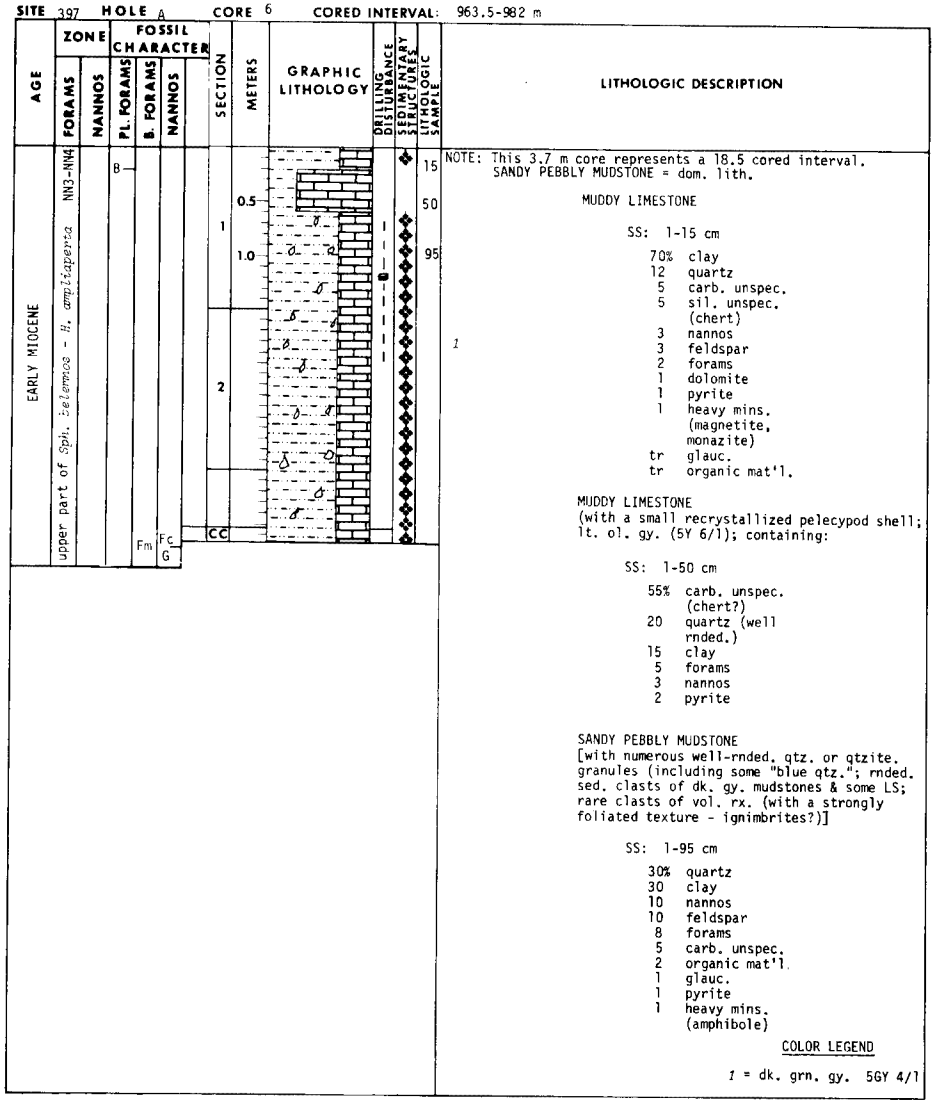
SS: 2-90 cm

60%	clay
20	carb. unspec.
10	quartz
6	nannos
3	feldspar
tr	mica
tr	pyrite

COLOR LEGEND

1 = very dk. brn. 2.5Y 3/2
2 = dk. grn. gy. 5GY 4/1
3 = lt. gy. 5Y 6/1
4 = blk. 5Y 2/1

SITE 397 HOLE A CORE 6 CORED INTERVAL: 963.5-982 m



LITHOLOGIC DESCRIPTION

NOTE: This 3.7 m core represents a 18.5 cored interval.
SANDY PEBBLY MUDSTONE = dom. lith.

MUDDY LIMESTONE

SS: 1-15 cm

70%	clay
12	quartz
5	carb. unspec.
5	sil. unspec. (chert)
3	nannos
3	feldspar
2	forams
1	dolomite
1	pyrite
1	heavy mins. (magnetite, monazite)
tr	glauc.
tr	organic mat'l.

MUDDY LIMESTONE
(with a small recrystallized pelecypod shell; lt. ol. gy. (5Y 6/1); containing:

SS: 1-50 cm

55%	carb. unspec. (chert?)
20	quartz (well rnded.)
15	clay
5	forams
3	nannos
2	pyrite

SANDY PEBBLY MUDSTONE
[with numerous well-rnded. qtz. or qtzite. granules (including some "blue qtz."; rnded. sed. clasts of dk. gy. mudstones & some LS; rare clasts of vol. rx. (with a strongly foliated texture - ignimbrites?)]

SS: 1-95 cm

30%	quartz
30	clay
10	nannos
10	feldspar
8	forams
5	carb. unspec.
2	organic mat'l.
1	glauc.
1	pyrite
1	heavy mins. (amphibole)

COLOR LEGEND

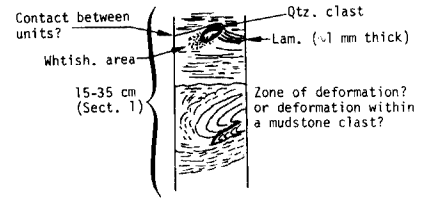
1 = dk. grn. gy. 5GY 4/1

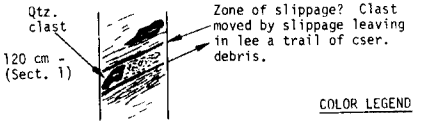
SITE 397 HOLE A CORE 7 CORED INTERVAL: 982.5-992 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
EARLY MIOCENE	upper part of *Sph. belemnos* to *H. ampliaperta*	NN3-NN4	Rg	Cm	Fg	1	0.5, 1.0				1
						2					
						CC					

LITHOLOGIC DESCRIPTION

Continuation of SANDY PEBBLY MUDSTONE = dom. lith. described in C.6; here both qtz. (qtzite?) granules & pebbles, & sed. clasts becoming progressively larger down-core; some clasts show deformation; also some indistinct contacts:





COLOR LEGEND

1 = dk. grn. gy. 5G 4/1

SITE 397 HOLE A CORE 8 CORED INTERVAL: 992-1001.5 m

AGE	ZONE: FORAMS	ZONE: NANNOS	FOSSIL CHARACTER: PL. FORAMS	FOSSIL CHARACTER: B. FORAMS	FOSSIL CHARACTER: NANNOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
EARLY MIOCENE	lower part	N8(?)	Cg			1	0.5, 1.0				1
	upper part of *Sph. belemnos* to *H. ampliaperta*	NN3-NN4	B			2					
			Cg	Cm	Cg	CC					

LITHOLOGIC DESCRIPTION

SANDY PEBBLY MUDSTONE = dom. lith. Fewer sed. clasts, more & larger-sized granules of qtz.

DOLOMITIC MUDSTONE

SS: 1-47 cm

40%	quartz
30	dolomite
10	carb. unspec.
10	feldspar
10	clay
tr	pyrite

Sandy pebbly mudstone with no sed. clasts; abund. wht. to bl. qtzite. granules; abund. moll. frags. & solitary corals (up to 1 cm in size); some smaller reddish chert grains.

Matrix:
DOLOMITIC LIMESTONE

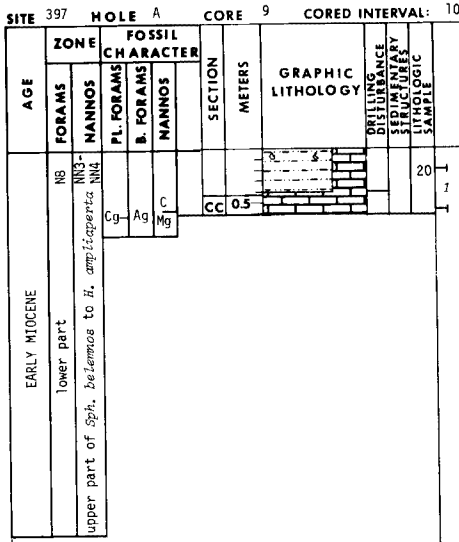
SS: 2-8 cm

42%	carb. unspec.
35	dolomite
20	clay
2	quartz
1	feldspar
tr	nannos
tr	pyrite

COLOR LEGEND

1 = dk. grn. gy. 5G 4/1

SITE 397 HOLE A CORE 9 CORED INTERVAL: 1001.5-1011 m



LITHOLOGIC DESCRIPTION

Continuation of SANDY PEBBLY MUDSTONE = dom. lith. see C.8. Qtzite. pebbles here to 3 cm.

CALCAREOUS MUDSTONE

SS: 1-20 cm

45%	clay
20	nannos
15	quartz
5	forams
5	carb. unspec.
5	feldspar
3	sil. unspec.
1	mica
1	pyrite
tr- 1	dolomite
tr- 1	diatoms
tr	heavy mins. (pyroxene?)

Becoming more sil. at base of core; also decrease in terrig. component:

NANNO LIMESTONE

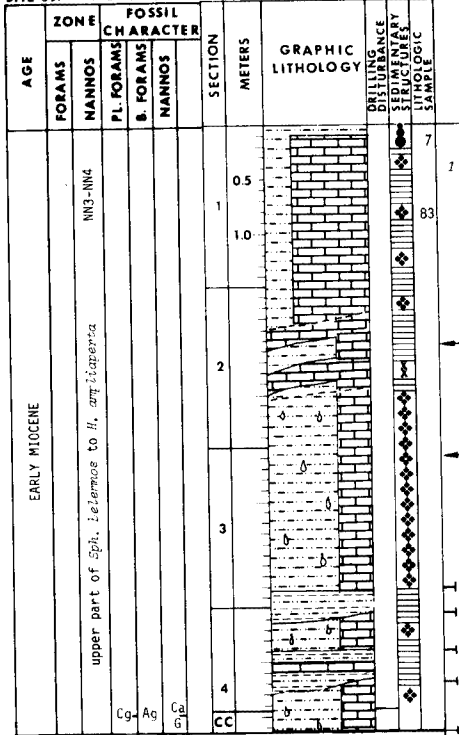
SS: cc

60%	nannos
10	carb. unspec.
5-10	diatoms
5	quartz
5	clay
5	sponge spics.
tr- 5	forams
2	rads
tr	dolomite
tr	mica
tr	pyrite

COLOR LEGEND

1 = dk. grn. gy. 5GY 4/1

SITE 397 HOLE A CORE 10 CORED INTERVAL: 1011-1020.5 m



LITHOLOGIC DESCRIPTION

PEBBLY MUDSTONE CONGLOMERATE = dom. lith.

Sequence of foram-rich (ltr. 5Y 3/2) & clay-rich (dkr. 5Y 4/2, dk. ol. gy.) lam.; all with 18 to 20° dip; some burrowing although no evid. of dep. break to allow burrowing; contacts grad.

Pebbly mudstone-cgl.; trans. upwards into overlying lam. unit; numerous clasts, to 4 cm, some plastically deformed; slight imbrication, non-deformed clasts rnded. becomes silty in lower 15 cms.

Sequence of claystone & marly siltstone lam.; ~10° dip.

Pebbly mudstone-cgl. (see above).

Sequence of claystone & marly LS lam.; L. contact sharp & angular.

Pebbly mudstone-cgl. again (see above).

CALCAREOUS MUDSTONE (somewhat graded; contains numerous qtz. granules; calc. fossil debris common; 5G 6/1-4/1.

SS: 1-7 cm

50%	clay
20	nannos
15	quartz
5	forams
5	carb. unspec.
5	feldspar
1	organic mat'l.
tr- 1	dolomite
tr	heavy mins. (magnetite)
tr	pyrite
tr	diatoms

MARLY LIMESTONE Gassy; dor; some occ. peb.-sized clasts, some deformed & smeared || to bedding; seds. gen. dip 10°, locally to 30° (Sect. 1-40 to 50 cms); scat. tests of benthic forams & small gastropods:

SS: 1-83 cm

35%	clay
25	carb. unspec.
20	quartz
15	forams
5	feldspar
tr	nannos

		$CaCO_3$%	C_{org}%
LECO:	Sect. 4-65 cm:	18	2.9
CARB. BOMB:	Sect. 1-82 to 84 cms	27	

COLOR LEGEND

; = dk. ol. grn. 5Y 3/2
: = ol. gy. 5Y 5/2

SITE 397 HOLE A CORE 11 CORED INTERVAL: 1020.5-1030 m

AGE: EARLY MIOCENE

ZONE — FORAMS: upper part of *Sphenolithus belemnos* to *Heliopontosphaera ampliaperta*

ZONE — NANNOS: NN3-NN4

FOSSIL CHARACTER — PL. FORAMS: Fm

FOSSIL CHARACTER — B. FORAMS: Rb–Rg

FOSSIL CHARACTER — NANNOS: Cg–

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

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES: 99, 1 & 2, 26, 130, 98

LITHOLOGIC SAMPLE

LITHOLOGIC DESCRIPTION

Foram-rich silty sd. — PEBBLY MUDSTONE = dom. lith.

Pebbly mudstone; deformed & smeared clasts, becoming more prominent in L. part, size range <1 cm to >6 cm, some imbrication; infrequent lenses ltr.-tan foram silt; vague zones homog. mudstone without clasts or sd./silt lenses (Sect. 1-35 to 60; 110-120 cms; Sect. 2-10 to 20 cms); somewhat siltier & sdier. Sect. 2-20 to 60 cms.

Pebbly mudstone as above.

Silty marly LS with lam. as above; lam. have ~25° dips.

Pebbly mudstone as above; here with some qtzite. granules near top.

Silty marly LS with lam. as above; lam. have ~5° dips; "wht. specks" of carb. filled foram tests; L. contact sharp with 10° dip.

Pebbly mudstone as above; clasts strongly deformed by plastic flowage.

Pebbly mudstone; somewhat sdier. & with more qtzite. granules.

Silty marly LS, as above; ~20° dip.

Pebbly mudstone; U. part somewhat fissile; large (3 x 5 cm) brn. clast at Sect. 4-135 cm with carb. fossils, qtz. granules, etc. similar to pebbly mudstones-cgls. noted up-section; matrix with a poorly-so. qtz. granules, Sect. 5-30 to 75 cms interval more homog. without clasts & granules; L. part with smeared & deformed clasts, clast size larger.

Silty marly LS as above; lam. faint.

Pebbly mudstone, as above; clasts plastically deformed, some fissile, clasts to 10 cm long, no apparent imbrication, some of sdy.-silty; one such large clast (or an interbedded unit?).

SILTY MARLY LIMESTONE (with wavy to lenticular lam.)
SS: 2-99 cm

62%	forams
25	clay
9	quartz
5	carb. unspec.
1	feldspar
tr	nannos
tr	pyrite; dol.

MARLY LIMESTONE [faintly lam. as above; ~20° dips (in opposite direction to these above & below)]
SS: 4-26 cm

40%	nannos
35	clay
10	quartz
5	forams
5	carb. unsper.
1	feldspar
tr	glauc.
tr	pyrite
tr	sil. unspec.

Matrix: MUDSTONE (authigenic mica?)
SS: 4-130 cm

80%	clay
5	nannos
5	carb. unspec.
5	quartz
5	pyrite

CALCAREOUS SANDY MUDSTONE
SS: 6-98 cm

50%	quartz
15	forams
10	nannos
10	carb. unspec.
10	clay
3	dolomite
1	glauc.
tr	pyrite
tr	heavy mins. (magnetite, ilmenite)

	$CaCO_3$%	C_{org}%
LECO: Sect. 4-90 cms	14	2.2
CARB. BOMB: Sect. 2-59 to 62 cms	27	

COLOR LEGEND
1 = dk. ol. grn. 5Y 3/2
2 = ol. gy. 5Y 4/2

SITE 397 HOLE A CORE 12 CORED INTERVAL: 1030-1039.5 m

AGE: EARLY MIOCENE

ZONE — FORAMS: N7(?) *Globigerinatella insueta-globigerinoides trilobus*; upper part of *Sph. belemnos* to *H. ampliaperta*

ZONE — NANNOS: NN3-NN4

FOSSIL CHARACTER — PL. FORAMS: Fp, Fm

SECTION: 1, 2, 3

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES: 55, 77

LITHOLOGIC SAMPLE

Gas samp.

LITHOLOGIC DESCRIPTION

In gen., a continuation of PEBBLY MUDSTONE = dom. lith. & silty marly LS sequence described in C.11, except here the distinction between these non-lam. & lam. units is not as clear lam. units often fissile (may be drilling disturbance).

Pebbly mudstone matrix: CALCAREOUS MUDSTONE
SS: 1-55 cm

35%	clay
25	forams
20	quartz
10	feldspar
5	nannos
5	carb. unspec.
tr	dolomite

Lam. units: CLAYSTONE
SS: 1-77 cm

90%	clay
10	quartz
tr	nannos
tr	carb. unspec.
tr	dolomite

	$CaCO_3$%	C_{org}%
LECO: Sect. 1-92 cms	7	0.6
CARB. BOMB: Sect. 1-32 to 34 cms	34	

SITE 397 HOLE A CORE 13 CORED INTERVAL: 1039.5-1049 m

AGE: EARLY MIOCENE

ZONE: FORAMS: N7(?) *G. insueta-G. trilobus*; NANNOS: NN3-NN4 upper part of *Sph. heimos-H. ampliaperta*

FOSSIL CHARACTER: PL. FORAMS: B; B. FORAMS: Ag Ag; NANNOS: Cg

SECTION: 1, 2, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE: 1 & 2, 20, 79, 80, 3, 1, 3

LITHOLOGIC DESCRIPTION

Continuation of PEBBLY MUDSTONE = dom. lith. of prev. cores; clasts highly deformed plastically with distinct 30-40° dipping imbrication; portions have more clay (Sect. 1-105 to 148 cms; Sect. 2-75 to 120 cms, Sect. 3-38 to 70 cms) with no clasts.

Large slump (Sect. 0 to 35 cms); some layers in slump are burrowed, one bed is distinct with cubes & blebs of pyrite; gen. ltr. in color (5GY 6/1-4/1).

Dkr., homog. interval with no clasts:

Clasts

Pyrite

Dominant lith. in slump: MARLY LIMESTONE

SS: 2-20 cm

35%	carb. unspec.
30	nannos
30	clay
3	quartz
2	pyrite

QUARTZ MUDSTONE

SS: 2-79 cm

35%	clay
30	quartz
16	carb. unspec.
10	nannos
5	forams
5	feldspar
4	pyrite

Matrix: MARLY NANNO LIMESTONE-CALCAREOUS MUDSTONE

SS: 2-80 cm

40%	nannos
40	clay
8	quartz
5	forams
5	carb. unspec.
2	sil. unspec.
1	dolomite
tr	feldspar
tr	mica
tr	pyrite

COLOR LEGEND

1 = dk. ol. grn. 5Y 3/2
2 = ol. gy. 5Y 4/2
3 = blk. 5Y 2/1

SITE 397 HOLE A CORE 14 CORED INTERVAL: 1049-1058.5 m

AGE: EARLY MIOCENE

ZONE: FORAMS; NANNOS: NN3-NN4 upper part of *Sphenolithus heimos* to *Heliopontosphaera ampliaperta*

FOSSIL CHARACTER: PL. FORAMS; B. FORAMS: Fm Cm; NANNOS: Cg

SECTION: 1, 2, 3, 4, 5

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID

DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE: 88

LITHOLOGIC DESCRIPTION

CALCAREOUS MUDSTONE = dom. lith.

Lam. silty marly LS.

Pebbly mudstone; plastically deformed clasts, frequently as pull-apart or boudinage types

CALCAREOUS MUDSTONE (lam. unit with numerous blk., pyrite-rich lam. & foram tests filled with pyrite; lam. dip ~10°.

SS: 1-88 cm

50%	clay
20	carb. unspec.
10	forams
8	quartz
8	pyrite
2	feldspar
2	glauc.
tr	nannos
tr	dolomite

Pebbly mudstone, clasts plastically deformed; clasts not present in intervals Sect. 1-132 to 142 cms; Sect. 2 & Sect. 3-90 to 120 cms.

Lam. dk. ol. blk.-brn. mudstone; lam. dip ~35°; portions more homog. (with distinct lam.); Sect. 4-130 to 150 cms contain vertical fract. network that bubbles when wet & smells with gassy odor.

Pebbly mudstone

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-109 cms	35	2.5
CARB. BOMB:	Sect. 1-109 to 111 cms	30	

SITE 397 HOLE A CORE 15 CORED INTERVAL: 1058.5-1068 m

AGE: EARLY MIOCENE

ZONE: FORAMS: upper part of *Sphenolithus belemnos* to *Heliocpontosphaera ampliaperta*; NANNOS: NN3-NN4

FOSSIL CHARACTER: PL. FORAMS: P21; B. FORAMS: Cm; NANNOS: N6/N7

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

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE: 100, 80, 46, 70, 75, 76

LITHOLOGIC DESCRIPTION

PEBBLY MUDSTONE = dom. lith.

Pebbly mudstone

Pebbly mudstone; clasts plastically deformed & folded; suggestion of slumping.

Pebbly mudstone

Mass, mudstone, some broken pelecypod frags. becomes very dk. gy. brn. near base.

Pebbly mudstone; plastically deformed clasts, some intercal. zones of blk. (5YR 2/1) mat'l.

CALCAREOUS MUDSTONE (with vague lam. throughout)

SS: 1-100 cm

50%	clay
30	nannos
10	carb. unspec.
5	quartz
2	forams
2	heavy mins. (magnetite; ilmenite)
1	pyrite
tr	sil. unspec.

DOLOMITE

SS: 2-80 cm

65%	dolomite
10	nannos
10	quartz
10	clay
5	carb. unspec.
2	feldspar
tr	glauc.
tr	pyrite

CALCAREOUS SANDSTONE [ungraded, wht. (N9)]

SS: 4-75 cm

90%	carb. unspec.
5	quartz
4	clay
tr	nannos
tr	feldspar

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-36 cms	14	3.5
CARB. BOMB:	Sect. 4-48 to 50 cms	21	

COLOR LEGEND

1 = ol. gy. 5Y 4/1
2 = med. ol. brn. 5Y 4/4
3 = lt. ol. gy. 5Y 3/2

SITE 397 HOLE A CORE 16 CORED INTERVAL: 1068-1077.5 m

AGE: EARLY MIOCENE with LATE OLIGOCENE clasts

ZONE: FORAMS: upper part of *Sphenolithus belemnos* to *Heliocpontosphaera ampliaperta*; NANNOS: NN3-NN4

FOSSIL CHARACTER: PL. FORAMS: P21; B. FORAMS: Cm; NANNOS: no sample

SECTION: 1, 2, 3, 4, 5

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE

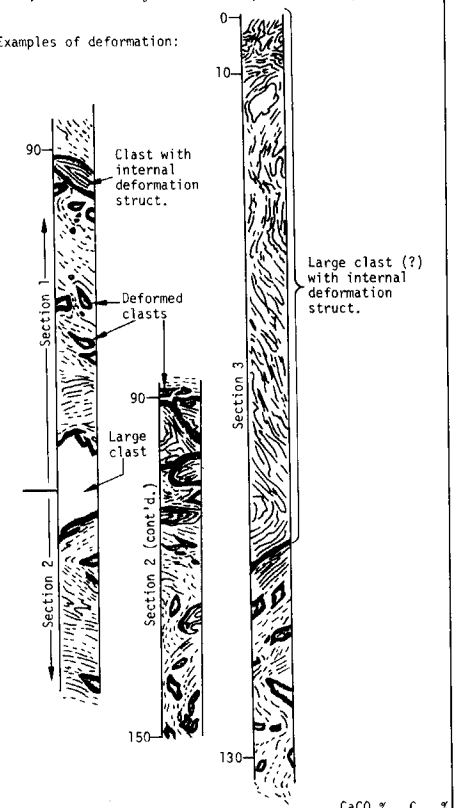
SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE: 18, 67, 96, 58, 59

LITHOLOGIC DESCRIPTION

PEBBLY MUDSTONE = dom. lith.
Clasts deformed & folded; suggestion of some slumping; clasts from 1 cm to nearly 100 cm (Sect. 3; see below); colors of clasts variable from brnish.-blks. (5YR 2/1), dk. reddish brn. (5YR 2/2), lt. grn.-gy. (5G 8/1), ol. blk. (5Y 2/1), ol. gy. (5Y 4/1) to yellow gy. (5Y 6/1); lith. of clasts also variable: mudstones, burrowed marly nanno chalks, cherts & LS.

Examples of deformation:



		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-124 cms	27	1.7
CARB. BOMB:	Sect. 3-100 to 103 cms	22	

COLOR LEGEND

1 = ol. gy. 5Y 4/1

SITE 397 HOLE A CORE 17 CORED INTERVAL: 1077.5-1087 m

AGE: EARLY MIOCENE with LATE OLIGOCENE clasts

ZONE — FORAMS: P21

ZONE — NANNOS: upper part of *Sphenolithus belemnos* to *Helicopontosphaera ampliaperta*

FOSSIL CHARACTER — PL. FORAMS: *G. angulisuturalis-Globorotalia opima opima*; Rp; Fm; Cm

FOSSIL CHARACTER — B. FORAMS:

FOSSIL CHARACTER — NANNOS: NN3-NN4

SECTION: 1, 2, 3, 4, 5, 6, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE: 50, 100, 58

LITHOLOGIC DESCRIPTION

PEBBLY MUDSTONE = dom. lith.

Pebbly mudstone with plastically deformed clasts.

Homog., no clasts.

Pebbly mudstone with plastically deformed clasts & matrix showing fold struct.

Lam., lt. ol. gy. (5Y 5/2).

Folding around a clast of marly nanno LS; lam. surrounding it contain sd. & glauc. & some pelecypod shell frags.

Pelecypod

Clasts here show almost a migmatitic texture in a marly nanno LS (lt. grn. gy., 5G 8/1).

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-45 cms	27	1.8
CARB. BOMB:	Sect. 3-47 to 49 cms	27	

COLOR LEGEND

1 = ol. gy. 5Y 4/1
2 = dk. gy. brn. 2.5Y 3/2
3 = gy. ol. 10Y 4/2

SITE 397 HOLE A CORE 18 CORED INTERVAL: 1087-1096.5 m

AGE: EARLY MIOCENE

ZONE — FORAMS:

ZONE — NANNOS: upper part of *Sphenolithus belemnos* to *Helicopontosphaera ampliaperta*

FOSSIL CHARACTER — PL. FORAMS: Rp; Cp; Rm

FOSSIL CHARACTER — B. FORAMS:

FOSSIL CHARACTER — NANNOS: NN3-NN4

SECTION: 1, 2, 3, 4, CC

METERS: 0.5, 1.0

VOID

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE

SEDIMENTARY STRUCTURES

LITHOLOGIC SAMPLE: 26, 50, 119

LITHOLOGIC DESCRIPTION

PEBBLY MUDSTONE = dom. lith.

Base of graded bed here irregular (mud pebbles?; bioturbation?; load casts?)

MUDSTONE
(numerous small (<3 mm) burrows; occ. sdy. or silty patches.

SS: 1-26 cm

65%	clay
30	nannos
5	quartz
tr	forams
tr	carb. unspec.
tr	dolomite
tr	pyrite

Typical graded unit:

Burrows

Graded (sometimes with lam.)

Clasts (of underlying pebbly mudstone)

Pebbly mudstone with plastically deformed clasts, folding of matrix.

CALCAREOUS MUDSTONE
(graded bed)

SS: 1-50 cm

33%	carb. unspec.
25	quartz
15	forams
15	clay
5	feldspar
5	heavy mins.
3	pyrite
2	nannos
tr	glauc.

CALCAREOUS MUDSTONE
(U. part of graded unit; forams filled with pyrite)

SS: 2-119 cm

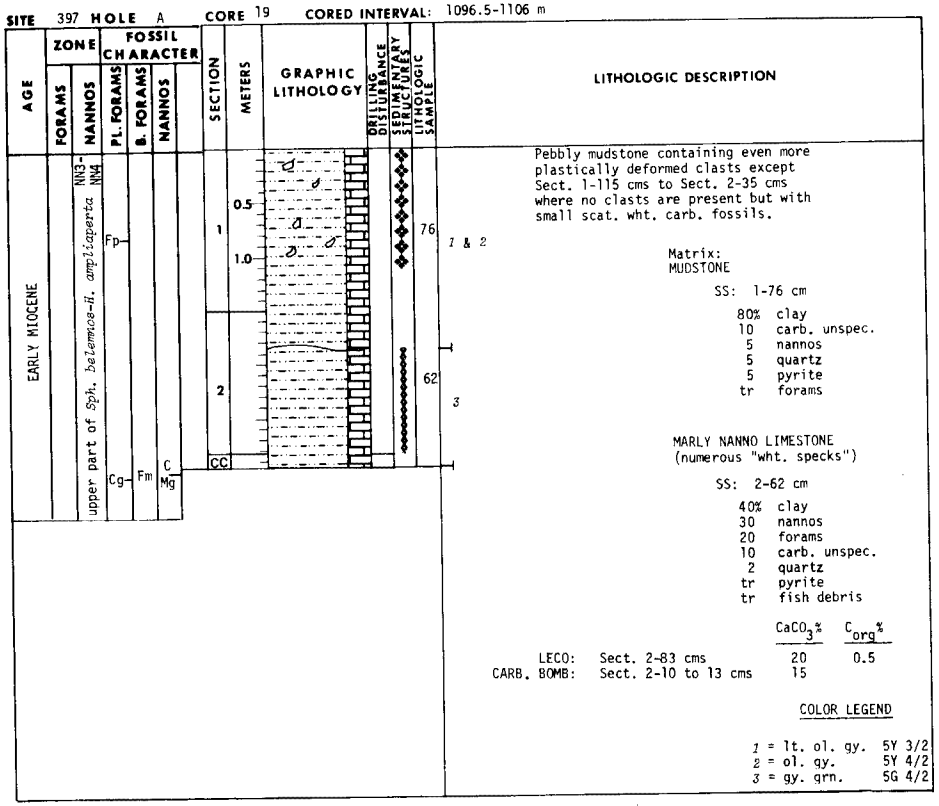
25%	clay
20	nannos
20	carb. unspec.
15	forams
15	quartz
5	feldspar
3	pyrite
tr	dolomite

		$CaCO_3$%
CARB. BOMB:	Sect. 1-26 to 28 cms	28

COLOR LEGEND

1 = med. ol. gy. 5Y 4/2

SITE 397 HOLE A CORE 19 CORED INTERVAL: 1096.5-1106 m



LITHOLOGIC DESCRIPTION

Pebbly mudstone containing even more plastically deformed clasts except Sect. 1-115 cms to Sect. 2-35 cms where no clasts are present but with small scat. wht. carb. fossils.

Matrix:
MUDSTONE

SS: 1-76 cm

80%	clay
10	carb. unspec.
5	nannos
5	quartz
5	pyrite
tr	forams

MARLY NANNO LIMESTONE
(numerous "wht. specks")

SS: 2-62 cm

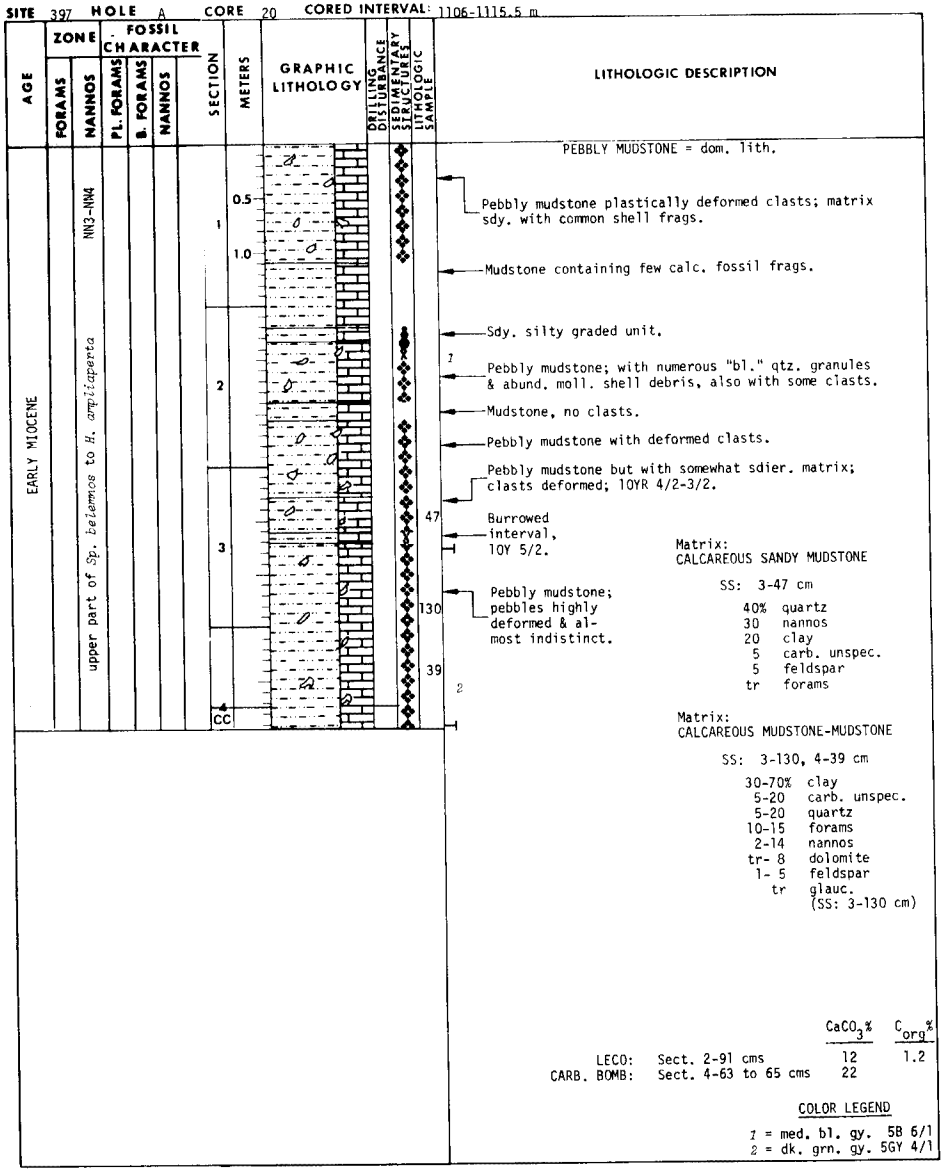
40%	clay
30	nannos
20	forams
10	carb. unspec.
2	quartz
tr	pyrite
tr	fish debris

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-83 cms	20	0.5
CARB. BOMB:	Sect. 2-10 to 13 cms	15	

COLOR LEGEND

1 = lt. ol. gy. 5Y 3/2
2 = ol. gy. 5Y 4/2
3 = gy. grn. 5G 4/2

SITE 397 HOLE A CORE 20 CORED INTERVAL: 1106-1115.5 m



LITHOLOGIC DESCRIPTION

PEBBLY MUDSTONE = dom. lith.

Pebbly mudstone plastically deformed clasts; matrix sdy. with common shell frags.

Mudstone containing few calc. fossil frags.

Sdy. silty graded unit.

Pebbly mudstone; with numerous "bl." qtz. granules & abund. moll. shell debris, also with some clasts.

Mudstone, no clasts.

Pebbly mudstone with deformed clasts.

Pebbly mudstone but with somewhat sdier. matrix; clasts deformed; 10YR 4/2-3/2.

Burrowed interval, 10Y 5/2.

Pebbly mudstone; pebbles highly deformed & almost indistinct.

Matrix:
CALCAREOUS SANDY MUDSTONE

SS: 3-47 cm

40%	quartz
30	nannos
20	clay
5	carb. unspec.
5	feldspar
tr	forams

Matrix:
CALCAREOUS MUDSTONE-MUDSTONE

SS: 3-130, 4-39 cm

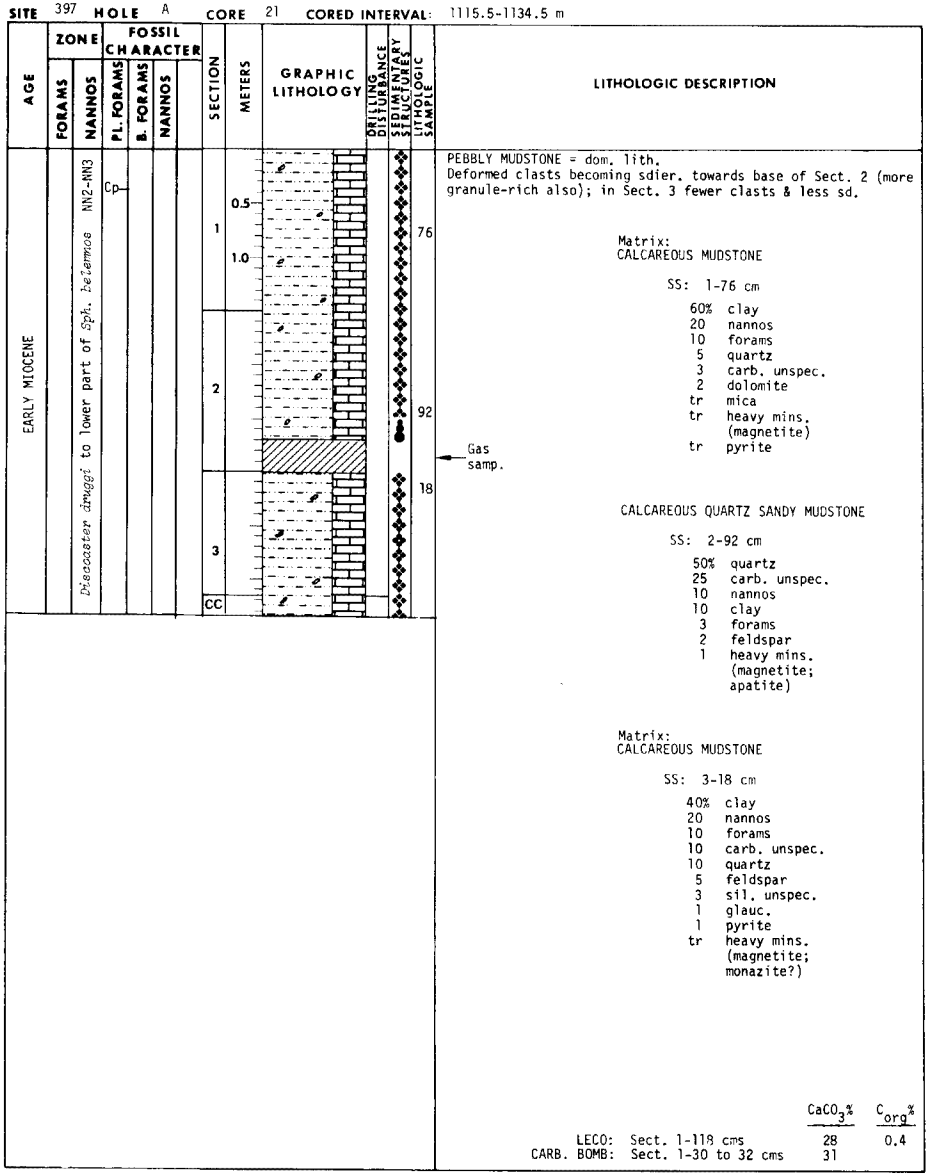
30-70%	clay
5-20	carb. unspec.
5-20	quartz
10-15	forams
2-14	nannos
tr- 8	dolomite
1- 5	feldspar
tr	glauc. (SS: 3-130 cm)

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-91 cms	12	1.2
CARB. BOMB:	Sect. 4-63 to 65 cms	22	

COLOR LEGEND

1 = med. bl. gy. 5B 6/1
2 = dk. grn. gy. 5GY 4/1

SITE 397 HOLE A CORE 21 CORED INTERVAL: 1115.5-1134.5 m



PEBBLY MUDSTONE = dom. lith.
Deformed clasts becoming sdier. towards base of Sect. 2 (more granule-rich also); in Sect. 3 fewer clasts & less sd.

Matrix:
CALCAREOUS MUDSTONE

SS: 1-76 cm

60%	clay
20	nannos
10	forams
5	quartz
3	carb. unspec.
2	dolomite
tr	mica
tr	heavy mins. (magnetite)
tr	pyrite

CALCAREOUS QUARTZ SANDY MUDSTONE

SS: 2-92 cm

50%	quartz
25	carb. unspec.
10	nannos
10	clay
3	forams
2	feldspar
1	heavy mins. (magnetite; apatite)

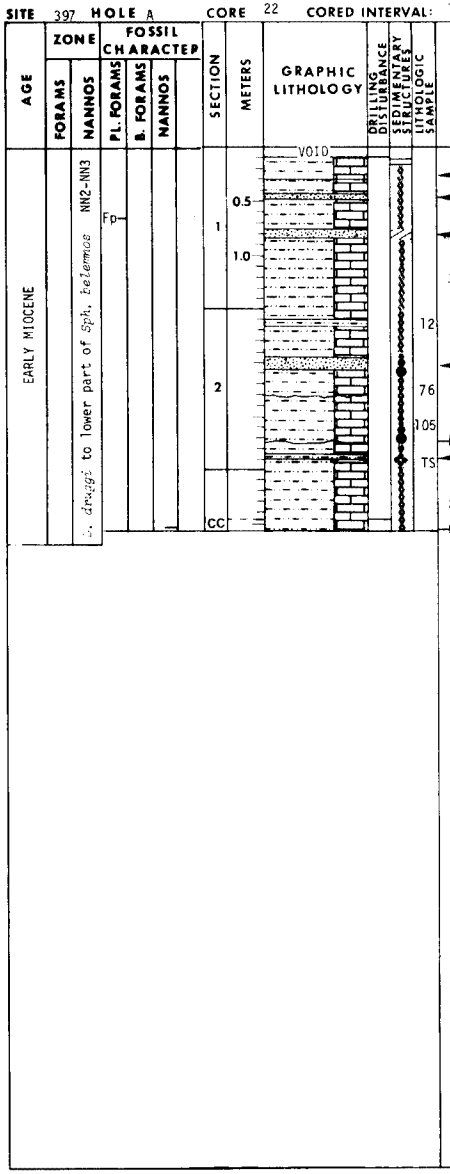
Matrix:
CALCAREOUS MUDSTONE

SS: 3-18 cm

40%	clay
20	nannos
10	forams
10	carb. unspec.
10	quartz
5	feldspar
3	sil. unspec.
1	glauc.
1	pyrite
tr	heavy mins. (magnetite; monazite?)

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-118 cms	28	0.4
CARB. BOMB:	Sect. 1-30 to 32 cms	31	

SITE 397 HOLE A CORE 22 CORED INTERVAL: 1134.5-1153.5 m



Sequence of burrowed CALCAREOUS MUDSTONES = dom. lith. with intercalations of sd. & silt layers; numerous hor. composite burrows.

Sdy. lam. sequence of sdy. mudstones.

Ungraded sd. with carb. cement, lt. gy. (N-7).

Fn. sd., x-bedded, lt. ol. gy. (5Y 5/2).

Graded silty layer with organic mat'l.; ol. gy. (5Y 3/2).

Slumped zone with clasts of wht. LS.

CALCAREOUS MUDSTONE
(ol. gy., 5Y 3/2)

SS: 2-12 cm

50%	clay
20	carb. unspec.
15	nannos
5	dolomite
3	forams
3	quartz
1	heavy mins. (magnetite)
1	pyrite
1	sil. unspec.
1	organic mat'l.
tr	feldspar
tr	glauc.

Gen. lith.:
MUDSTONES

SS: 2-76 cm

70%	clay
20	nannos
5	carb. unspec.
tr	forams
tr	dolomite
tr	quartz
tr	mica
tr	pyrite

CALCAREOUS MUDSTONE

SS: 2-105 cm

40%	clay
25	forams
15	nannos
10	carb. unspec.
5	quartz
2	heavy mins. (magnetite)
2	pyrite
1	dolomite
tr	feldspar
tr	mica

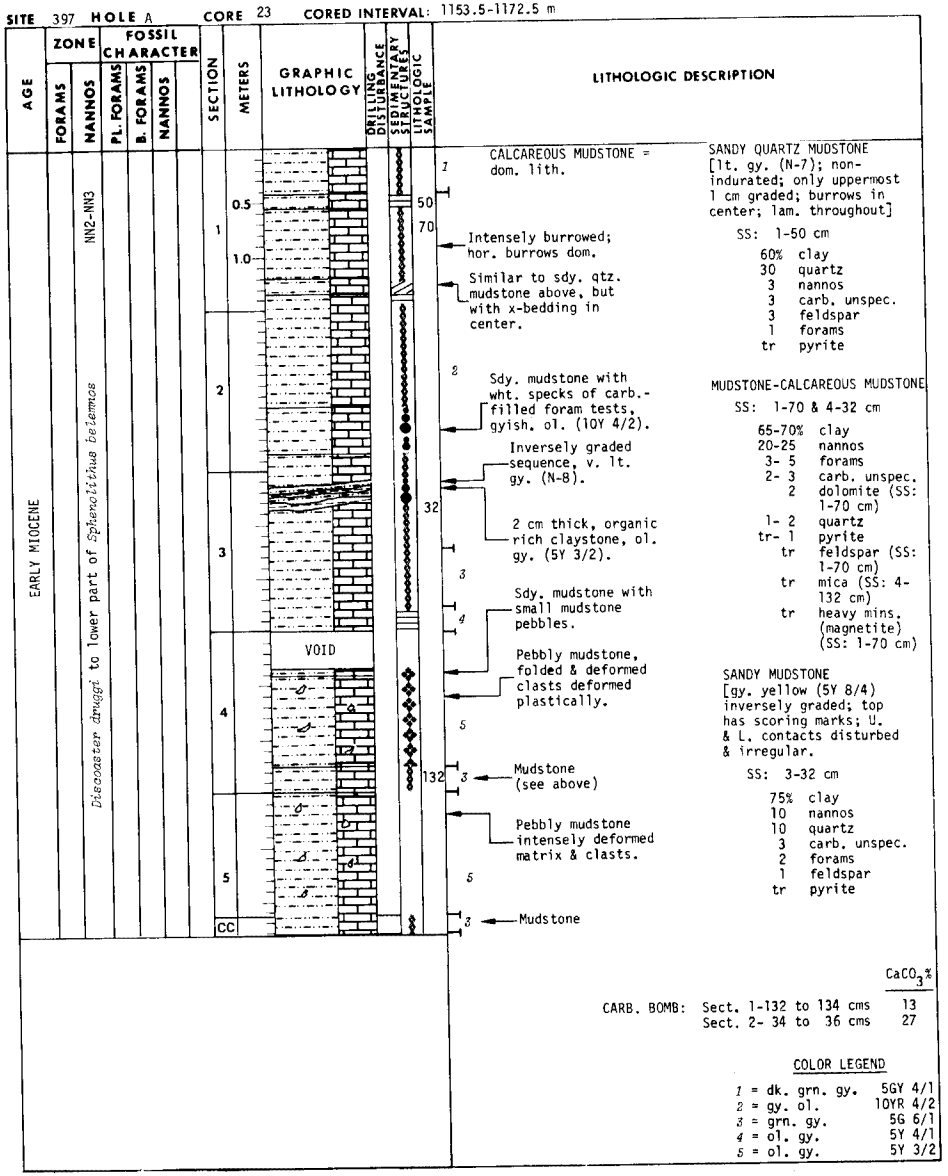
In thin-sect. (TS):
CALCAREOUS QUARTZ MUDSTONE
(dominant grain-size: 0.05-0.1 mm)

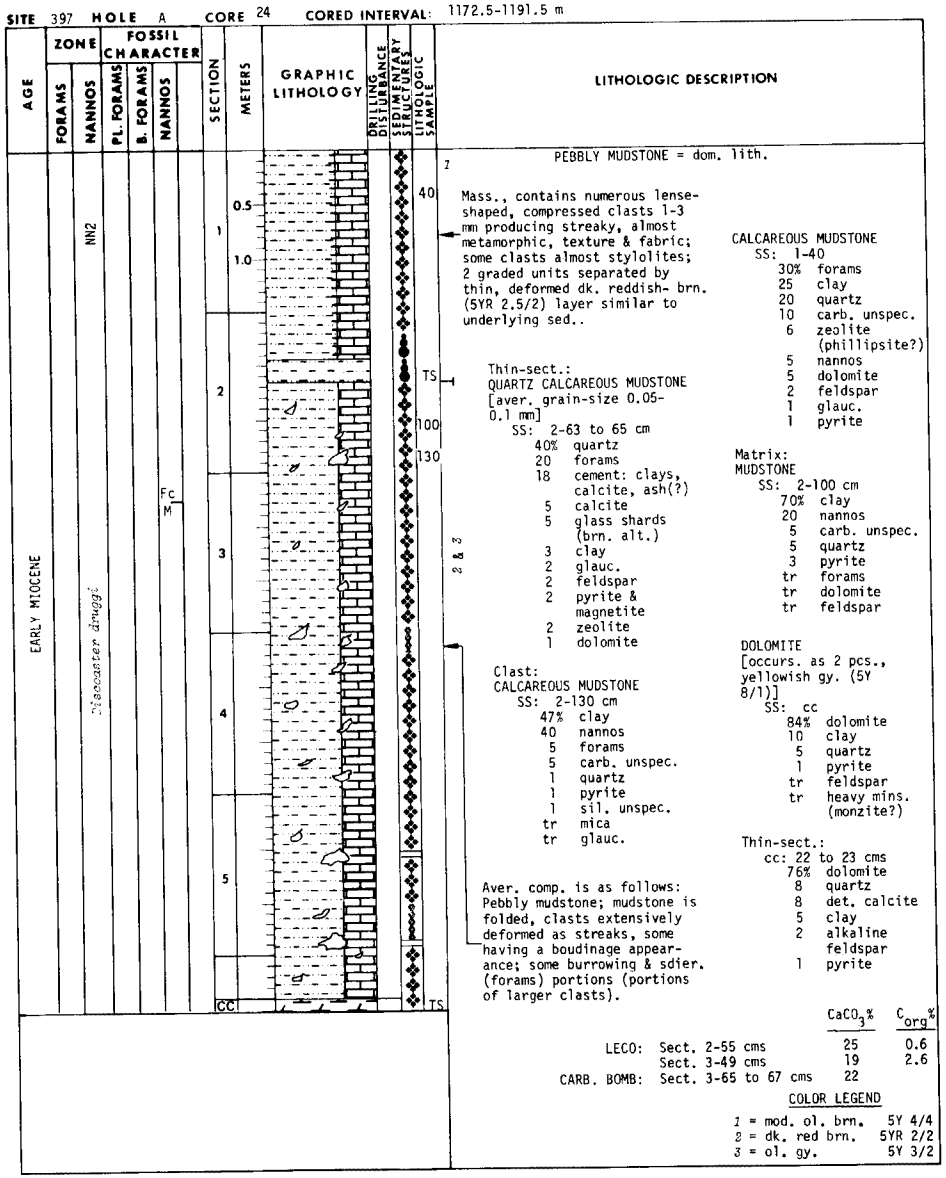
40%	calcite cement
40	quartz
12	forams
5	alkaline
5	feldspar
1	carb. unspec.
tr	monazite(?) & other ore mins. (grains angular)

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-55 cms	22	0.4
CARB. BOMB:	Sect. 1-59 to 61 cms	22	

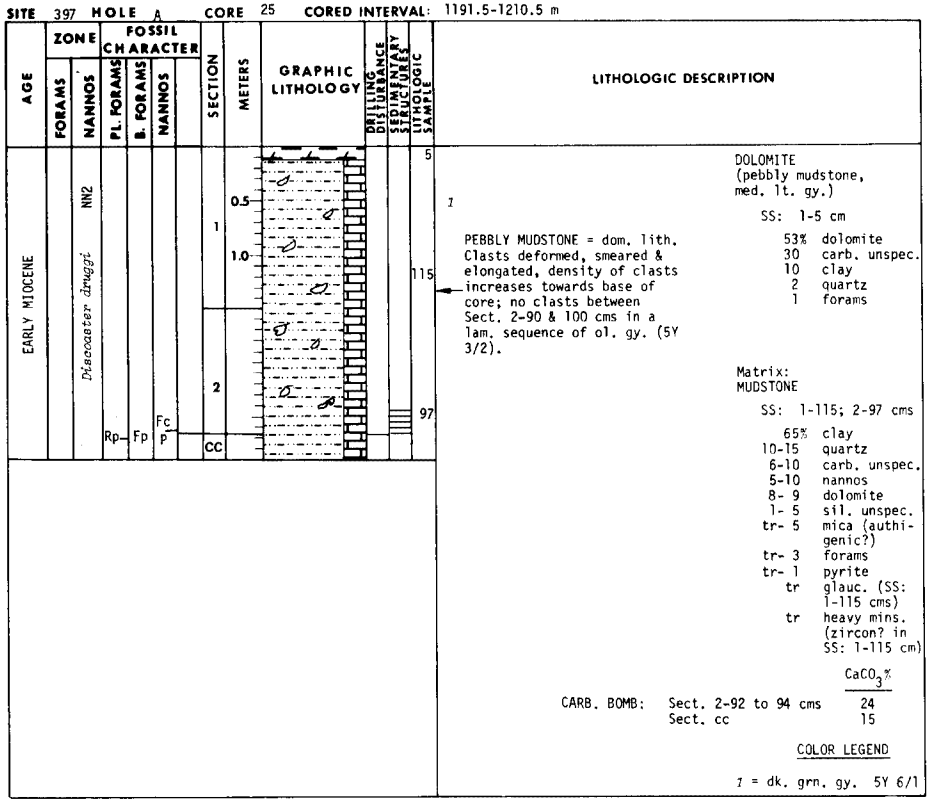
COLOR LEGEND

1 = gy. ol. grn. 5GY 3/2
2 = pale ol. 10Y 6/2


SITE 397 HOLE A CORE 23 CORED INTERVAL: 1153.5-1172.5 m
AGE
ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
PL. FORAMS
B. FORAMS
NANNOS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
EARLY MIOCENE
NN2-NN3
Discoaster druggi to lower part of Sphenolithus belemnos
VOID
CC
CALCAREOUS MUDSTONE = dom. lith.
Intensely burrowed; hor. burrows dom.
Similar to sdy. qtz. mudstone above, but with x-bedding in center.
Sdy. mudstone with wht. specks of carb.-filled foram tests, gyish. ol. (10Y 4/2).
Inversely graded sequence, v. lt. gy. (N-8).
2 cm thick, organic rich claystone, ol. gy. (5Y 3/2).
Sdy. mudstone with small mudstone pebbles.
Pebbly mudstone, folded & deformed clasts deformed plastically.
Mudstone (see above)
Pebbly mudstone intensely deformed matrix & clasts.
Mudstone
SANDY QUARTZ MUDSTONE [lt. gy. (N-7); non-indurated; only uppermost 1 cm graded; burrows in center; lam. throughout]
SS: 1-50 cm
60% clay
30 quartz
3 nannos
3 carb. unspec.
3 feldspar
1 forams
tr pyrite
MUDSTONE-CALCAREOUS MUDSTONE
SS: 1-70 & 4-32 cm
65-70% clay
20-25 nannos
3- 5 forams
2- 3 carb. unspec.
2 dolomite (SS: 1-70 cm)
1- 2 quartz
tr- 1 pyrite
tr feldspar (SS: 1-70 cm)
tr mica (SS: 4-132 cm)
tr heavy mins. (magnetite) (SS: 1-70 cm)
SANDY MUDSTONE [gy. yellow (5Y 8/4) inversely graded; top has scoring marks; U. & L. contacts disturbed & irregular.
SS: 3-32 cm
75% clay
10 nannos
10 quartz
3 carb. unspec.
2 forams
1 feldspar
tr pyrite
CaCO3%
CARB. BOMB: Sect. 1-132 to 134 cms 13
Sect. 2- 34 to 36 cms 27
COLOR LEGEND
1 = dk. grn. gy. 5GY 4/1
2 = gy. ol. 10YR 4/2
3 = grn. gy. 5G 6/1
4 = ol. gy. 5Y 4/1
5 = ol. gy. 5Y 3/2


SITE 397 HOLE A CORE 24 CORED INTERVAL: 1172.5-1191.5 m
AGE
ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
PL. FORAMS
B. FORAMS
NANNOS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
EARLY MIOCENE
NN2
Discoaster druggi
CC
PEBBLY MUDSTONE = dom. lith.
Mass., contains numerous lense-shaped, compressed clasts 1-3 mm producing streaky, almost metamorphic, texture & fabric; some clasts almost stylolites; 2 graded units separated by thin, deformed dk. reddish- brn. (5YR 2.5/2) layer similar to underlying sed..
Thin-sect.:
QUARTZ CALCAREOUS MUDSTONE [aver. grain-size 0.05-0.1 mm]
SS: 2-63 to 65 cm
40% quartz
20 forams
18 cement: clays, calcite, ash(?)
5 calcite
5 glass shards (brn. alt.)
3 clay
2 glauc.
2 feldspar
2 pyrite & magnetite
2 zeolite
1 dolomite
Clast:
CALCAREOUS MUDSTONE
SS: 2-130 cm
47% clay
40 nannos
5 forams
5 carb. unspec.
1 quartz
1 pyrite
1 sil. unspec.
tr mica
tr glauc.
Aver. comp. is as follows: Pebbly mudstone; mudstone is folded, clasts extensively deformed as streaks, some having a boudinage appearance; some burrowing & sdier. (forams) portions (portions of larger clasts).
CALCAREOUS MUDSTONE
SS: 1-40
30% forams
25 clay
20 quartz
10 carb. unspec.
6 zeolite (phillipsite?)
5 nannos
5 dolomite
2 feldspar
1 glauc.
1 pyrite
Matrix:
MUDSTONE
SS: 2-100 cm
70% clay
20 nannos
5 carb. unspec.
5 quartz
3 pyrite
tr forams
tr dolomite
tr feldspar
DOLOMITE
[occurs. as 2 pcs., yellowish gy. (5Y 8/1)]
SS: cc
84% dolomite
10 clay
5 quartz
1 pyrite
tr feldspar
tr heavy mins. (monzite?)
Thin-sect.:
cc: 22 to 23 cms
76% dolomite
8 quartz
8 det. calcite
5 clay
2 alkaline feldspar
1 pyrite
CaCO3% Corg%
LECO: Sect. 2-55 cms 25 0.6
Sect. 3-49 cms 19 2.6
CARB. BOMB: Sect. 3-65 to 67 cms 22
COLOR LEGEND
1 = mod. ol. brn. 5Y 4/4
2 = dk. red brn. 5YR 2/2
3 = ol. gy. 5Y 3/2

SITE 397 HOLE A CORE 25 CORED INTERVAL: 1191.5-1210.5 m



LITHOLOGIC DESCRIPTION

DOLOMITE
(pebbly mudstone, med. lt. gy.)

SS: 1-5 cm

53%	dolomite
30	carb. unspec.
10	clay
2	quartz
1	forams

PEBBLY MUDSTONE = dom. lith. Clasts deformed, smeared & elongated, density of clasts increases towards base of core; no clasts between Sect. 2-90 & 100 cms in a lam. sequence of ol. gy. (5Y 3/2).

Matrix:
MUDSTONE

SS: 1-115; 2-97 cms

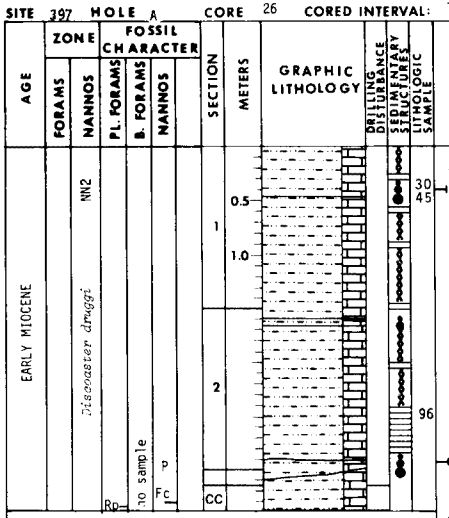
65%	clay
10-15	quartz
6-10	carb. unspec.
5-10	nannos
8- 9	dolomite
1- 5	sil. unspec.
tr- 5	mica (authigenic?)
tr- 3	forams
tr- 1	pyrite
tr	glauc. (SS: 1-115 cms)
tr	heavy mins. (zircon? in SS: 1-115 cm)

		$CaCO_3$%
CARB. BOMB:	Sect. 2-92 to 94 cms	24
	Sect. cc	15

COLOR LEGEND

1 = dk. grn. gy. 5Y 6/1

SITE 397 HOLE A CORE 26 CORED INTERVAL: 1210.5-1229.5 m



LITHOLOGIC DESCRIPTION

MUDSTONE

SS: 1-30, 45 cms

40-45%	clay
20-25	quartz
10-20	forams
10	sil. unspec. (chert?) (SS: 1-30 cm)
3-10	nannos
5	carb. unspec.
tr- 3	pyrite
2	feldspar
tr	dol. (SS: 1-45 cm)
tr	mica
tr	collophane(?) (SS: 1-30 cm)

MUDSTONE = dom. lith.
In gen. an alt. sequence of mudstones, some with faint lam. (lt. ol. gy., 5Y 5/2) & some sequences burrowed (v. dk. gy. brn., 10YR 3/2; grn. gy., (5G 6/1); gen. a dk. gy. brn. (10YR 4/2); lam. dip ~15-17°.

MUDSTONE

SS: 2-96 cm

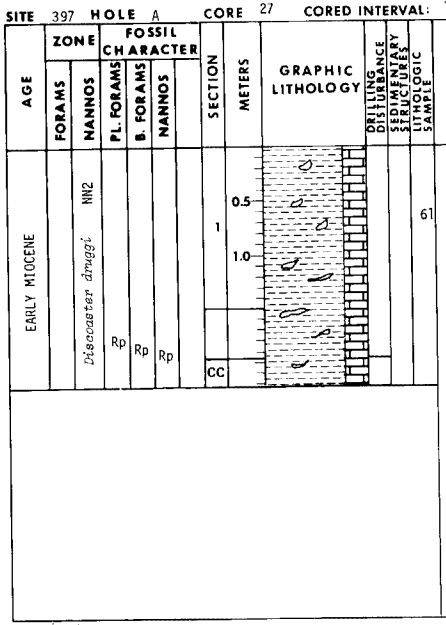
80%	clay
10	nannos
4	quartz
3	carb. unspec.
2	forams
1	mica

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1- 36 cms	23	2.3
CARB. BOMB:	Sect. 1- 37 to 39 cms	22	
	Sect. 2-103 to 105 cms	15	

COLOR LEGEND

1 = very dk. gy. brn.	10YR 3/2
2 = dk. gy. brn.	10YR 4/2
3 = gy. brn.	10YR 5/2

SITE 397 HOLE A CORE 27 CORED INTERVAL: 1229.5-1239 m



PEBBLY MUDSTONE = dom. lith. Clasts def. - lenticular stretched, often to produce a migmatitic texture; sdier. portions (Sect. 1-15 to 20 cms, 64 & 78 cms), dips of vague lam. 18 to 25°.

Matrix:
CLAYSTONE

SS: 1-61

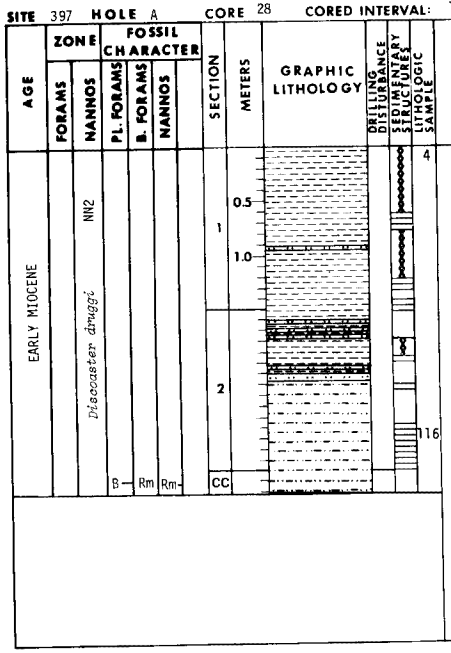
75% clay
15 nannos
9 carb. unspec.
4 quartz
1 pyrite
tr mica

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-89 cms	15	0.7
CARB. BOMB:	Sect. 2-33 to 35 cms	22	

COLOR LEGEND

1 = grn. blk. 5G 2/1
2 = lt. bl. gy. 5B 7/1
3 = dk. gy. brn. 10YR 4/2
4 = dk. gy. 5Y 4/1

SITE 397 HOLE A CORE 28 CORED INTERVAL: 1239-1248.5 m



Alt. sequence of burrowed sed. with lam. & homog. mat'l. often burrowed only in its upper portion; numerous intercalated silt & sandstone layers; dips of 22-24° in Sect. 2; silt & sd. layers 1 to 10 cms thick; colors variable: burrowed mat'l. dk. grn. gy. (5G 4/1), v. dk. gy. (10YR 3/1) wht. more homog. non-burrowed portions dk. brn. (10YR 3/3) to v. dk. gy. (10YR 3/1); in gen. the sed. is a:

CLAYSTONE

SS: 1-4 cm

88% clay
10 nannos
2 quartz
tr carb. unspec.
tr mica
tr pyrite
tr sponge spics.

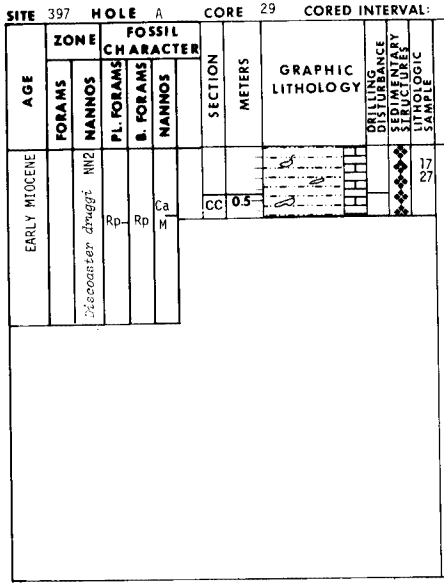
CALCAREOUS MUDSTONE
(homog. sequence)

SS: 2-116 cm

28% clay
18 quartz
10 nannos
10 dolomite
10 carb. unspec.
3 feldspar
1 mica
tr pyrite

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-137 cms	10	0.3
CARB. BOMB:	Sect. 1- 80 to 82 cms	9	

SITE 397 HOLE A CORE 29 CORED INTERVAL: 1248.5-1258 m



PEBBLY MUDSTONE = dom. lith. Clasts completely streaked & distorted, clast's size range from 0.5 to 1.5 cms; gen. dip of ~21°.

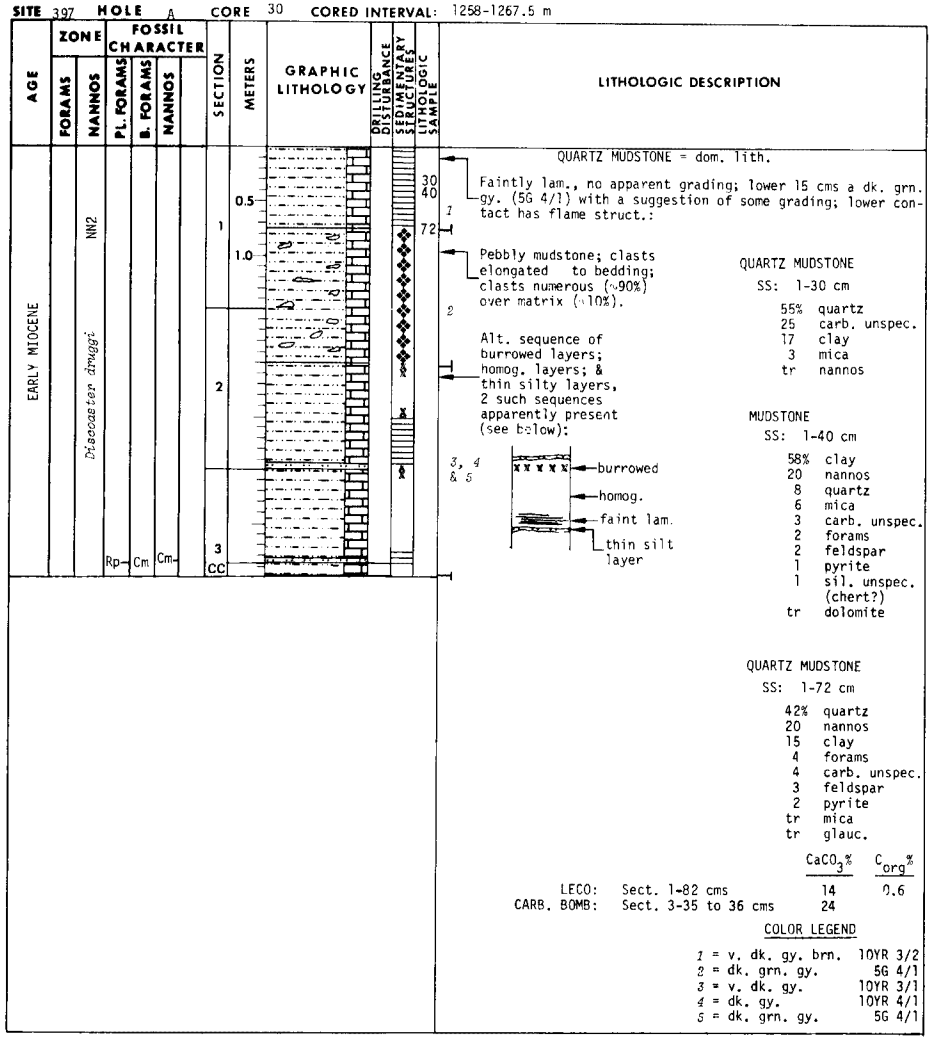
MUDSTONE
(taken from both matrix & clast-SS: 1-17 & 27 cms, respectively)

SS: 1-17, 27 cm

64-74% clay
15-20 nannos
4- 6 sil. unspec. (chert? or v. fn.-grained metaqtzite frags.)
3- 6 quartz
2- 4 carb. unspec.
1 pyrite (SS: 1-17 cm)
1 mica (SS: 1-17 cm)
tr forams (SS: 1-27 cm)
tr dolomite (SS: 1-17 cm)

		$CaCO_3$%
CARB. BOMB:	Sect. 1-40 to 42 cms	19
	Sect. 1-68 to 70 cms	14

SITE 397 HOLE A CORE 30 CORED INTERVAL: 1258-1267.5 m



QUARTZ MUDSTONE = dom. lith.

Faintly lam., no apparent grading; lower 15 cms a dk. grn. gy. (5G 4/1) with a suggestion of some grading; lower contact has flame struct.:

Pebbly mudstone; clasts elongated to bedding; clasts numerous (~90%) over matrix (~10%).

Alt. sequence of burrowed layers; homog. layers; & thin silty layers, 2 such sequences apparently present (see below):

QUARTZ MUDSTONE
SS: 1-30 cm

55%	quartz
25	carb. unspec.
17	clay
3	mica
tr	nannos

MUDSTONE
SS: 1-40 cm

58%	clay
20	nannos
8	quartz
6	mica
3	carb. unspec.
2	forams
2	feldspar
1	pyrite
1	sil. unspec. (chert?)
tr	dolomite

QUARTZ MUDSTONE
SS: 1-72 cm

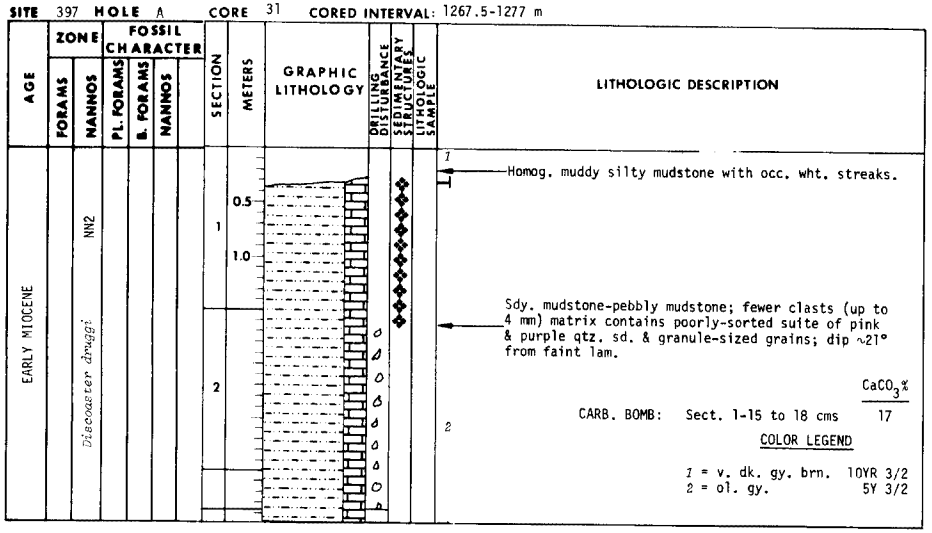
42%	quartz
20	nannos
15	clay
4	forams
4	carb. unspec.
3	feldspar
2	pyrite
tr	mica
tr	glauc.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-82 cms	14	0.6
CARB. BOMB:	Sect. 3-35 to 36 cms	24	

COLOR LEGEND

1 = v. dk. gy. brn.	10YR 3/2
2 = dk. grn. gy.	5G 4/1
3 = v. dk. gy.	10YR 3/1
4 = dk. gy.	10YR 4/1
5 = dk. grn. gy.	5G 4/1

SITE 397 HOLE A CORE 31 CORED INTERVAL: 1267.5-1277 m



Homog. muddy silty mudstone with occ. wht. streaks.

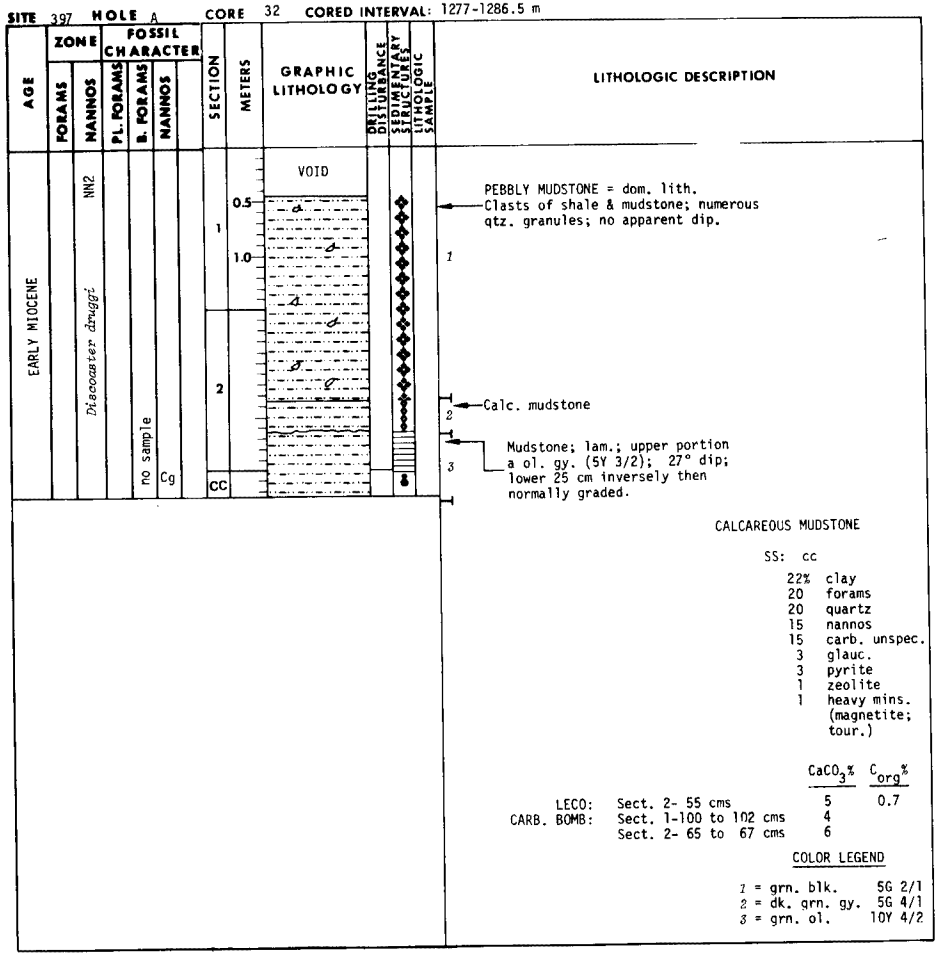
Sdy. mudstone-pebbly mudstone; fewer clasts (up to 4 mm) matrix contains poorly-sorted suite of pink & purple qtz. sd. & granule-sized grains; dip ~21° from faint lam.

		$CaCO_3$%
CARB. BOMB:	Sect. 1-15 to 18 cms	17

COLOR LEGEND

1 = v. dk. gy. brn.	10YR 3/2
2 = ol. gy.	5Y 3/2

SITE 397 HOLE A CORE 32 CORED INTERVAL: 1277-1286.5 m



LITHOLOGIC DESCRIPTION

PEBBLY MUDSTONE = dom. lith. Clasts of shale & mudstone; numerous qtz. granules; no apparent dip.

Calc. mudstone

Mudstone; lam.; upper portion a ol. gy. (5Y 3/2); 27° dip; lower 25 cm inversely then normally graded.

CALCAREOUS MUDSTONE

SS: cc

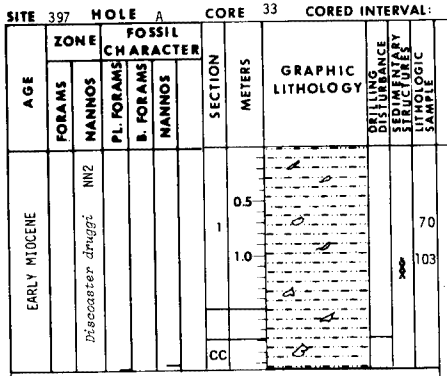
22%	clay
20	forams
20	quartz
15	nannos
15	carb. unspec.
3	glauc.
3	pyrite
1	zeolite
1	heavy mins. (magnetite; tour.)

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2- 55 cms	5	0.7
CARB. BOMB:	Sect. 1-100 to 102 cms	4	
	Sect. 2- 65 to 67 cms	6	

COLOR LEGEND

1 = grn. blk. 5G 2/1
2 = dk. grn. gy. 5G 4/1
3 = grn. ol. 10Y 4/2

SITE 397 HOLE A CORE 33 CORED INTERVAL: 1286.5-1296 m



LITHOLOGIC DESCRIPTION

PEBBLY MUDSTONE = dom. lith. Clasts stretched, streaked, smeared, pulled apart (boudinage), imbrication suggests 20° dip; 110-120 cms (Sect. 1) burrowed (part of a large clast?).

Matrix: MUDSTONE

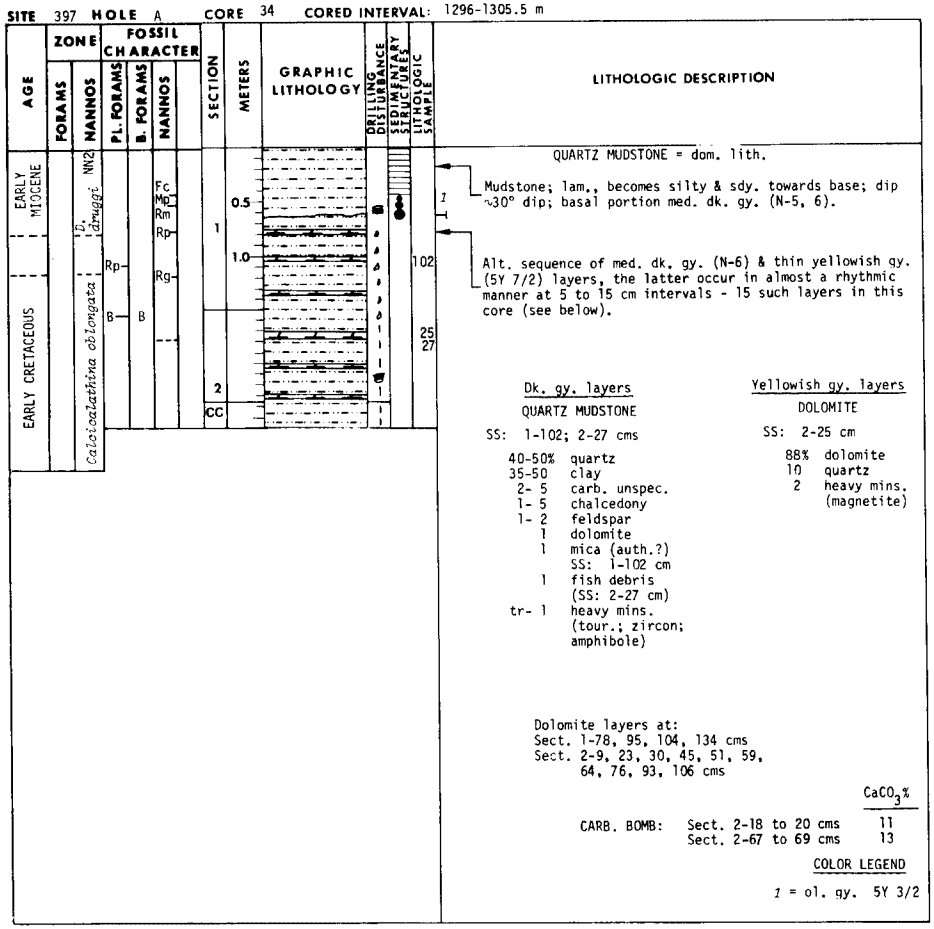
SS: 1-70, 103 cms

40-55%	clay
30-40	quartz
5	nannos
5	carb. unspec.
2- 3	forams
2	opal(?) SS: 1-103 cm)
tr- 2	feldspar
1	pyrite
tr- 1	dolomite
tr- 1	glauc.
tr	heavy mins. (magnetite; zircon - SS: 1-70 cm - tour.)

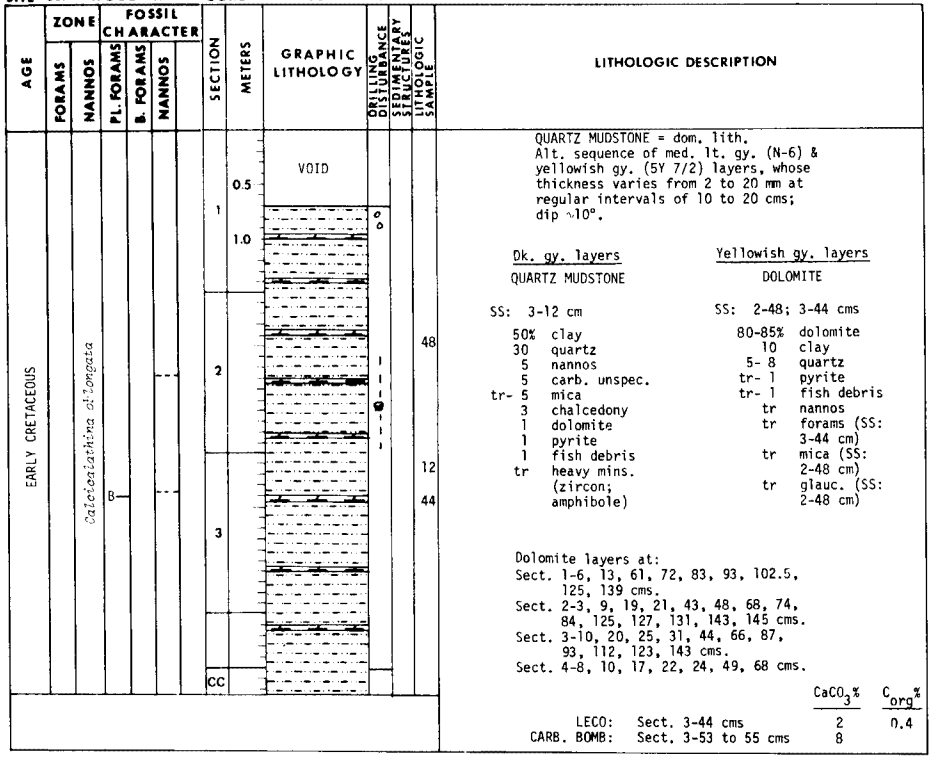
COLOR LEGEND

1 = med. bl. gy. 5B 5/1

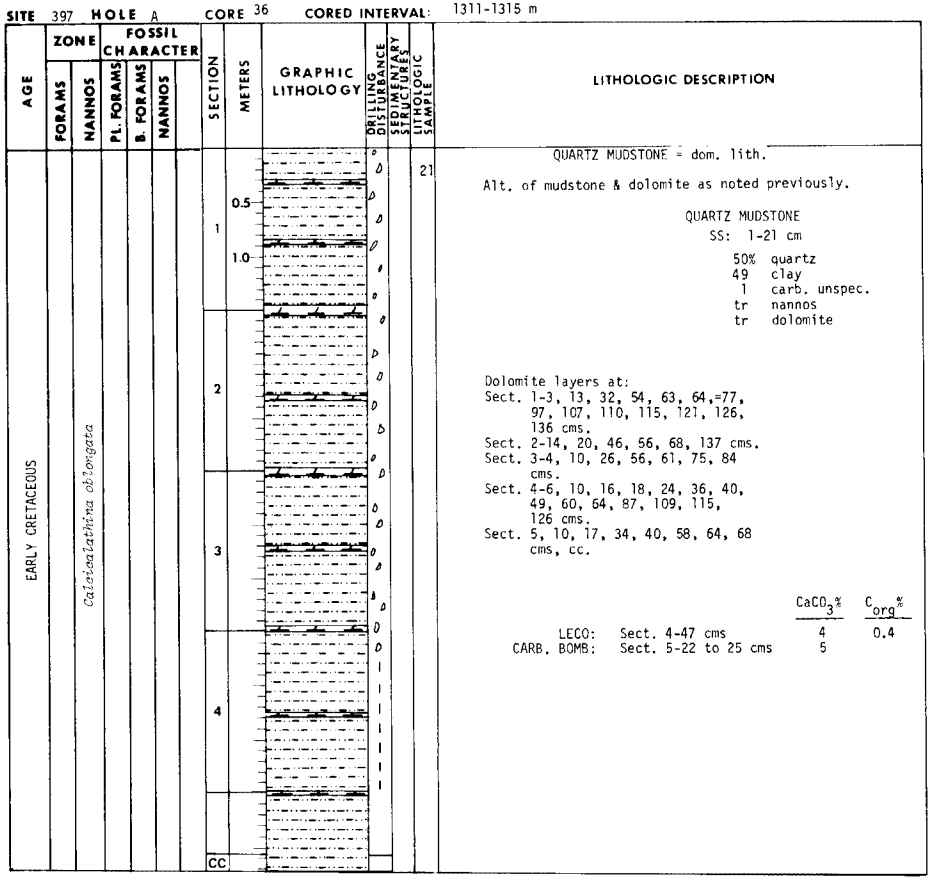
SITE 397 HOLE A CORE 34 CORED INTERVAL: 1296-1305.5 m



SITE 397 HOLE A CORE 35 CORED INTERVAL: 1305.5-1311 m



SITE 397 HOLE A CORE 36 CORED INTERVAL: 1311-1315 m



QUARTZ MUDSTONE = dom. lith.

Alt. of mudstone & dolomite as noted previously.

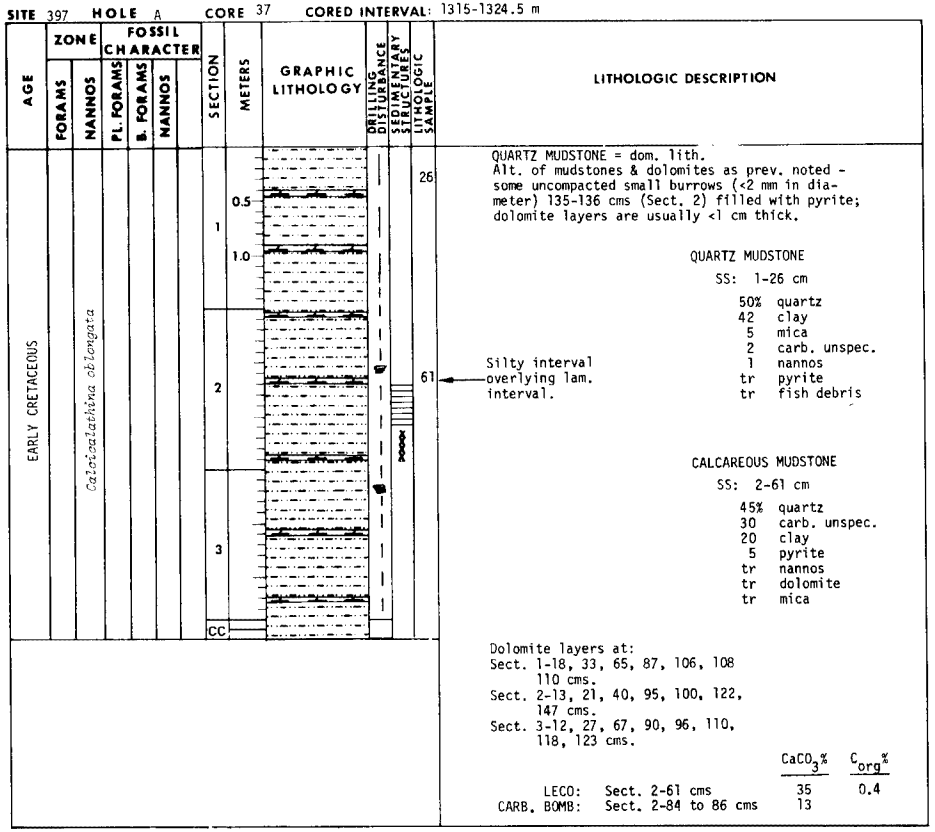
QUARTZ MUDSTONE
SS: 1-21 cm

50%	quartz
49	clay
1	carb. unspec.
tr	nannos
tr	dolomite

Dolomite layers at:
Sect. 1-3, 13, 32, 54, 63, 64,=77, 97, 107, 110, 115, 121, 126, 136 cms.
Sect. 2-14, 20, 46, 56, 68, 137 cms.
Sect. 3-4, 10, 26, 56, 61, 75, 84 cms.
Sect. 4-6, 10, 16, 18, 24, 36, 40, 49, 60, 64, 87, 109, 115, 126 cms.
Sect. 5, 10, 17, 34, 40, 58, 64, 68 cms, cc.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 4-47 cms	4	0.4
CARB. BOMB:	Sect. 5-22 to 25 cms	5	

SITE 397 HOLE A CORE 37 CORED INTERVAL: 1315-1324.5 m



QUARTZ MUDSTONE = dom. lith.
Alt. of mudstones & dolomites as prev. noted - some uncompacted small burrows (<2 mm in diameter) 135-136 cms (Sect. 2) filled with pyrite; dolomite layers are usually <1 cm thick.

QUARTZ MUDSTONE
SS: 1-26 cm

50%	quartz
42	clay
5	mica
2	carb. unspec.
1	nannos
tr	pyrite
tr	fish debris

Silty interval overlying lam. interval.

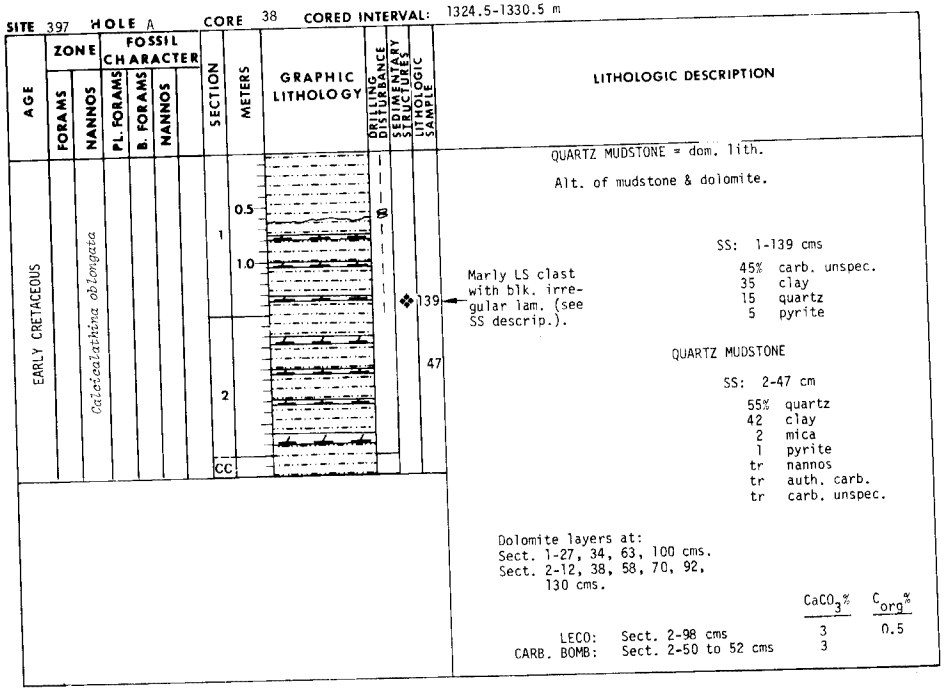
CALCAREOUS MUDSTONE
SS: 2-61 cm

45%	quartz
30	carb. unspec.
20	clay
5	pyrite
tr	nannos
tr	dolomite
tr	mica

Dolomite layers at:
Sect. 1-18, 33, 65, 87, 106, 108 110 cms.
Sect. 2-13, 21, 40, 95, 100, 122, 147 cms.
Sect. 3-12, 27, 67, 90, 96, 110, 118, 123 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-61 cms	35	0.4
CARB. BOMB:	Sect. 2-84 to 86 cms	13	

SITE 397 HOLE A CORE 38 CORED INTERVAL: 1324.5-1330.5 m



QUARTZ MUDSTONE = dom. lith.

Alt. of mudstone & dolomite.

Marly LS clast with blk. irregular lam. (see SS descrip.).

SS: 1-139 cms

45%	carb. unspec.
35	clay
15	quartz
5	pyrite

QUARTZ MUDSTONE

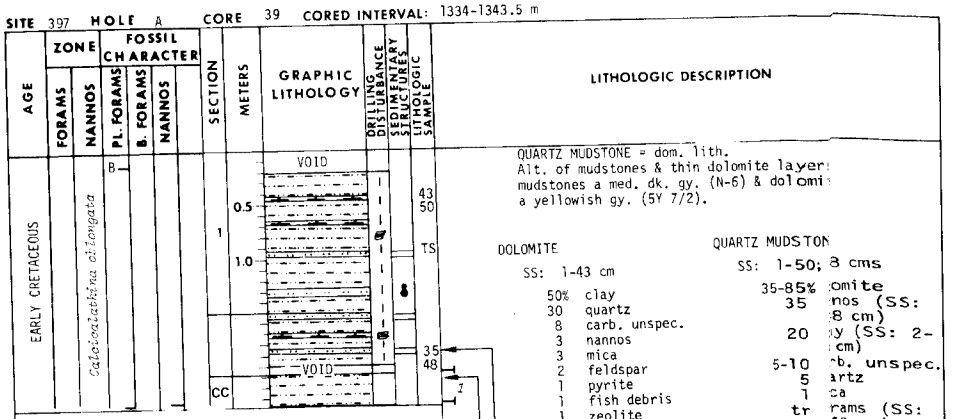
SS: 2-47 cm

55%	quartz
42	clay
2	mica
1	pyrite
tr	nannos
tr	auth. carb.
tr	carb. unspec.

Dolomite layers at:
Sect. 1-27, 34, 63, 100 cms.
Sect. 2-12, 38, 58, 70, 92, 130 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-98 cms	3	0.5
CARB. BOMB:	Sect. 2-50 to 52 cms	3	

SITE 397 HOLE A CORE 39 CORED INTERVAL: 1334-1343.5 m



QUARTZ MUDSTONE = dom. lith.
Alt. of mudstones & thin dolomite layer
mudstones a med. dk. gy. (N-6) & dolomi
a yellowish gy. (5Y 7/2).

DOLOMITE

SS: 1-43 cm

50%	clay
30	quartz
8	carb. unspec.
3	nannos
3	mica
2	feldspar
1	pyrite
1	fish debris
1	zeolite
tr- 1	heavy mins. (magnetite; tour.; apatite)

QUARTZ MUDSTON

SS: 1-50; 8 cms

35-85%	omite
35	nos (SS: 8 cm)
20	y (SS: 2- cm)
5-10	b. unspec.
5	artz
1	a
tr	rams (SS: 48 cm)

Intercalations of thin well-indurated s silt layers, sometimes with x-bedding, always th lam.; med. gy. (N-6).

Calc. mudstone with forams, shell frags (pelecypods) & 1 ammonite.

MUDSTONE

Thin-sect. (aver. grain-size: 0.06-0.12 mm):

SS: 1-95 to 97 cms

45%	calcite cement
45	quartz
3	feldspar
2	muscovite
1	magnetite
1	qtzite. rock frags.
tr	biotite
tr	chlorite
tr	glauc.
tr	zircon
tr	garnet
tr	sphene
tr	tour.

SS: 2-35 cm

37%	clay
30	quar
20	carb inspec.
3	nann
2	dolo e
1	fora
1	pyri
1	orga mat'l.
tr	mica
tr	heav mins. (tou)

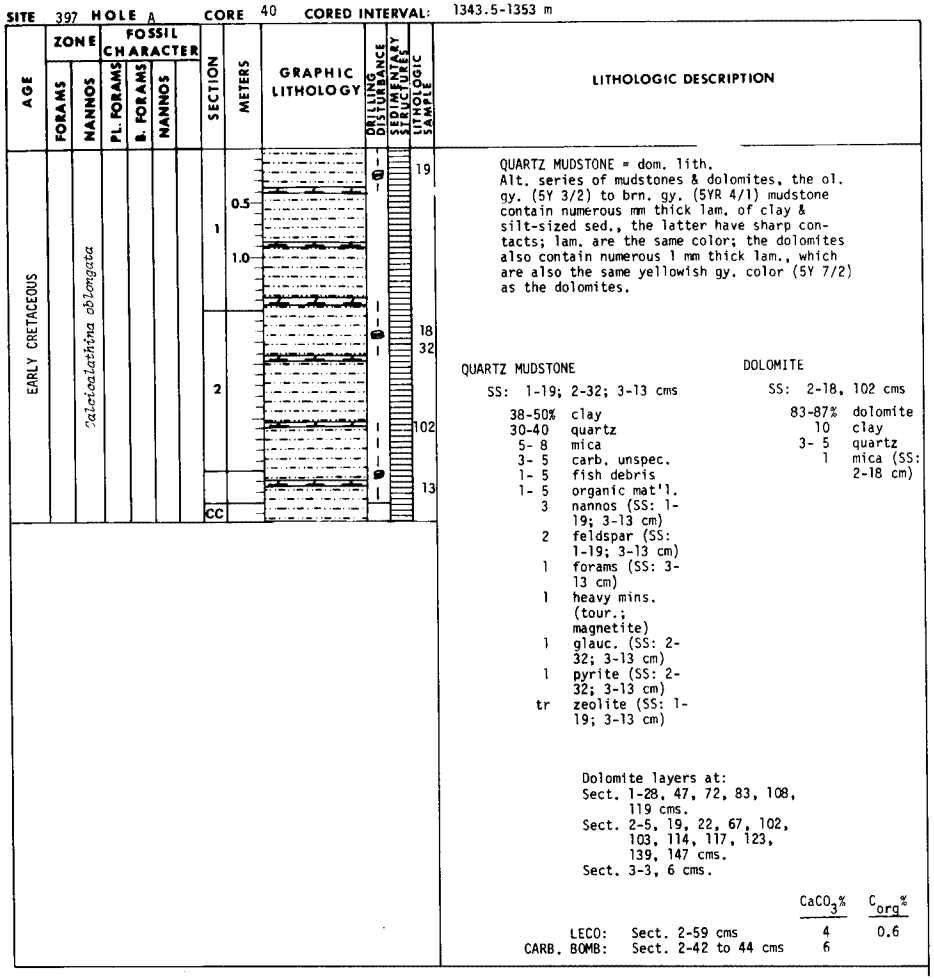
Dolomite layers at:
Sect. 1-51, 73, 81, 90, 109, 112.5, 120 cms.
Sect. 2-3, 31, 37 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-16 cms	2	0.4
CARB. BOMB:	Sect. 1-57 to 60 cms	5	

COLOR LEGEND

I = lt. ol. gy. 5Y 5/2

SITE 397 HOLE A CORE 40 CORED INTERVAL: 1343.5-1353 m



QUARTZ MUDSTONE = dom. lith.
Alt. series of mudstones & dolomites, the ol. gy. (5Y 3/2) to brn. gy. (5YR 4/1) mudstone contain numerous mm thick lam. of clay & silt-sized sed., the latter have sharp contacts; lam. are the same color; the dolomites also contain numerous 1 mm thick lam., which are also the same yellowish gy. color (5Y 7/2) as the dolomites.

QUARTZ MUDSTONE

SS: 1-19; 2-32; 3-13 cms

38-50%	clay
30-40	quartz
5- 8	mica
3- 5	carb. unspec.
1- 5	fish debris
1- 5	organic mat'l.
3	nannos (SS: 1-19; 3-13 cm)
2	feldspar (SS: 1-19; 3-13 cm)
1	forams (SS: 3-13 cm)
1	heavy mins. (tour.; magnetite)
1	glauc. (SS: 2-32; 3-13 cm)
1	pyrite (SS: 2-32; 3-13 cm)
tr	zeolite (SS: 1-19; 3-13 cm)

DOLOMITE

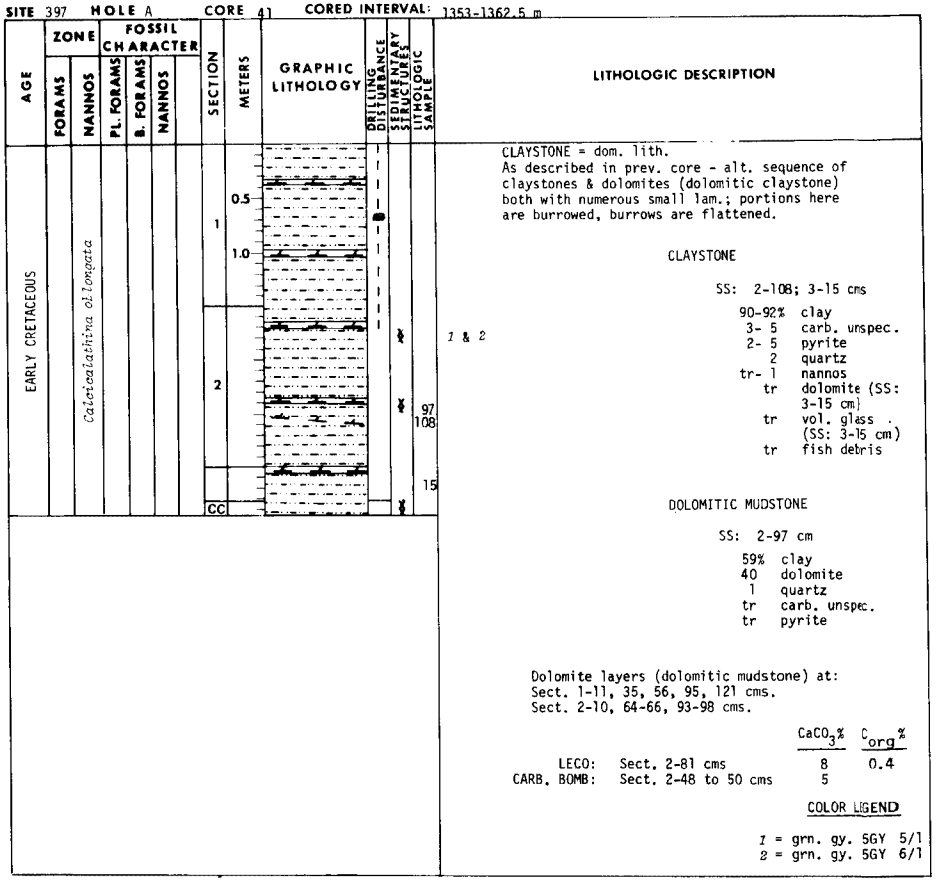
SS: 2-18, 102 cms

83-87%	dolomite
10	clay
3- 5	quartz
1	mica (SS: 2-18 cm)

Dolomite layers at:
Sect. 1-28, 47, 72, 83, 108, 119 cms.
Sect. 2-5, 19, 22, 67, 102, 103, 114, 117, 123, 139, 147 cms.
Sect. 3-3, 6 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-59 cms	4	0.6
CARB. BOMB:	Sect. 2-42 to 44 cms	6	

SITE 397 HOLE A CORE 41 CORED INTERVAL: 1353-1362.5 m



CLAYSTONE = dom. lith.
As described in prev. core - alt. sequence of claystones & dolomites (dolomitic claystone) both with numerous small lam.; portions here are burrowed, burrows are flattened.

CLAYSTONE

SS: 2-108; 3-15 cms

90-92%	clay
3- 5	carb. unspec.
2- 5	pyrite
2	quartz
tr- 1	nannos
tr	dolomite (SS: 3-15 cm)
tr	vol. glass (SS: 3-15 cm)
tr	fish debris

DOLOMITIC MUDSTONE

SS: 2-97 cm

59%	clay
40	dolomite
1	quartz
tr	carb. unspec.
tr	pyrite

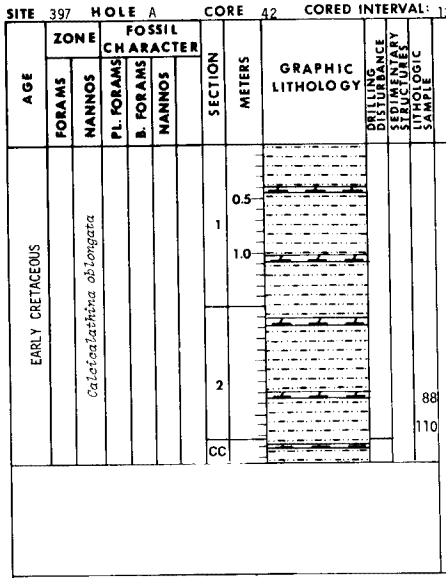
Dolomite layers (dolomitic mudstone) at:
Sect. 1-11, 35, 56, 95, 121 cms.
Sect. 2-10, 64-66, 93-98 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-81 cms	8	0.4
CARB. BOMB:	Sect. 2-48 to 50 cms	5	

COLOR LEGEND

1 = grn. gy. 5GY 5/1
2 = grn. gy. 5GY 6/1

SITE 397 HOLE A CORE 42 CORED INTERVAL: 1362.5-1372 m



LITHOLOGIC DESCRIPTION

QUARTZ MUDSTONE = dom. lith.
Alt. sequence prev. described; dolomite & mudstones both containing numerous v. thin (<1 mm) lam.:

QUARTZ MUDSTONE

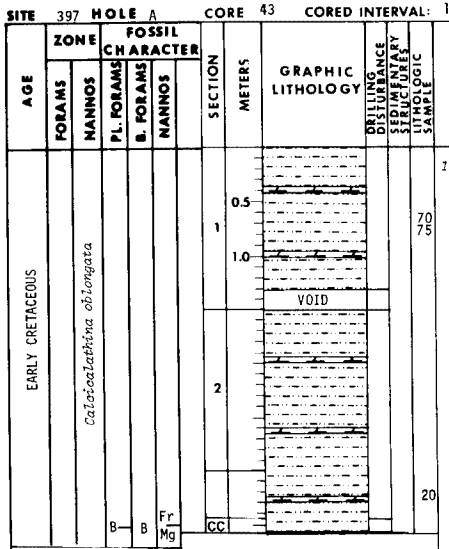
SS: 2-88, 110 cms

45-75%	clay
20-50	quartz
4	dolomite (SS: 2-88 cm)
tr- 3	carb. unspec.
1- 2	pyrite
tr	nannos
tr	fish debris

Dolomite layers at:
Sect. 1-87, 88 cms.
Sect. 2-44, 114 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-114 cms	45	0.5
CARB. BOMB:	Sect. 1- 27 to 30 cms	7	

SITE 397 HOLE A CORE 43 CORED INTERVAL: 1372-1381.5 m



1 & 2 QUARTZ MUDSTONE = dom. lith.
Alt. sequence of mudstones & dolomites.
Only occ. lam.

DOLOMITE

SS: 1-70 cm

90%	dolomite
10	clay
tr	pyrite
tr	fish debris

QUARTZ MUDSTONE

SS: 1-75; 2-20 cms

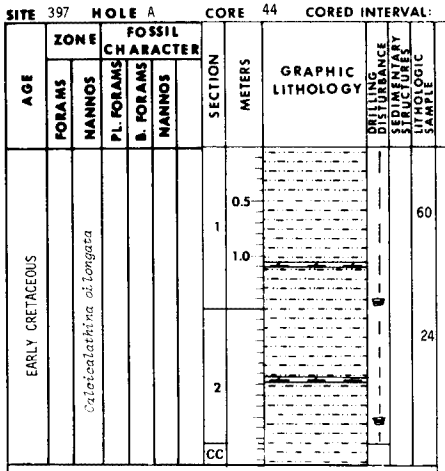
55-59%	clay
30-35	quartz
3	mica (SS: 3-20 cm)
tr- 2	nannos
tr- 2	carb. unspec.
1	feldspar (SS: 3-20 cm)
1	pyrite
tr- 1	fish debris
tr	glauc. (SS: 3-20 cm)
tr	organic mat'l. (SS: 3-20 cm)
tr	zeolite (SS: 3-20 cm)
tr	heavy mins. (SS: 3-20 cm) tour.; apatite; zircon.

Dolomite layers at:
Sect. 1-11, 26, 70 cms.
Sect. 2-16, 54, 75, 120 cms.

COLOR LEGEND

1 = wht. 5Y 8/1
2 = dk. ol. gy. 5Y 3/2

SITE 397 HOLE A CORE 44 CORED INTERVAL: 1381.5-1384.5 m



QUARTZ MUDSTONE = dom. lith.
Alt. mudstones & dolomites.

QUARTZ MUDSTONE

SS: 1-60; 2-24 cms

53-69%	clay
30-45	quartz
1	pyrite (SS: 2-24 cm)
tr- 1	carb. unspec.
tr- 1	fish debris
tr	nannos
tr	dolomite
tr	plant debris (SS: 2-24 cm)

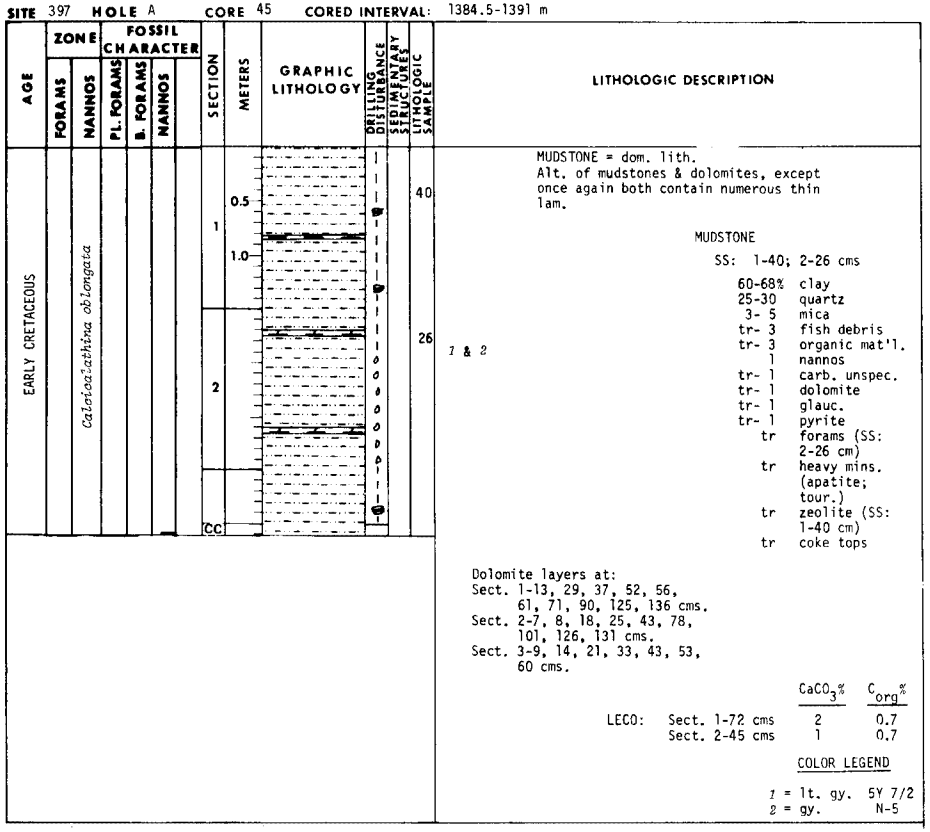
Dolomite layers at:
Sect. 2-34, 43 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2-65 cms	1	0.7
CARB. BOMB:	Sect. 1-24 to 27 cms	2	

COLOR LEGEND

1 = med. gy. brn. 5Y 4/2
2 = med. gy. brn. 5Y 3/2

SITE 397 HOLE A CORE 45 CORED INTERVAL: 1384.5-1391 m



MUDSTONE = dom. lith.
Alt. of mudstones & dolomites, except once again both contain numerous thin lam.

MUDSTONE
SS: 1-40; 2-26 cms

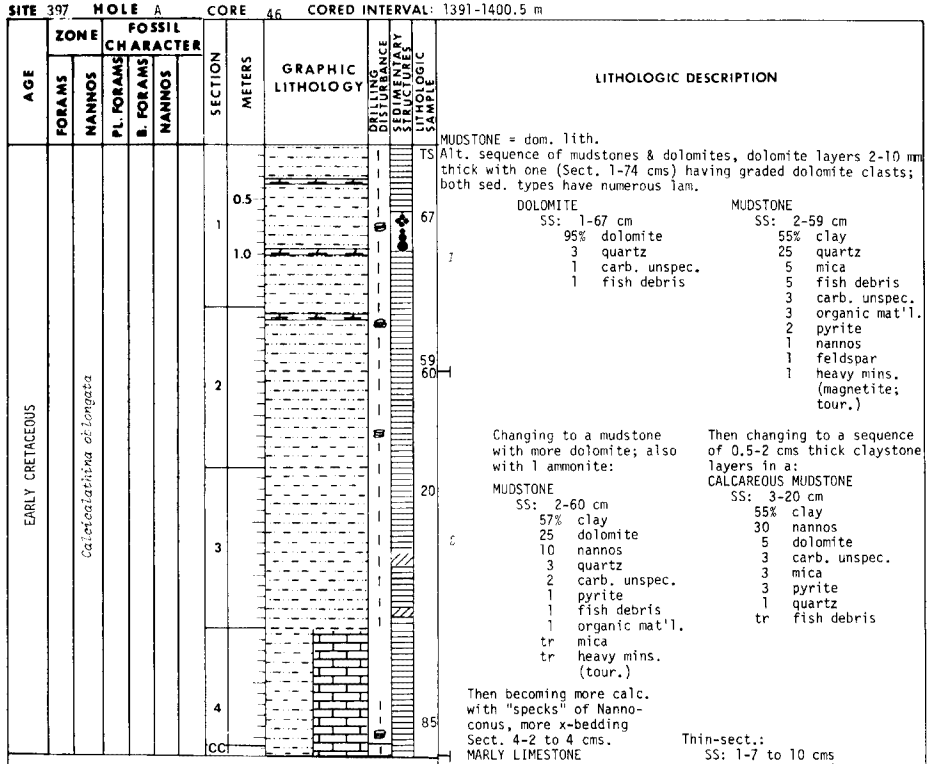
60-68%	clay
25-30	quartz
3- 5	mica
tr- 3	fish debris
tr- 3	organic mat'l.
1	nannos
tr- 1	carb. unspec.
tr- 1	dolomite
tr- 1	glauc.
tr- 1	pyrite
tr	forams (SS: 2-26 cm)
tr	heavy mins. (apatite; tour.)
tr	zeolite (SS: 1-40 cm)
tr	coke tops

Dolomite layers at:
Sect. 1-13, 29, 37, 52, 56, 61, 71, 90, 125, 136 cms.
Sect. 2-7, 8, 18, 25, 43, 78, 101, 126, 131 cms.
Sect. 3-9, 14, 21, 33, 43, 53, 60 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-72 cms	2	0.7
	Sect. 2-45 cms	1	0.7

COLOR LEGEND
1 = lt. gy. 5Y 7/2
2 = gy. N-5

SITE 397 HOLE A CORE 46 CORED INTERVAL: 1391-1400.5 m



MUDSTONE = dom. lith.
Alt. sequence of mudstones & dolomites, dolomite layers 2-10 mm thick with one (Sect. 1-74 cms) having graded dolomite clasts; both sed. types have numerous lam.

DOLOMITE
SS: 1-67 cm

95%	dolomite
3	quartz
1	carb. unspec.
1	fish debris

MUDSTONE
SS: 2-59 cm

55%	clay
25	quartz
5	mica
5	fish debris
3	carb. unspec.
3	organic mat'l.
2	pyrite
1	nannos
1	feldspar
1	heavy mins. (magnetite; tour.)

Changing to a mudstone with more dolomite; also with 1 ammonite:

MUDSTONE
SS: 2-60 cm

57%	clay
25	dolomite
10	nannos
3	quartz
2	carb. unspec.
1	pyrite
1	fish debris
1	organic mat'l.
tr	mica
tr	heavy mins. (tour.)

Then changing to a sequence of 0.5-2 cms thick claystone layers in a:
CALCAREOUS MUDSTONE
SS: 3-20 cm

55%	clay
30	nannos
5	dolomite
3	carb. unspec.
3	mica
3	pyrite
1	quartz
tr	fish debris

Then becoming more calc. with "specks" of Nannoconus, more x-bedding Sect. 4-2 to 4 cms.
MARLY LIMESTONE
SS: 4-85 cm

45%	clay
25	nannos
20	dolomite
5	mica
3	carb. unspec.
1	quartz
1	pyrite
tr	fish debris

Thin-sect.:
SS: 1-7 to 10 cms

76%	dolomite (avg. grain-size ~0.1 mm)
16	clay mins.
5	quartz (avg. grain-size ~0.05 mm)
3	calcite
tr	muscovite
tr	magnetite
tr	fish debris

Yellow-gy. calc. mudstone layers at: Sect. 4-43 & 75 cms.

Claystone layers at:
Sect. 3-13 to 15; 32 to 34; 53; 78 to 81 cms.

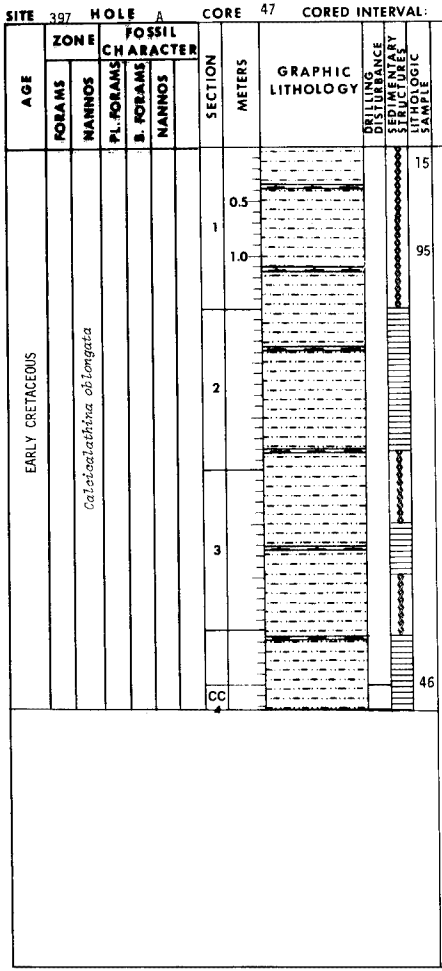
Dolomite layers at:
Sect. 1-23, 28, 30, 39, 57, 68, 74, 88, 99, 108, 112 cms.
Sect. 2-22, 27, 36, 42, 61, 71, 85, 122 cms.
Sect. 4-75 cms.

X-bedding between:
Sect. 3-86 to 90 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-100 cms	12	0.5
CARB. BOMB:	Sect. 3- 83 to 85 cms	22	

COLOR LEGEND
1 = med. bl. gy. 5B 5/1
2 = dk. grn. gy. 6GY 4/1

SITE 397 HOLE A CORE 47 CORED INTERVAL: 1400.5-1410 m



LITHOLOGIC DESCRIPTION

MUDSTONE = dom. lith.
Alt. of mudstones & dolomites; numerous v. fn. lam., varve-like (e.g. 1-12 cms, Sect. 2, has 9 varve couplets) with individual lam. 50.25-0.50 cm thick; small Helminthoid burrows mainly in more clay-rich lam. so that lam. texture is not disturbed; some siltier intervals.

MUDSTONE

SS: 1-15, 95 cms

67-70%	clay
23	quartz
2	feldspar
2	fish debris
2	plant debris
1- 2	nannos
tr- 2	carb. unspec.
tr	forams (SS: 1-15 cm)
tr	pyrite

Siltier layers composed of carb. mat'l; v. fn.-grained; e.g.:

LIMESTONE

SS: 4-46 cm

85%	carb. unspec.
10	clay
4	dolomite
1	pyrite
tr	mica

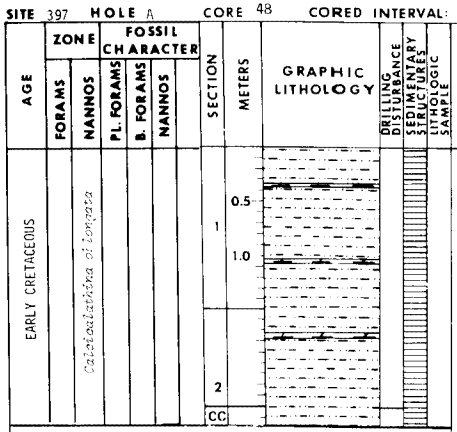
Dolomite layers at:
Sect. 1-142 cms.
Sect. 2-12, 40, 55, 68, 81, 84, 95, 149 cms.
Sect. 3-51, 52, 53, 74, 86, 94, 95, 96, 126, 127, 128 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 1-54 cms	44	0.4
CARB. BOMB:	Sect. 1-22 to 24 cms	6	

COLOR LEGEND

1 = dk. grn. gy. 5G 4/1

SITE 397 HOLE A CORE 48 CORED INTERVAL: 1410-1419.5 m



LITHOLOGIC DESCRIPTION

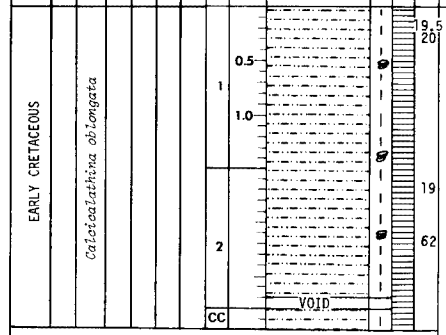
MUDSTONE = dom. lith.
Mudstones & dolomite sequences; lam. as described for C.47, but here with less intense burrowing; siltier layers Sect. 1-24 to 26, 49, 89, 114 cms; Sect. 2-24 to 26, 56 to 58, 85 to 88 cms.

Dolomite layers at:
Sect. 1-24, 25, 26, 49, 89, 114 cms.
Sect. 2-24, 25, 26, 56, 57, 58, 85, 86, 87, 88 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 2- 4 cms	3	0.8
CARB. BOMB:	Sect. 1-101 to 103 cms	7	

SITE 397 HOLE A CORE 49 CORED INTERVAL: 1419.5-1429 m

AGE: EARLY CRETACEOUS
ZONE: FORAMS; NANNOS: *Calciotathina oblongata*
FOSSIL CHARACTER: PL. FORAMS; B. FORAMS; NANNOS
SECTION; METERS; GRAPHIC LITHOLOGY; DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE



LITHOLOGIC DESCRIPTION

MUDSTONE = dom. lith.
Alt. sequence of mudstone (med. dk. gy., N-6) & dolomites (lt. brn. gy., 5YR 6/1); dolomite sequences occur as thin layers (mm-thick); mudstones are also lam. with lam. thicknesses to 3 mm often containing yellowish spots of dolomite; dolomite lam. at Sect. 1-37, 89, 117 cms; Sect. 2-9, 18, 46, 68, 76 to 84, 91, 101, 109 cms; blk. lam. 0.5 mm thick occur in Sect. 1-121 and 135 cms; piece of wood debris found in Sect. 2-53 cms.

Darker lam.:
MUDSTONE

SS: 1-19.5 cm

50%	clay
35	quartz
5	mica
3	fish debris
2	carb. unspec.
1	pyrite
tr	dolomite
tr	heavy mins. (tour.; apatite)

Lt.-gy. lam.:
MUDSTONE

SS: 1-20 cm

88%	clay
5	quartz
2	nannos
2	carb. unspec.
2	mica
1	pyrite
tr	organic mat'l.

Lt. brn.-gy.:
DOLOMITE

SS: 2-19 cm

96%	dolomite
3	quartz
tr- 1	fish debris
tr	heavy mins. (magnetite)

Yellowish speck:
DOLOMITE

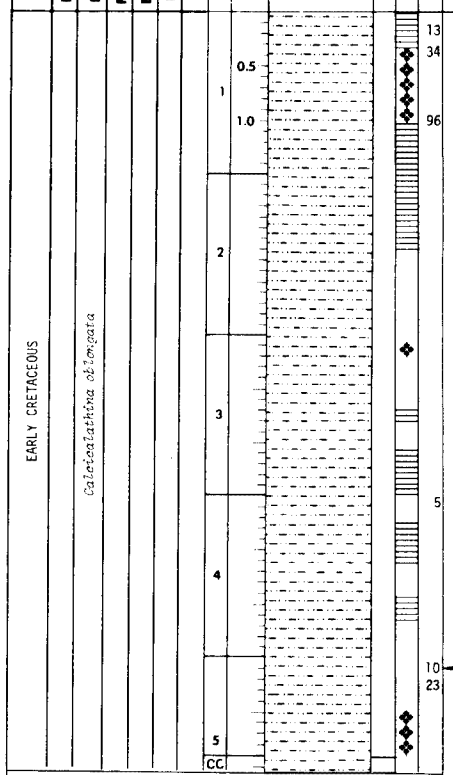
SS: 2-62 cm

70%	dolomite
20	clay
5	nannos
3	mica
2	carb. unspec.
1	quartz
1	fish debris
tr	heavy mins. (tour.)

LECO:		$CaCO_3$%	C_{org}%
	Sect. 2-87 cms	8	0.6

SITE 397 HOLE A CORE 50 CORED INTERVAL: 1429-1438.5 m

AGE: EARLY CRETACEOUS
ZONE: FORAMS; NANNOS: *Calciotathina oblongata*
FOSSIL CHARACTER: PL. FORAMS; B. FORAMS; NANNOS
SECTION; METERS; GRAPHIC LITHOLOGY; DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE



LITHOLOGIC DESCRIPTION

QUARTZ MUDSTONE = dom. lith.
Gen. a mudstone with deformation struct. (slumps, folds) and isolated clasts of sed.; parts are lam.

QUARTZ MUDSTONE

SS: 1-13, 96; 2-5; 3-23 cms

40-65%	clay
30-40	quartz
5	mica (SS: 4-5 cm)
1- 5	feldspar (SS: 1-96; 4-5 cm)
1- 3	carb. unspec.
1- 3	plant debris
tr- 3	fish debris
tr- 1	pyrite
tr- 1	nannos
tr	forams (SS: 5-23 cm)
tr	dolomite (SS: 1-96; 5-23 cm)
tr	heavy mins. (tour.) (SS: 4-5 cm)
tr	glauc. (SS: 4-5 cm)

Large nodule:
DOLOMITE

SS: 1-34 cm

97%	dolomite
2	quartz
1	plant debris
tr	pyrite

Homog. portion:
DOLOMITIC QUARTZ MUDSTONE

SS: 5-10 cm

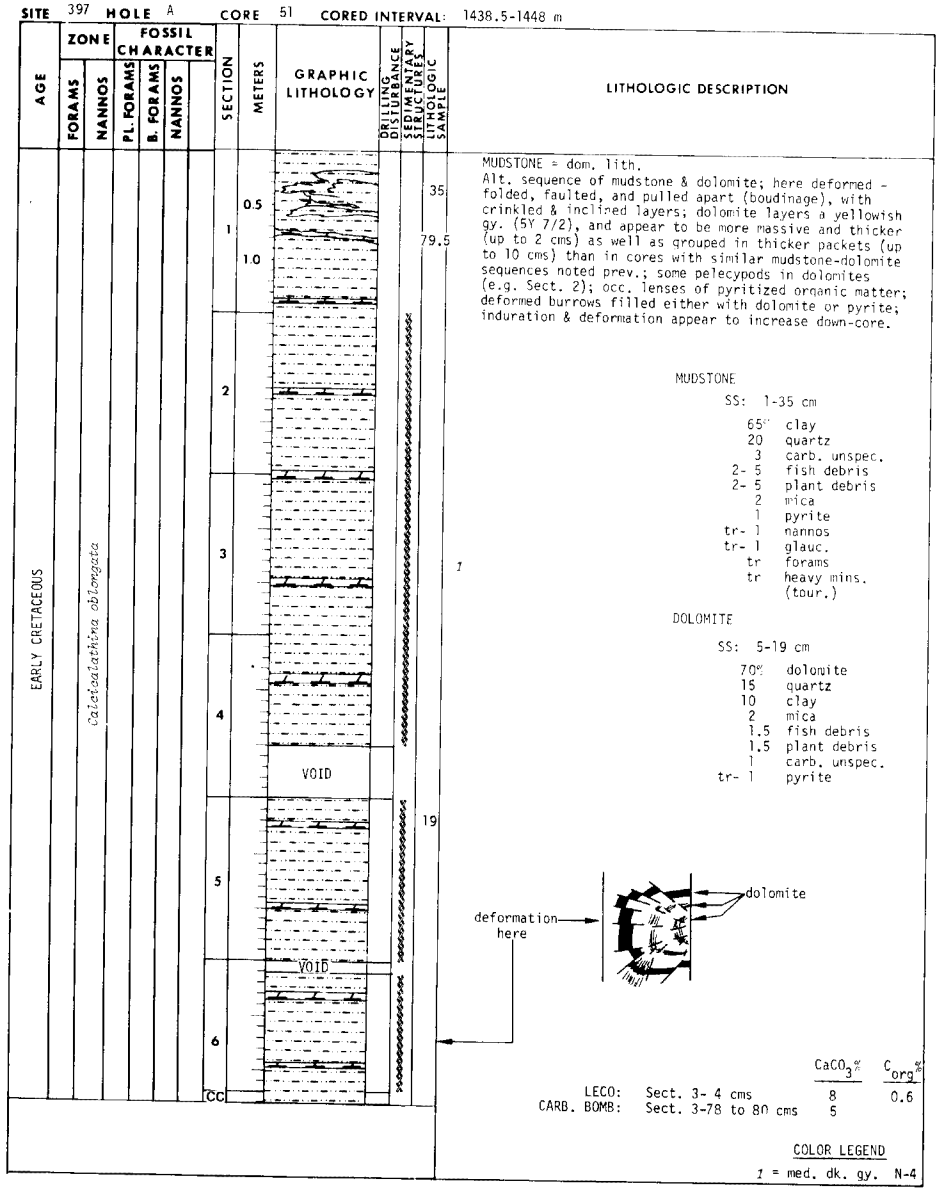
37%	clay
30	dolomite
30	quartz
1	mica
1	pyrite
1	fish debris
tr	heavy mins. (tour.; zircon)

		$CaCO_3$%	C_{org}%
LECO:	Sect. 5-11 cms	13	0.6
CARB. BOMB:	Sect. 2-29 to 31 cms	7	

COLOR LEGEND

1 = ol. blk.	5Y 3/1
2 = dk. ol. gy.	5Y 4/1
3 = gy. ol.	10YR 7/4
4 = dk. gy.	N-3

SITE 397 HOLE A CORE 51 CORED INTERVAL: 1438.5-1448 m



LITHOLOGIC DESCRIPTION

MUDSTONE = dom. lith.
Alt. sequence of mudstone & dolomite; here deformed - folded, faulted, and pulled apart (boudinage), with crinkled & inclined layers; dolomite layers a yellowish gy. (5Y 7/2), and appear to be more massive and thicker (up to 2 cms) as well as grouped in thicker packets (up to 10 cms) than in cores with similar mudstone-dolomite sequences noted prev.; some pelecypods in dolomites (e.g. Sect. 2); occ. lenses of pyritized organic matter; deformed burrows filled either with dolomite or pyrite; induration & deformation appear to increase down-core.

MUDSTONE

SS: 1-35 cm

65%	clay
20	quartz
3	carb. unspec.
2- 5	fish debris
2- 5	plant debris
2	mica
1	pyrite
tr- 1	nannos
tr- 1	glauc.
tr	forams
tr	heavy mins. (tour.)

DOLOMITE

SS: 5-19 cm

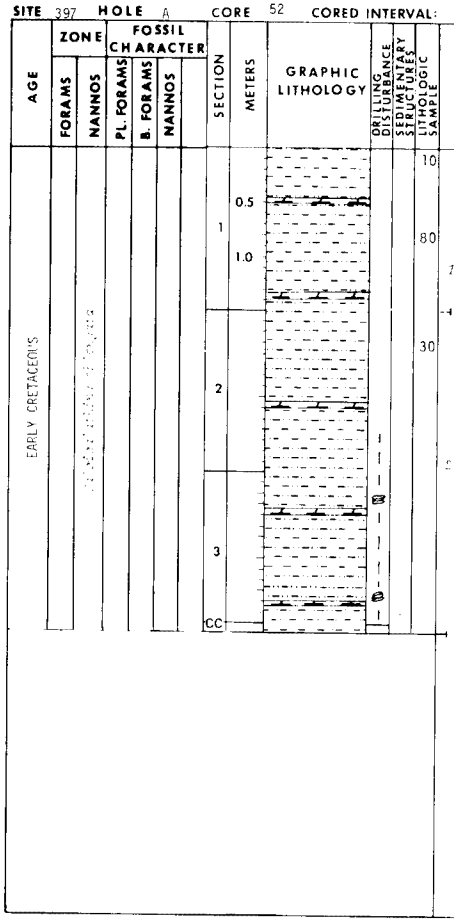
70%	dolomite
15	quartz
10	clay
2	mica
1.5	fish debris
1.5	plant debris
1	carb. unspec.
tr- 1	pyrite

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3- 4 cms	8	0.6
CARB. BOMB:	Sect. 3-78 to 80 cms	5	

COLOR LEGEND

1 = med. dk. gy. N-4

SITE 397 HOLE A CORE 52 CORED INTERVAL: 1448-1453 m (base of hole)



LITHOLOGIC DESCRIPTION

QUARTZ MUDSTONE = dom. lith.
As prev. described; a continuing sequence of mudstones & dolomites deformed, faulted, & folded; dolomites gen. mass. although a suggestion of mm-thick lam.; no apparent burrows (too deformed?).

QUARTZ MUDSTONE

SS: 1-10, 80; 2-30; cc

50-72%	clay
10-35	quartz
3-10	plant debris
3- 5	fish debris
2- 5	mica
1- 2	carb. unspec.
1	glauc. (SS: 2-30; cc)
1	pyrite
tr- 1	nannos
tr	dolomite (SS: 2-30 cm)
tr	feldspar (SS: 1-80; 2-30 cm)
tr	heavy mins. ((tour.; zircon) (cc)
tr	zeolite (SS: 1-80 cm)

Dolomite layers at:
Sect. 1-90 to 93, 100 to 103, 110, 121 cms.
Sect. 2-34 to 40, 54, 64, 80, 105, 126, 135, 143 cms.
Sect. 3-7 to 11, 20 to 23, 33 to 45, 50, 62, 83, 87 to 92, 110, 134 cms.

		$CaCO_3$%	C_{org}%
LECO:	Sect. 3-98 cms	4	0.8
CARB. BOMB:	Sect. 3-84 to 86 cms	6	

COLOR LEGEND

1 = ol. gy. 5Y 3/2
2 = med. dk. gy. N-4

INITIAL CORE DESCRIPTIONS

DEEP SEA DRILLING PROJECT

LEG 47 B

12 April — 12 May 1976

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
Department of Oceanography, Texas A & M University
University of Washington
Woods Hole Oceanographic Institution
National Environment Research Council, London
Centre National Pour L'Exploitation Des Oceans, Paris
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

William Ryan, Jean Claude Sibuet, Michael Arthur,
Ross Barnes, Gretchen Blechschmidt, Dan Habib,
Silvia Iaccarino, David Johnson, I. S. Lopatin,
Andres Maldonado, David G. Moore, G. E. Morgan,
J. P. Rehault, Jacques Sigal, Carol Williams

LEG 47B SUMMARY

Introduction

Leg 47B concentrated its efforts entirely on a single drillsite west of Portugal in the North Atlantic. This site (398) is situated in the axis of a half graben in the acoustic basement near the base of a small elevated crustal block about half-way between the mainland of the Iberian continent and Galicia Bank (Figure 1). This elevated feature is non-magnetic and is known as Vigo Seamount.

Multiple re-entry was attempted and accomplished successfully permitting an ultimate penetration of 1740 meters sub-bottom in a water depth of 3890 meters. Drilling was terminated after a last-minute three-day extension when it was confirmed by the shipboard team that the latest cores contained limestones laid down in a epi-continental setting near the time of the main phase of tensional pull-apart, and prior to the initiation of rapid downward flexure of the adjacent margin of Portugal.

Twenty-five days were spent on site with the Glomar Challenger, departing Vigo, Spain on April 12 and arriving in Brest, France on May 12, 1976.

Five separate holes were drilled. The first was started as a pilot hole to evaluate the ability of the uppermost 100 meters to support the re-entry cone and casing. It was abandoned with a parted sand-line necessitating round tripping the entire string. Hole 398A was terminated due to bad weather and Hole 398B with another parted sandline. The cone was, in fact, not implaced until after the drilling vessel had been on site for one week. Hole 398C involved a first attempt to wash in the casing, which had to be abandoned because of uncertainty of whether the cone had actually come into contact with the seafloor or not. Practically all the principal scientific results were generated from Hole 398D.

BACKGROUND AND OBJECTIVES

The Galicia region was considered by the JOIDES Passive Margin Advisory Panel as belonging to the continental margin province of the eastern North Atlantic. The attractiveness of the Galicia region for the first attempt at very deep drilling in IPOD Phase I focused on the general absence of major offshore deltas along the western coast of Portugal, and hence the likelihood of encountering a thinner blanket of Mesozoic and Cenozoic sediments than exists on the northwest African Margin.

A prolonged subsidence in the Galicia region of marine sediments originally deposited in shallow, sun-lit epicontinental seaways is confirmed by several dredge hauls containing Jurassic age limestones obtained from the summits and around the marginal escarpments of both Galicia Bank and Vigo Seamount. The sialic nature of the underlying bedrock of the prominences is similarly demonstrated by the sampling of feldspathic gneisses, granodiorites and granites.

One of the principal objectives of drilling at Site 398 was to obtain new information on the age when continental fragmentation began, the timing of the collapse of the epi-continental sea that was accompanied by the rotation of large fault blocks observed on the seismic profiles, and the rate of continental margin subsidence that followed the inception of seafloor spreading between Iberia and Newfoundland.

The choice of the axial position within the half-graben target area provided a better chance of recovering a more complete stratigraphic section than exists on the upturned horsts and far greater security against an entrapment situation of liquid hydrocarbons. Four major acoustic units were defined in the pre-site reflection profiling surveys of IFP-CNEXO and are illustrated on the accompanying sketch of seismic profile GP19 which passes about 0.4 miles north of the drillsite (Figure 2). Drilling terminated within or near the base of Acoustic Unit #4.

PRINCIPAL RESULTS

Five major lithologic units are differentiated. Unit 1 is a marly nannofossil ooze to siliceous marly chalk of Pleistocene to early Oligocene age (0-590 meters subbottom). Rhythmic bedding is conspicuous, indicating both dilution and dissolution cycles. Unit 2 is a siliceous marly chalk to mudstone of Eocene to early Paleocene age (590-775 meters) characterized by abundant zeolites, moderately low carbonate contents, and numerous thin sand and silt layers reflecting deposition of reworked deep-sea sediments by both downslope turbidity currents and traction transporting benthic boundary currents. Unit 3 is a calcareous mudstone, alternating with a marly chalk and grading downward to a red, barren mudstone of early Paleocene to Campanian age (775-945 meters). It is rich in fine-grained quartz and mica and was, in part, deposited near or below the CCD. Unit 4 is a dark laminated and only occasionally bioturbated mudstone to claystone grading down into dark organic shales with thin dolomitic laminae and lenses (some having the appearance of algal stromalolite-like accretionary mounds. It terminates in thin turbiditic sandstones, siltstones and calcareous mudflow-debris flow strata with associated mudchip conglomerates of Cenomanian to early Barremian age (945-1668 meters). Unit 5 contains fine-grained, nannofossil limestone of Hauterivian age (1668-1740 meters) interbedded in varved brown mudstone devoid of benthic remains and trace fossils. The evolution of water depths and depositional environments is not unambiguous. The presence of stromalolite-like structures and extremely well preserved ammonites and other molluscs in the extremely rapid sedimentation rate (100 m/m.y.) Aptian to early Albian interval, on the one hand, suggests a moderately shallow and partly sun-lit sea floor. However, the co-occurrence of Radiolaria and "primitive" arenaceous benthonic foraminifera,

with only intermittent levels bearing planktonic foraminifera, is alternately explained with a deep sedimentary basin near or below the CCD periodically supplied by turbidity currents and debris flows from upslope regions on the continental margin.

The interpretation of the Cenozoic sequence is somewhat more straight forward with the attainment of a genuine deep-sea situation receiving calcareous-rich allochthonous sediment from the flanking escarpments of Vigo Seamount, as well as Radiolaria, zeolites, quartz, mica and other components in swift bottom currents capable of scouring and sculpturing erosional bed forms such as abyssal furrows and drifts. Dissolution cycles and the rhythmic input of hemipelagic clays are thought to be diagnostic of a climatic influence on abyssal circulation, eustatic sea-level fluctuations, and the run off of coastal streams and deltas into the heads of submarine canyons.

Stratigraphic gaps induced by the erosion of ocean bottom currents and/or non-deposition were detected in the late to middle Miocene, early Paleocene and between the Campanian and the Cenomanian stages of the Cretaceous. A small hiatus might be present also in the vicinity of the Cretaceous-Tertiary boundary.

Measurements of remanent magnetization permit the detection of numerous changes in the earth's magnetic polarity during the Tertiary and Late Cretaceous. However, the entire pre-Campanian is of a single polarity, part of which may represent the long Cretaceous normal Epoch and part of which may be an overprint of this Epoch on earlier sediments which had at one time experienced reversals of the earth's magnetic field. A downhole measurement indicates an anomalously low temperature gradient of 1°C per 100 meters. No volumetrically significant hydrocarbon gases were detected from apparently thermally immature sediments, even though the early Cretaceous strata possess organic carbon contents of up to 3 or more percent by weight.

Correlation of the drill cores to the acoustic profile was not adequately resolved aboard ship. Two slightly different interpretations are presented in Figure 2 expressing different judgments of compressional wave velocities and different criteria as to the assignment of stratigraphic gaps with observed reflector pinch out and onlap sequences. Basically both interpretations indicate that Acoustic Unit #1 is Neogene in age, the base of Unit #2 is Campanian in age, and the base of Acoustic Unit #3 is Aptian in age. However, according to one interpretation, the base of the hole is midway into Acoustic Unit #4, and with the other the base of the hole is just below the base of Unit #4.

In the Galicia region west of Portugal Acoustic Unit #4 is found only beneath the continental slope province. It has a restricted distribution which points towards its deposition prior to the generation of oceanic crust north of the Newfoundland Fracture Zone. The Site 398 drilling results appear compatable with both Acoustic Unit #4 and even the lower part of Unit #3, having accumulated in epicontinental environments as part of a broad seaway linking Europe to North America.

The Leg 47B cores however were not able to shed much light either on the time of onset of initial basement collapse west of Portugal or the rate of subsidence. In addition, little insight was provided as to the questions related to the geometry of pre-drift reconstructions in this area.

Perhaps one of the most significant discoveries is a major erosional phase just prior to the Campanian which the shipboard team felt might be related to the initial widening of the Rockall Trough to the north and the establishment of a transport route for cold bottom water from the Late Cretaceous North Sea and Barents shelf regions.

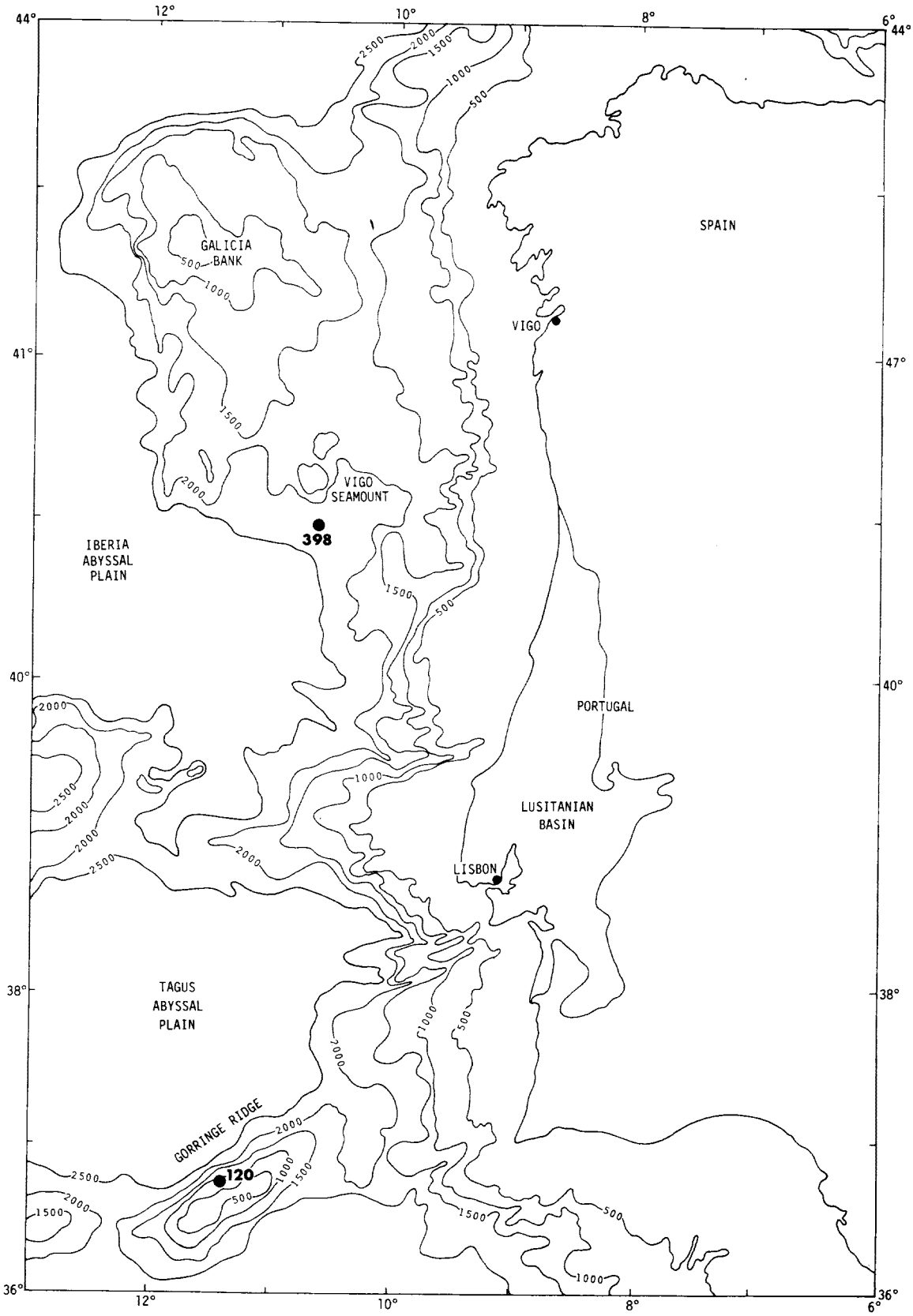


FIGURE 1. Topography of area of Site 398.

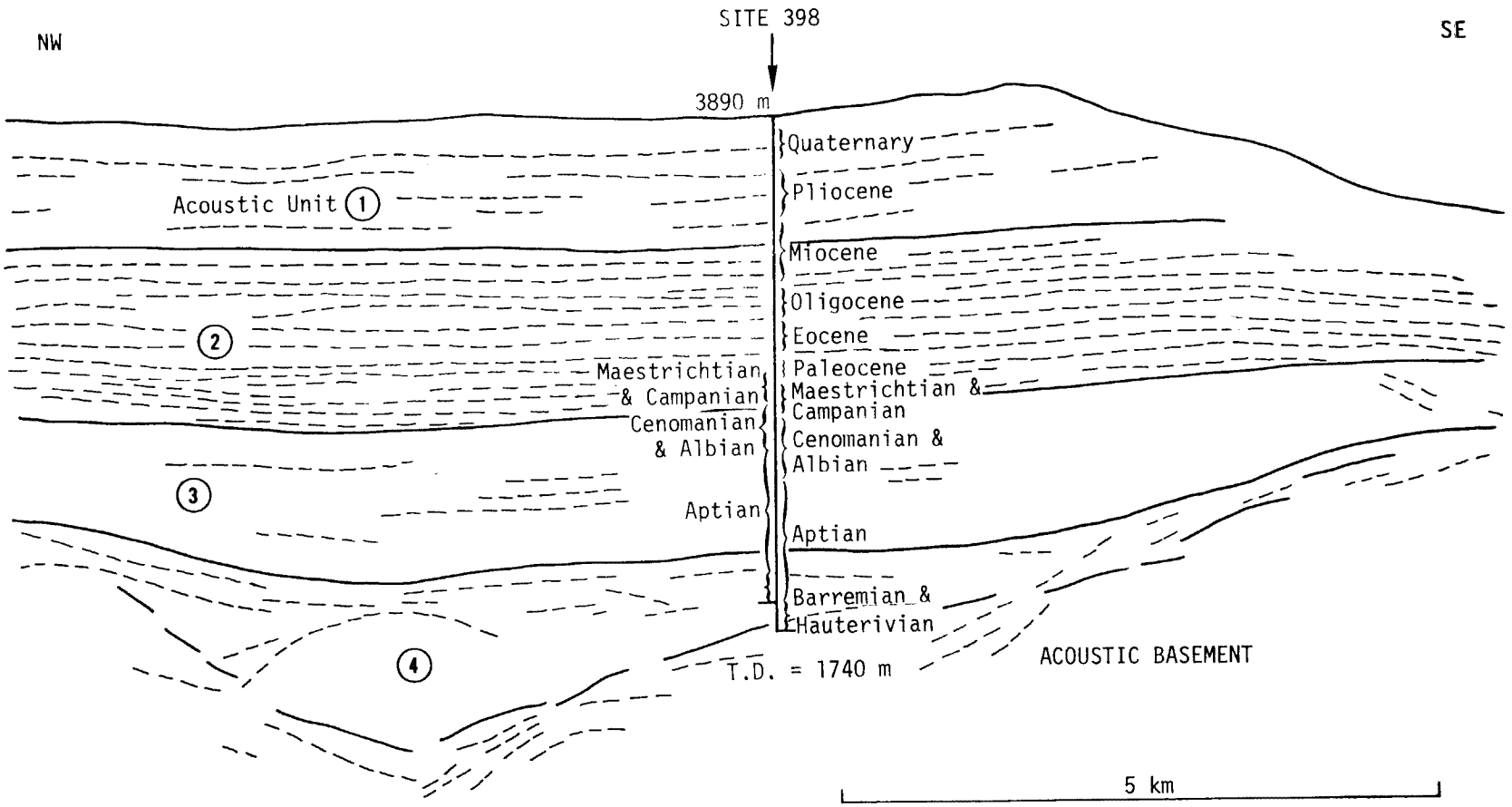


FIGURE 2. Seismic profile (diagrammatic) at Site 398.

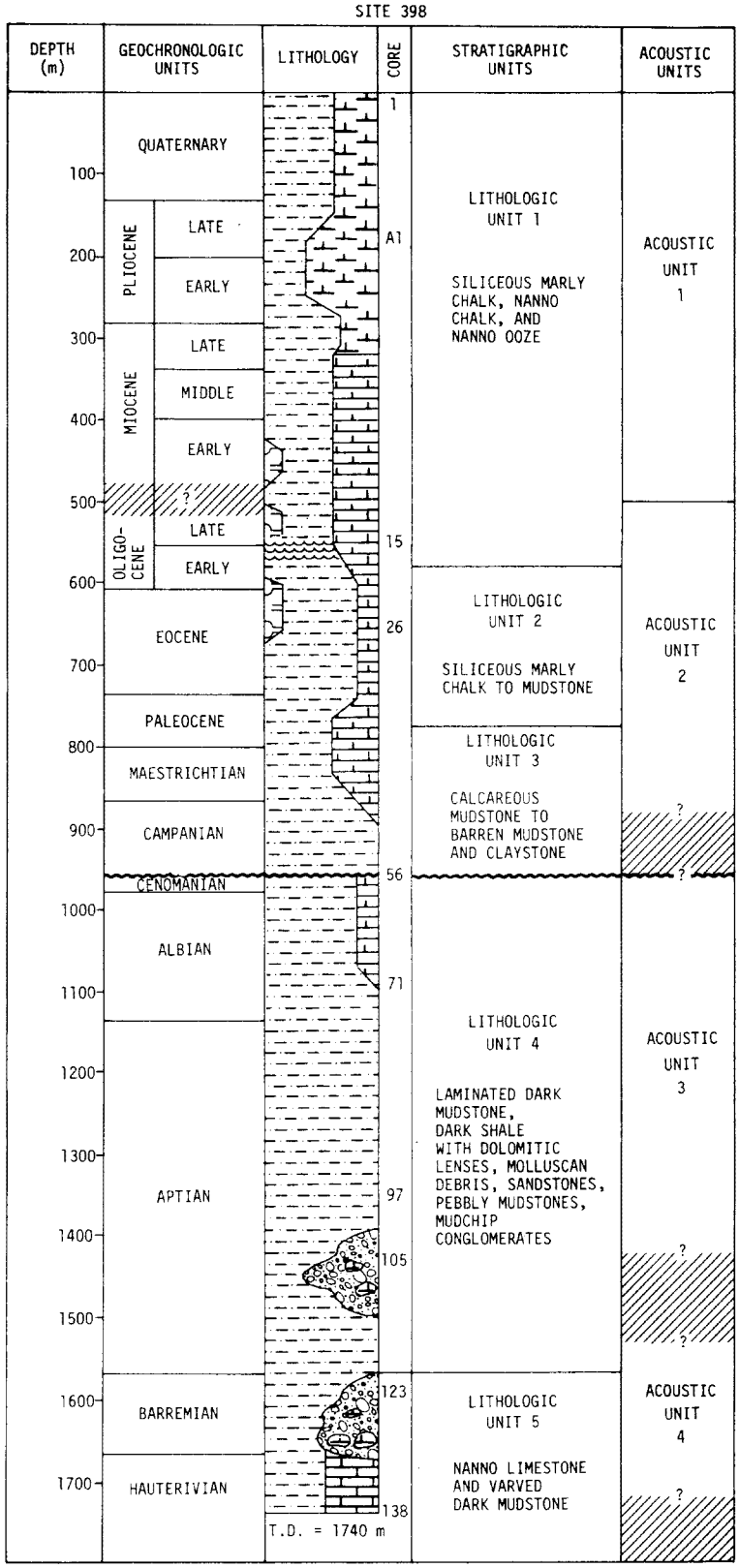


FIGURE 3. Age, lithology, stratigraphic and acoustic units - Site 398.

EXPLANATORY NOTES

Introduction

Persons wishing to obtain samples are directed to the DSDP-NSF sample distribution policy (reproduced here, p. 9). Sample requests must be submitted on standard DSDP request forms which may be obtained from:

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

The following material is intended as an aid in understanding:

(1) the terminology, labeling, and numbering conventions used by the Deep Sea Drilling Project;

(2) the sediment classification and biostratigraphic framework used on Leg 47B; and

(3) the presentation of the lithologic and paleontologic data on the core forms which make up much of this publication.

Numbering of Sites, Hole, Cores, Samples

Drill site numbers run consecutively from the first site drilled by *Glomar Challenger* in 1968; the site number is thus unique. A site refers to the hole or holes drilled from one acoustic positioning beacon. Several holes may be drilled at a single locality by pulling the drill string above the sea floor ("mud line") and offsetting the ship some distance (usually 100 meters or more) from the previous hole.

The first (or only) hole drilled at a site takes the site number. Additional holes at the same site are further distinguished by a letter suffix. The first hole has only the site number; the second has the site number with suffix A; the third has 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 usually do not come from equivalent positions in the stratigraphic column at different holes.

Cores are numbered sequentially from the top down. In the ideal case, they consist of 9.3 meters of sediment or rock in a plastic liner of 6.6 cm diameter. In addition, a short sample is obtained from the core catcher (a multi-fingered device at the bottom of the core barrel which prevents cored materials from sliding out during core-barrel recovery). This usually amounts to about 0.2 meters of sediment or rock.

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 each 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

During Leg 47B the core catcher sample was split, described, and stored along with the rest of the core, if at all possible, taking care to maintain its proper vertical orientation. This sample represents the lowest stratum recovered in a particular cored interval.

The cored interval is the interval in meters below the sea floor measured from the point at which coring for a particular core was started to the point at which it was terminated. This interval is generally 9.5 meters (nominal length of a core barrel) but may be shorter if conditions dictate. The interval can also be longer if the core barrel was placed in the drill string during a long drilling interval. On Leg 47B almost all core intervals were 9.5 meters, because the drilling program called for nearly continuous coring.

When a core is brought aboard the *Glomar Challenger* it is labeled as to depth in meters below the sea floor.

Core Disturbance

Unconsolidated sediments are often quite disturbed by the rotary drilling/coring technique, and there is a complete gradation of disturbance style with increasing sediment induration. An assessment of degree and style of drilling deformation is made on board ship for all cored material, and shown graphically on the core description sheets. The following symbols are used:

Slightly deformed; bedding contacts slight bend.

Moderately deformed; bedding contacts have undergone extreme bowing.

Highly deformed; bedding completely disturbed, often showing symmetrical diapir-like structures.

Soupy, or drilling breccia; water-saturated intervals that have lost all aspects of original bedding and sediment cohesiveness.

Void, interval in which no sediment occurs.

Consolidated sediments and rocks seldom show much internal deformation, but are usually broken by drilling into cylindrical pieces of varying length. There is frequently no indication if adjacent pieces in the core liner are actually contiguous or if intervening sediment has been lost during drilling.

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. Smear slide analyses at selected levels as well as averaged analyses for intervals of uniform lithology are given on the core description sheets. See Figure for explanation of smear slide notations. Visual estimates of sand, silt, and clay are given in addition to mineralogy.

Carbonate Data

During Leg 47B, extensive use was made of the "Karbonat Bombe" (Müller and Gastner, 1971) device as an aid in sediment classification. This device is basically a cylindrical vessel with pressure gauge in which a sediment sample of known weight is reacted with acid. The pressure of CO_2 generated is measured and converted to percent carbonate. Accuracy to within ±5% total carbonate has been quoted for the device. Shipboard carbonate bomb data are listed on the core description sheet.

Samples were taken for DSDP shore-based carbon-carbonate analysis using the LECO 70-second Analyzer (Boyce and Bode, 1972; Bode 1973). These and organic carbon values are tabulated following core forms (Table). However, because shipboard core description sheets have been reproduced directly here, lithologic symbols depicting carbonate content graphically and sediment classifications based on smear slide descriptions have not been updated to reflect shore-based carbonate results.

Sediment Induration

The determination of induration is highly subjective, but field geologists have successfully made similar distinctions for many years. The criteria of Moberly and Heath (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 finger 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 that the core can 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).

Sediment Classification

The sediment classification scheme used on Leg 47B is basically that devised by the JOIDES Panel on Sedimentary Petrology and Physical Properties and adopted for use by the JOIDES Planning Committee in March, 1974, with minor modifications. The classification is outlined below.

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%.

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 Pelagic Clay

>10% authigenic components
<30% siliceous microfossils
<30% $CaCO_3$
<30% terrigenous components

III Pelagic Siliceous Biogenic Sediments

>30% siliceous microfossils
<30% $CaCO_3$
<30% terrigenous components (mud)

Radiolaria dominant: radiolarian ooze (or radiolarite).
Diatoms dominant: diatom ooze (or diatomite).
Sponge spicules dominant: sponge spicule ooze (or spiculite).
Where uncertain: siliceous (biogenic) ooze (or chert, porcellanite).
When containing 10-30% $CaCO_3$: modified by nannofossil----, foraminiferal----, calcareous----, nannofossil-foraminiferal----, or foraminiferal-nannofossil----,

depending upon kind and quantity of $CaCO_3$ component.

IV Transitional Biogenic Siliceous Sediments

10-70% siliceous microfossils
30-90% terrigenous components (mud)
<30% $CaCO_3$

If diatoms < mud: diatomceous mud (stone).
If diatoms > mud: muddy diatom ooze (muddy diatomite).
If $CaCO_3$ 10-30%: appropriate qualifier is used (see III).

V Pelagic Biogenic Calcareous Sediments

>30% $CaCO_3$
<30% terrigenous components
<30% siliceous microfossils

Principal components are nannofossils and foraminifera; qualifiers are used as follows:

Foram %	Name
<10	nannofossil ooze (chalk, limestone)
10-25	foraminiferal-nannofossil ooze
25-50	nannofossil-foraminiferal ooze
>50	foraminiferal ooze

Calcareous sediment,containing 10-30% siliceous fossils carry the qualifier radiolarian, diatomaceous or siliceous depending upon the identification.

VI Transitional Biogenic Calcareous Sediments

>30% $CaCO_3$
>30% terrigenous components
<30% siliceous microfossils

If $CaCO_3$ 30-60%: marly is used as a qualifier:

Soft: calcareous (or nannofossil, etc.) ooze.
Firm: chalk (or nannofossil chalk, etc.).
Hard: limestone (or nannofossil limestone, etc.).

If $CaCO_3$ >60%:

Soft: calcareous (or nannofossil, etc.) ooze.
Firm: chalk (or nannofossil chalk, etc.).
Hard: limestone (or nannofossil limestone, etc.).

NOTE: Sediments containing 10-30% $CaCO_3$ fall in other classes where they are denoted with the adjective "calcareous", "nannofossil", etc.

VII Terrigenous Sediments

>30% terrigenous components
<30% $CaCO_3$
<10% siliceous microfossils
<10% authigenic components

Sediments in this category are subdivided into textural groups on the basis of the relative proportions of three grain-size components, i.e. sand, silt and clay. Sediments coarser than sand-size are treated as "Special Rock Types". The size limits are those defined by Wentworth (1922). The textural classification is according to the triangular diagram of Shepard (1954) (Figure). The suffix "-stone" is used to indicate hard or consolidated equivalents of the unconsolidated sediments.

If $CaCO_3$ is 10-30%: calcareous, nannofossil, etc. is used as a qualifier.

Other qualifiers (e.g. feldspathic, glauconitic, etc.) are used for components >10%.

VIII Volcanogenic Sediments

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

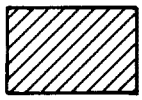
Volcanic breccia >32 mm
Volcanic lapilli <32 mm
Volcanic ash (tuff, if infurated) <4 mm

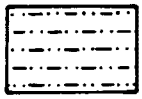
Compositionally, these pyroclastic rocks are described as vitric (glass), crystal or lithic.

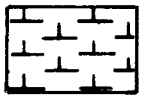
b) Clastic sediments of volcanic provenance are described in the same fashion as the terrigenous sediments, noting the dominant composition of the volcanic grains where possible.

Lithologic Symbols

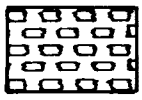
Figure 4 shows the graphic symbols used to depict the lithologies encountered on Leg 47B. In addition, many symbols are referenced on core sheets in which they occur.

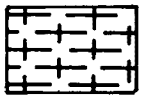

VOID

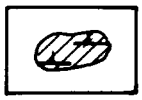

CLAY (terrigenous)

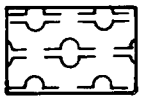

NANNO OOZE

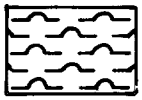

SAND LENSE


CARBONATE OOZE
(micritic unspecified)

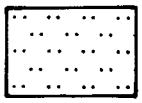

FORAM-NANNO OOZE


BALLS OR CLASTS WITHIN MATRIX
(probably drilling disturbance)

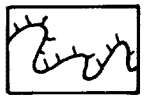

SILICEOUS OOZE

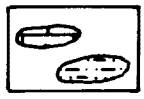

RADIOLARIAN OOZE

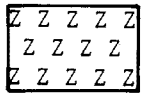

SILT


SAND

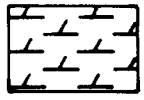

NANNO CHALK [D-15]

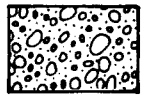

SLUMPED & CONTORTED NANNO CHALK [D-15]

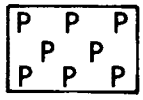

PEBBLES (rounded)
VARIOUS LITHOLOGIES [D-27]



ZEOLITE


DOLOMITE

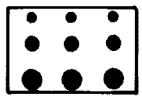

CLASTS IN CONGLOMERATE



PYRITE [D-136]


DOLOMITE LENSE [D-77]


SHELL FRAGMENT (molluscan)


GRADED BEDDING [D-100]

INTERSTITIAL WATER SAMPLE

ORGANIC GEOCHEMISTRY SAMPLE

FIGURE 4. LITHOLOGY

Color

Color determinations are based on standard Munsell and GSA color charts.

Core Forms

Leg 47B (Site 398, A, B, C, D) core forms in this book are reproduced directly from core forms prepared on board ship due to time considerations and the complex nature of lithologies in this passive margin setting. A certain amount of uniformity was maintained in preparing these forms in accordance with standard symbols used by the DSDP; however, a number of nonstandard symbols were used which denote a variety of color changes, sediment textures, and components not common to deep sea sediments. Some changes in systematics of core description were made at certain major lithologic transitions and were dependent on the sedimentologist responsible for forms at the time. All symbols and conventions utilized are explained on the core forms. For convenience, a listing is provided in Figure 5. Each symbol is accompanied by an explanation. The numerals next to each one represent the first core numbers in which the symbol is used (e.g. D-18 indicates core number 398D-18, etc.). After 398D-9, the "deformation column" was used to denote numerous color changes characterizing a rhythmically bedded sequence. Symbols are explained on each core sheet (see Figure 6) by drilling operations. Deformation of core materials became relatively unimportant after 398D-9. This column becomes more of a facies indicator incorporating both color and sedimentary structures after 398D-56. Again, symbols are explained on core forms as they occur.

A sedimentary structure column was also added to graphically depict notable structures and extent of bioturbation. All symbols are shown in Figure 7.

An overall view of conventions used on the core forms is shown on Figure 6.

Biostratigraphy

Biostratigraphic studies of Leg 47B material were still in progress when Leg 47B Initial Core Descriptions were compiled. Consequently biostratigraphic boundaries cited here are tentative; some boundaries may be adjusted prior to publication of Leg 47B Initial Reports. The Albian-Aptian boundary has been changed. Based on Ammonite data it is placed at 1370 meters in C.99.

COLOR KEY - SYMBOLS
CRETACEOUS

D-56

dk. gy. to blk. organic C-rich layers.

5Y 6/1-5GY 8/1

D-57

5GY 4/1

N-3, N-4

N-2, N-3 5GY 2/1 (1) burrowed

N-2, N-3 5GY 2/1 (2) laminated

D-63

N-3 5GY 2/1 (3) laminated-dolomitic

1 & 2 mixed

(a) 5G 3/1

D-67

(b) N-3

(c) N-3, 5GY 6/1

(a) 5GY 2/1 homog., burrowed

(b) N-1, N-2 homog. → lamin.

D-68

(c) N-2, 5Y 2/1 dolomitic, banded

(d) N-4, 5Y 4/1 laminated

D-120 1, 2, 3 in litho. sample column refers to major sedimentary units defined in description.

D-77

IW interstitial water

dolomite lense

shell fragment

graded bedding

clasts in conglomerates

D-136 PPP pyrite

FIGURE 5. CORES 398D-56 → 138

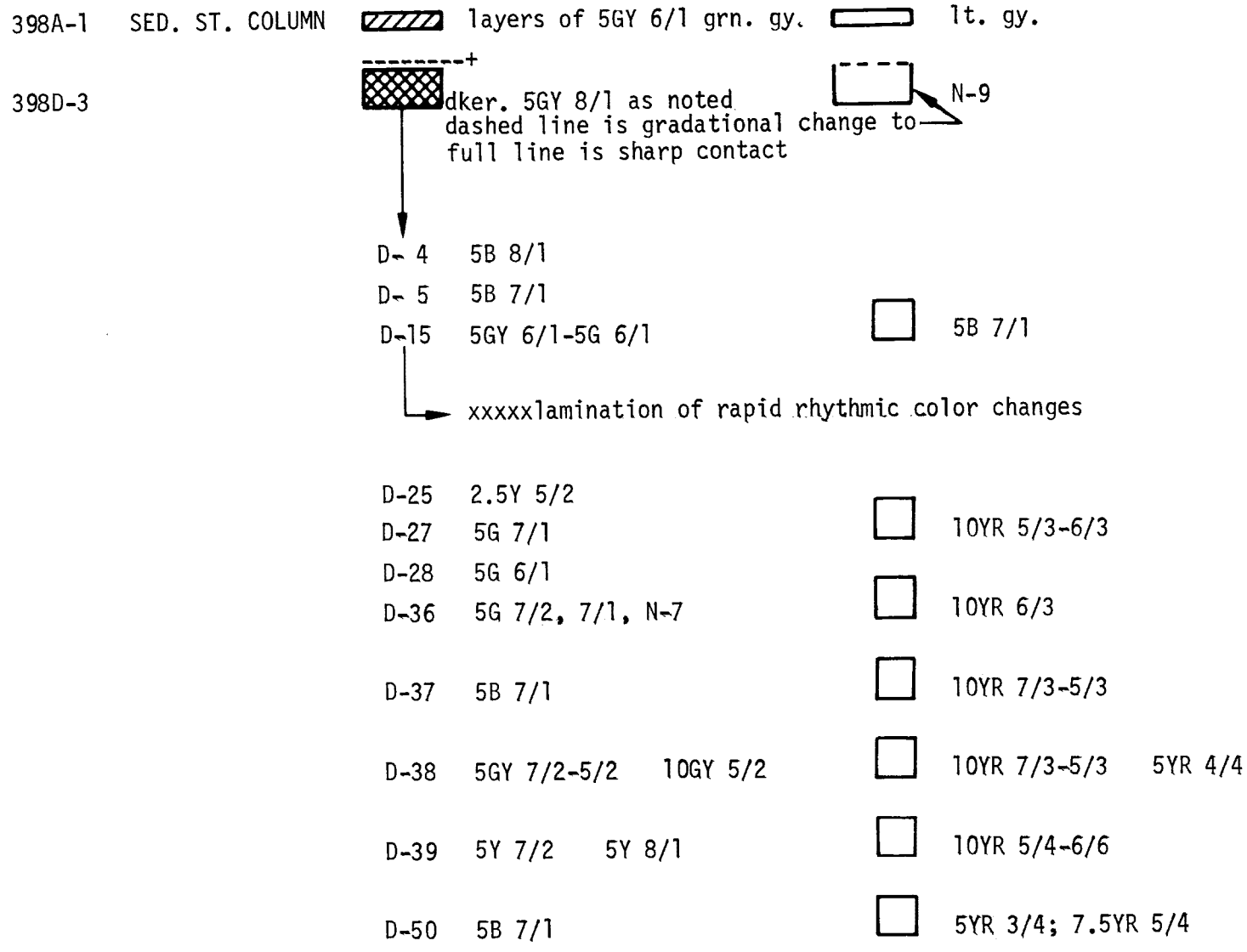
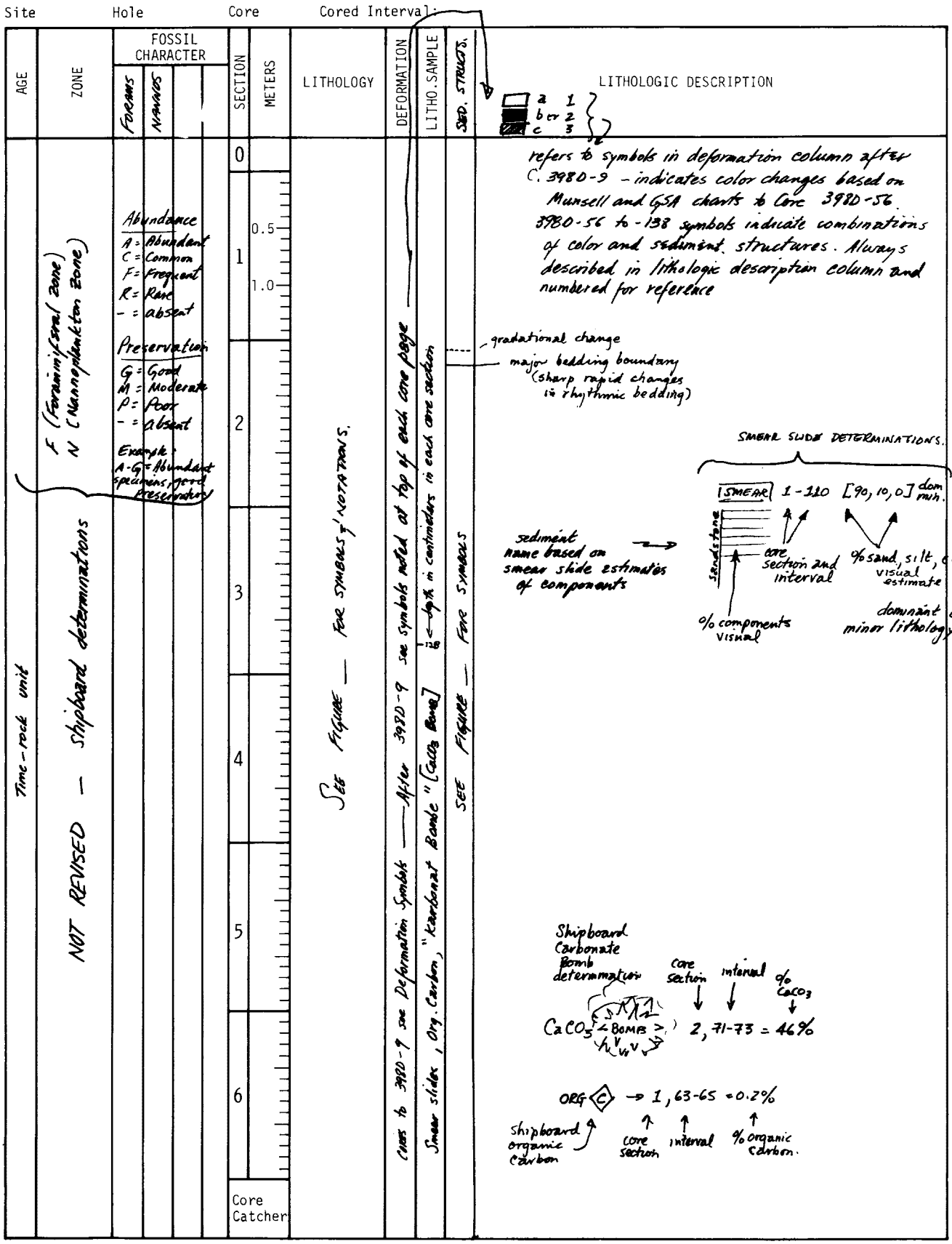
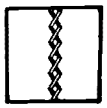


FIGURE 5. (CONTINUED)



Explanatory notes in Chapter 1

FIGURE 6. SAMPLE CORE DESCRIPTION



Burrow

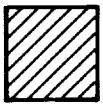
Parallel lamination

Deformed lamination

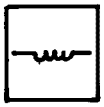
Bioturbation

Diagenetic laminae (grn., liesegang-type band) [D-3].

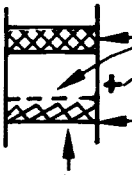
Flaser lamination (wavy) [D-3]

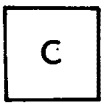


Micro-cross lamination

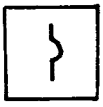


Sharp, burrowed, irregular contact.





Possible contourites - laminated to cross-laminated chalks.

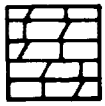


Slumped & contorted lamination [D-15]

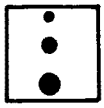
Thinly-laminated parallel lamination

Cross-bedded sets

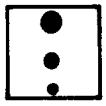
Pebble to granule conglomerate



Sedimentary microfaults [D-22]



Graded bedding [D-22]

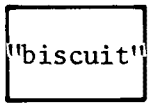


Reverse grading [D-23]

Fault (not drilled) [D-24]

Flame structure [D-24]

Micro-cross lamination ripples [D-32]



Biscuit texture (drilling deformation) [D-51]

FIGURE 7. SEDIMENTARY STRUCTURES

Site 398 Hole Core 1 Cored Interval: 0 -8

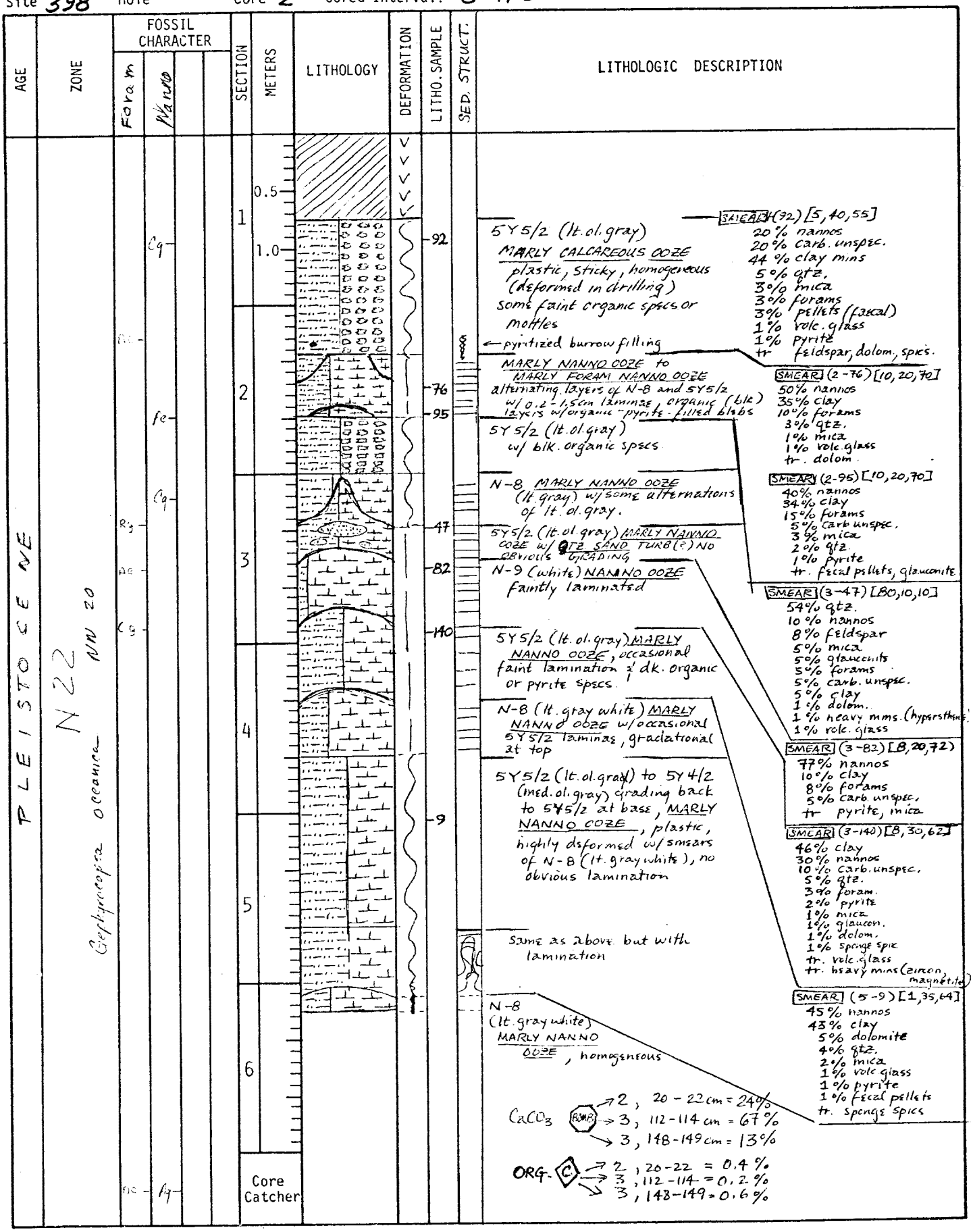
AGE	ZONES: Foram.	ZONES: Nanno	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	FOSSIL CHARACTER:	FOSSIL CHARACTER:	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
PLEISTOCENE	N 22	Cyclicargolithus oceanica NN 20	Ae	Cg			Core Catcher						MARLY NANNO OOZE, 5Y 7/2 (yellowish gray) homogeneous, sticky, no obvious structure

SMEAR: [5, 20, 75]
63% Nannos
30% Clay mins
4% Forams
1% quartz
1% carb. unspec.
1% pellets
tr. mica
tr. dolomite
tr. sponge spics.
tr. pyrite

21

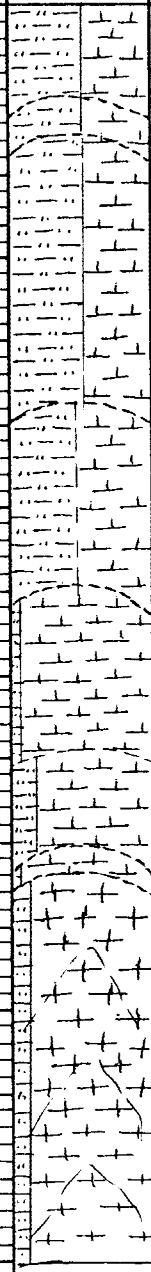
Explanatory notes in Chapter 1

Site 398 Hole Core 2 Cored Interval: 8-17.5



Explanatory notes in chapter 1

Site **398** Hole Core **3** Cored Interval: **17.5 – 27.0**

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCT.	LITHOLOGIC DESCRIPTION
PLEISTOCENE	N22; *Pseudoemiliania lacunosa* – NN19	Ac, Ac, Ac, Ag, Ag	1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0			1-71, 3-141, 3-29, 3-30, 4-94		see below

LITHOLOGIC DESCRIPTION

0–63 cm 5Y 5/2 (yellowish gray) MARLY NANNO OOZE
intensely disturbed by drilling
a few 5B 9/1 (bluish white) laminae

63–84 cm (yellowish olive gray) 5Y 6/2 MARLY NANNO OOZE, laminae of 5Y 8/4, 1 cm thick
black specs (pyrite – organic?)

84–150 cm gradational change
1–95 cm to 5Y 7/2 (yellowish gray) MARLY NANNO OOZE, soft, very fine laminations of 5B 9/1 (bluish white) NANNO OOZE

SMEAR (1-71) [5, 20, 75]
47% clay
30% nannos
8% carb. unspec.
5% qtz.
3% forams
2% siliceous unspec.
2% fecal pellets
1% mica
1% pyrite
1% dolomite
tr glaucon., sponge spics

95–150 cm
0–55 cm Gradation to 5Y 7/2 (yellowish ol. gray) MARLY NANNO OOZE w/ 5B 9/1 (BLUISH Gray) interlayers (NANNO OOZE) up to 20% of interval, also some organic-rich layers.

SMEAR (3-141) [3, 5, 92]
90% nannos
5% clay
3% forams
1% dolom.
1% qtz.
1% mica
1% volc. glass
tr. sponge spics, pellets

55–150 cm. Gradation to 5B 9/1 (lt. bluish gray) NANNO OOZE w/ irreg. laminations of blk, organic-rich ooze every 5–10 cm (lower 40 cm) Some organic burrow mottles.

0–65 cm 5GY 8/1 (lt. grnish. gray) NANNO OOZE w/ some 5Y 7/2 MARLY NANNO OOZE near base, irreg. thin lamination of organic-rich layers. Halo burrows or lt. nodules w/ organic coatings

SMEARS (3-29 & 3-30) [3, 10, 87]
75% nannos
18% clay
2% qtz.
2% dolom.
2% pellets
1% mica
1% heavy mins.
1% pyrite
1% silic. unspec.

5B 9/1 (lt. bluish white) NANNO OOZE

5G 8/1 (lt. grnish. gray) alternating with 5Y 7/2 (yellowish gray) occas. dker. laminae of 5Y 6/2 to 5Y 5/2, FORAM NANNO OOZE, small blk. specs of organic C or pyrite (burrows?)

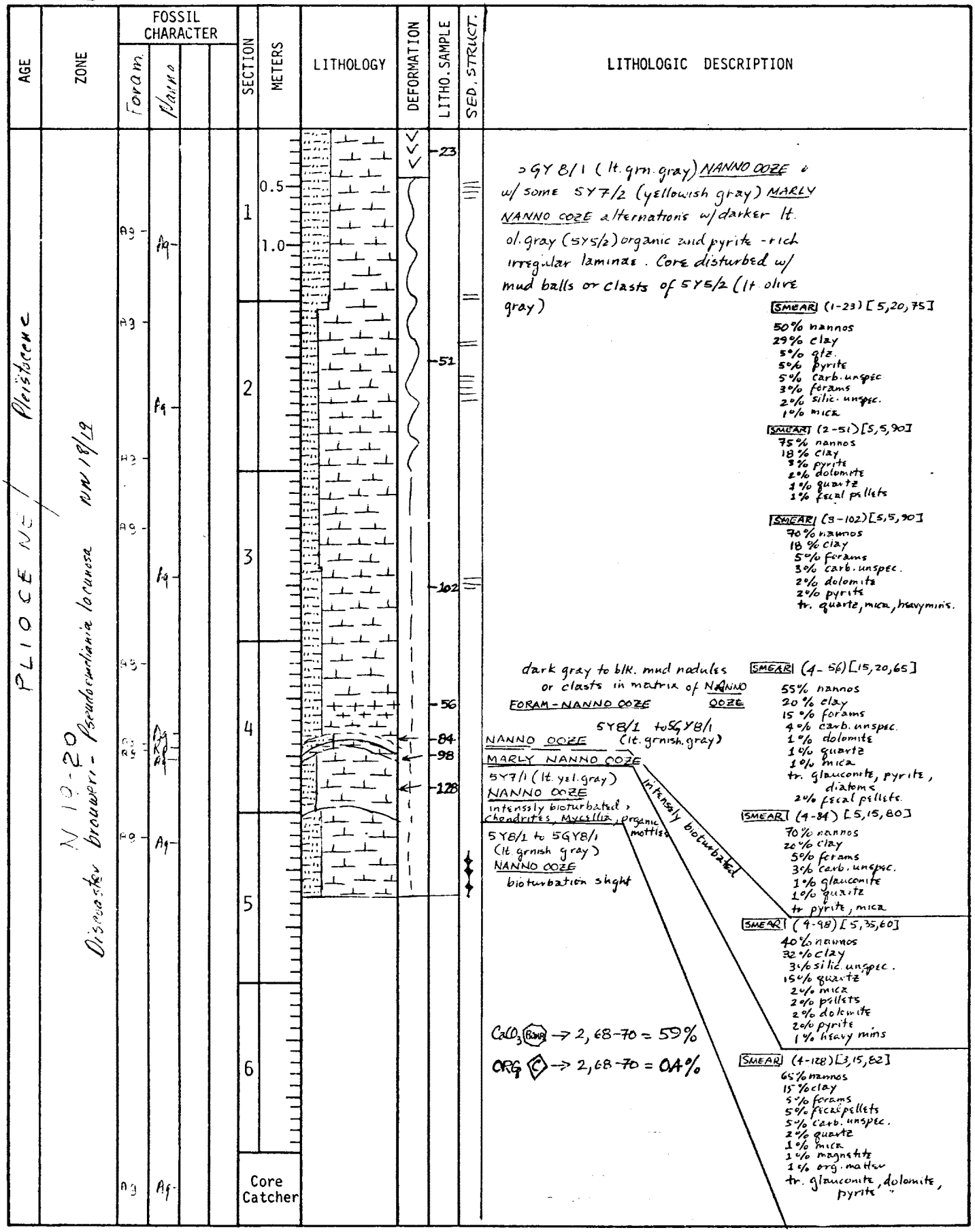
SMEAR (4-94) [1, 5, 94]
70% nannos
13% clay
10% forams
2% dolom.
2% fecal pellets
1% pyrite
1% qtz.
1% silic. unspec.
tr. mica
tr. heavy mins.

$CaCO_3$ (Bomb) → 1, 54–56 = 33%
→ 5, 108–110 = 54%

ORG (C) → 1, 54–56 = 0.4%
→ 5, 108–110 = 0.5%

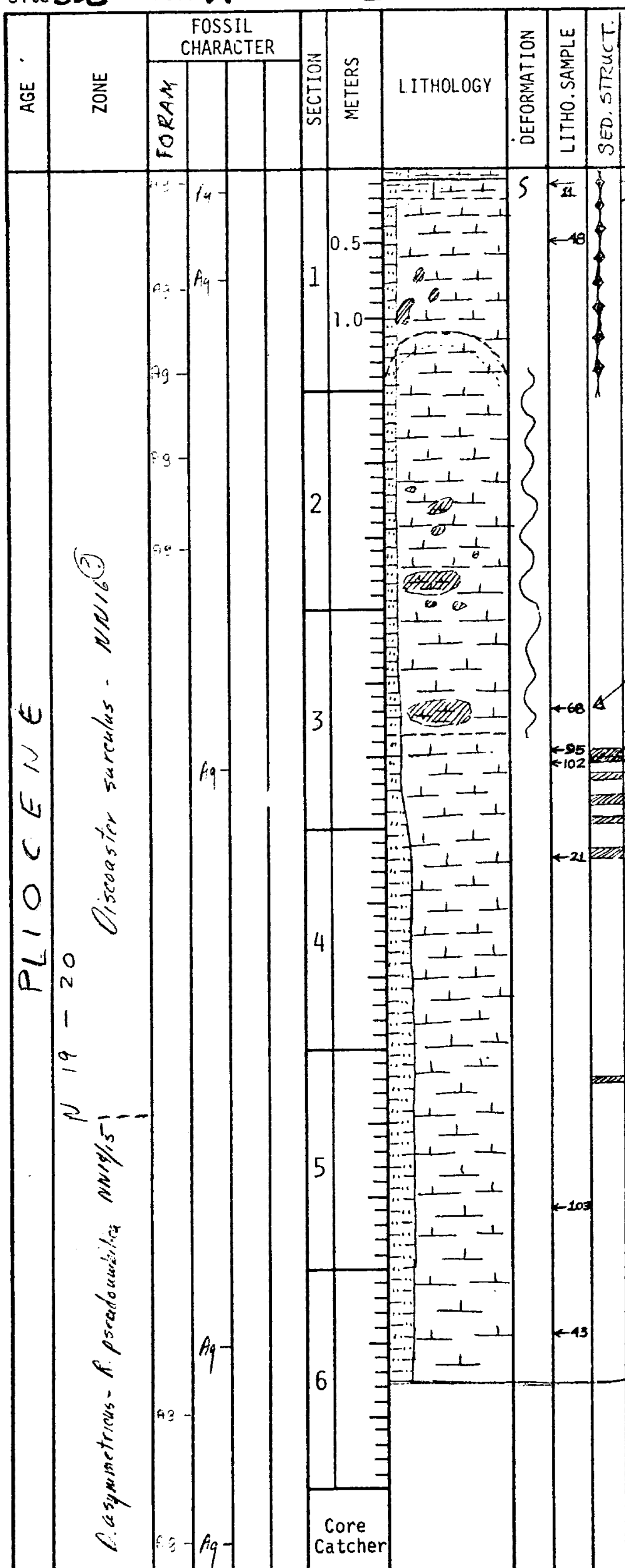
Explanatory notes in chapter 1

Site 398 Hole Core 4 Cored Interval: 103 – 109.5



Explanatory notes in chapter 1

Site 398 Hole A Core 1 Cored Interval: 172.5 – 182.0



LITHOLOGIC DESCRIPTION

5Y7/2 (lt. gray) soupy NANNO OOZE, bioturbated

2.5Y 5/2 (grayish brwn.) MARLY NANNO OOZE firm w/ slight color variations and scattered pyrite blebs

NANNO OOZE
5Y7/1 (lt. gray)
numerous pyrite blebs

lter. white interval
N-7 (lt. gray)

homogeneous, non-laminated

balls or clasts disturbed by drilling consisting of 2.5Y 5/2 (grayish brwn.) up to 8cm wide (see smear 3-68) MARLY NANNO OOZE

N-7 (lt. gray) NANNO OOZE
pyrite specs smeared thruout, perhaps more numerous in 5GY 6/1 layers

layers of 5GY 6/1 (grn. gray) NANNO OOZE (slightly more clay-rich) occas. faint lamination, sharp top & bottom contacts. TO MARLY NANNO OOZE

5B 8/1 → 5B 9/1 (lt. bluish gray)
same general lithology
gradation to N-8 (lt. gray white)

pyrite specs abund. thruout

5B 9/1 (lt. bluish gray)

SMEAR (1-11) [0,10,90]
54% nannos
40% clay
2% qtz.
2% carb. unspec.
2% foraminifera
tr. mica, heavy mins., pyrite, dolomite, sponge spics.

SMEAR (1-48) [5,30,65]
81% nannos
10% clay
5% forams
2% carb. unspec.
1% quartz
1% mica
tr heavy mins, glauconite, sponge spics.

SMEAR (3-68) [3,30,67]
52% nannos
30% clay
8% quartz
5% carb. unspec.
3% forams.
1% feldspar
1% mica
tr. magnetite, apatite, tourmaline
tr. glauconite, pyrite, diatoms

SMEAR (3-95) [5,20,75]
78% nannos
10% clay
8% forams
2% carb. unspec.
1% pyrite
1% quartz
tr. mica, heavy mins, glaucon., org. matter

SMEAR (3-102) [5,20,75]
77% nannos
20% clay
1% quartz
1% carb. unspec.
1% forams.
tr. mica, glauconite
tr magnetite, apatite

SMEAR (4-21) [1,20,79]
65% nannos
20% clay
5% quartz
3% forams
3% carb. unspec.
1% pyrite
1% feldspar
1% mica
1% magnetite, zircon
tr. glaucon., sponge spics.

SMEAR (5-103) [3,20,77]
74% nannos
15% clay
8% forams
2% carb unspec
1% quartz
tr. mica, heavy mins., glauconite, pyrite, dolomite

SMEAR (6-43) [3,19,78]
77% nannos
15% clay
5% forams
2% carb. unspec.
1% quartz
tr. magnetite, tourmaline
tr. mica, glauconite, pyrite, dolomite

$CaCO_3$ (BOMB) → 1, 63–65cm = 64% $CaCO_3$

ORG. (C) → 1, 63–65 = 0.2%

Explanatory notes in chapter 1

Site 398 Hole A Core 2 Cored Interval: 201.0 – 210.5

AGE: PLIOCENE

ZONE: N 19 Ceratolithus tricorniculatus – NN12

FOSSIL CHARACTER: FORAMS; NANNOS: Cg; RADS; DIATOMS: Cg

SECTION: 1, 2, 3, 4, 5, 6, Core Catcher

METERS: 0.5, 1.0

LITHOLOGY

DEFORMATION

LITHO. SAMPLE: 123, 126, 127, 75, 72, 115

SED. STRUCT.

LITHOLOGIC DESCRIPTION

NANNO OOZE predominantly 5B9/1 (lt. bluish gray to white) w/ occasional beds of 5GY 8/1 (lt. greenish gray) NANNO OOZE (in sed struct. column)

5B9/1 comprises >95% of core

every 10 to 15 cm. is a thin laminae of 5Y3/2 (olive gray) organic & pyrite rich mud

FORAM-NANNO OOZE 5G 8/1

Burrowed thruout w/ halo burrows, Mycellia, chondrites types, organic-rich or pyritized fillings occas. laminae of 5G 6/1 OOZE

NANNO OOZE 5B 9/1 (smooth bluish) predominant & 5B 8/1 fairly uniform occas deformed laminations

SMEAR (1-123) [3,5,92]
70% nannos
24% clay
3% forams
2% quartz
1% dolomite
tr mica, heavy mins

SMEAR (1-126) [2,10,88]
65% nannos
25% clay
5% forams
2% carb. unspec.
1% Quartz
1% mica
1% fecal pellets
tr. glauconite, pyrite

SMEAR (1-127) [3,7,90]
70% nannos
21% clay
3% quartz
3% fecal pellets
2% carb. unspec
1% forams
tr. mica, heavy mins.

SMEAR (2-75) [8,10,82]
66% nannos
20% clay
10% forams.
1% quartz
1% mica
1% pyrite
1% carb. unspec.
tr. tourmalins
tr. glauconite, dolomite

SMEAR (4-72) [5,10,85]
70% nannos
22% clay
3% forams
2% quartz
2% fecal pellets
1% carb. unspec.
tr mica, heavy mins., glauconite, pyrite, dolomite

SMEAR (5-115) [3,10,87]
70% nannos
20% clay
5% forams
2% quartz
2% carb. unspec.
1% mica
tr. apatite, glauconite, pyrite, org. matter

$CaCO_3$ (BOMB) → 2, 54-56 cm. = 68% $(CaCO_3)$

ORG. (C) → 2, 54-56 = 0.15%

Core Catcher

Explanatory notes in chapter 1

Site 398 Hole B Core 1 Cored Interval: 229.5 – 239.0

AGE: PLIOCENE

ZONE: Ceratolithus tricorniculatus - NN12 / 19

FOSSIL CHARACTER: FORAM, NANNO

SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | SED STRUCTURES

LITHOLOGIC DESCRIPTION

NANNO OOZE throughout bluish white 5B 8/1 alternating with white N9, usually with sharp contacts; varying thicknesses of each, 5-50cm at top of core, increasing to 20-100cm at bottom; slightly bioturbated throughout with chondrites, mycellia, some halo burrows; numerous thin laminae and isolated blebs of green yellow 5GY 5/2 and 5G 6/1 nanno ooze with pyrite and organic material.

SMEAR (57) [4, 6, 90]
65% nannos
29% clay
2% forams
2% carb unspec
1% dolomite
1% quartz
tr heavy mins, glauconite, pyrite, sponge spics.

SMEAR (59) [4, 10, 86]
65% nannos
26% clay
5% pyrite (½ pyrite, ½ organic ??)
2% forams
2% fecal pellets
1% carb unspec
1% dolomite
tr qtz, heavy mins, sponge spics.

SMEAR (2-60) [5, 10, 85]
65% nannos
28% clay
4% forams
1% carb unspec.
1% pyrite
1% qtz
tr mica, heavy mins., glauconite,

SMEAR (4-128) [3, 10, 87]
65% nannos
25% clay
5% forams
2% pyrite
2% fecal pellets
1% qtz
tr heavy mins

SMEAR (5-103) [0, 8, 92]
80% nannos
16% clay
2% pyrite
1% dolomite
1% qtz
tr mica, heavy mins, forams

SMEAR (6-2) [2, 10, 88]
75% nannos
19% clay
2% qtz
2% pyrite
2% forams
1% heavy mins
1% carb unspec.
tr mica

SMEAR (6-34) [5, 8, 87]
70% nannos
15% clay
5% forams
2% qtz
2% pyrite
1% dolomite
1% carb unspec.
1% heavy mins
3% fecal pellets
tr mica

Core Catcher

Explanatory notes in chapter 1

Site 398 Hole C Core 1-CC Cored Interval: 0-79.0 m

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCT.	LITHOLOGIC DESCRIPTION
Pleistocene	NN 19/20	Cg	1	0.5			9		CORE CATCHER ONLY - UNORIENTED
				1.0			42		MARLY NANNO OOZE
			2						Bluish white to light bluish gray 5B7/1→5B9/1 laminated with purplish gray organic streaks
			Core Catcher						Greenish gray 5GY 6/1 organic streaks & mottles

SMEAR (9) [5, 22, 73]
65% nannos
31% clay
2% forams
1% quartz
1% mica
tr feldspar, volc glass, carb. unspec.

SMEAR (42) [3, 25, 72]
47% clay
45% nannos
4% qtz
2% forams
1% carb unspec.
1% mica
tr heavy mins, pyrite, volc glass(?), dolomite

Site 398 Hole D Core 1 Cored Interval: 0-9.5

AGE	ZONE	FOSSIL CHARACTER: FORAM				SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						1	0.5 1.0				NO RECOVERY
						2					
						3					
						Core Catcher					

Site 398 Hole D Core 2 Cored Interval: 271.0–280.5

AGE: Early PLIOCENE
ZONE: Ceratolithus tricorniculatus – NN12 N 19-20
FOSSIL CHARACTER: FORAM. Ae Ae Ag Ag Cg Cp; NANNO Cg
SECTION: 1 2 3 Core Catcher
METERS: 0.5 1.0
LITHOLOGY: VOID — END CORE
DEFORMATION
LITHO. SAMPLE: 24 29 64 85 123 13 17 22 26 36 44
SED. STRUCT.

LITHOLOGIC DESCRIPTION

Alternation of 5GY8/1 (lt. grnish gray) 5GY 6/1 (grn gray) and 5Y 5/2 (lt. olive gray) MARLY NANNO OOZE w/ some NANNO OOZE, burrowed thruout, moderate to intense, some pyritic burrow-fillings (Chondrites, Mycellia common), halo and composite burrows also

Contacts between units sharp for base of 5Y 5/2 and gradational for 5GY 6/1 – 8/1; occasional thin laminations associated w/ dkish. marly nanno oozes (5Y5/2) and dk. grn (diagenetic?) laminations w/ gray, more organic-rich intervals

Mostly 5B 9/1 (lt. bluish white) to N-8 (very lt. gray) MARLY NANNO OOZE to NANNO OOZE in SECT. 2 40–150 cm & SECT. 3, some 5Y 8/1 (very lt. ol. gray), Bzds average > 10–20 cm. thickness, but highly variable

$CaCO_3$ (BOMB) 1, 95-97 = 47%

SMEAR ave. 1-24, 1-29, 1-64, 1-85, 1-23 [5,15,85]
45% clay 2% pyrite
37% nannos tr. sponge, organic matter
4% dolomite
3% forams
3% quartz
2% carb unspec
2% heavy mins
2% mica
2% fecal pellets

SMEAR 2-13 [5,30,65] PYRITIC MUD
52% clay
15% pyrite
15% nannos
10% quartz
5% carb. unspec
2% forams
1% mica
1% glauconite
tr – tourmaline, apatite, feldspar

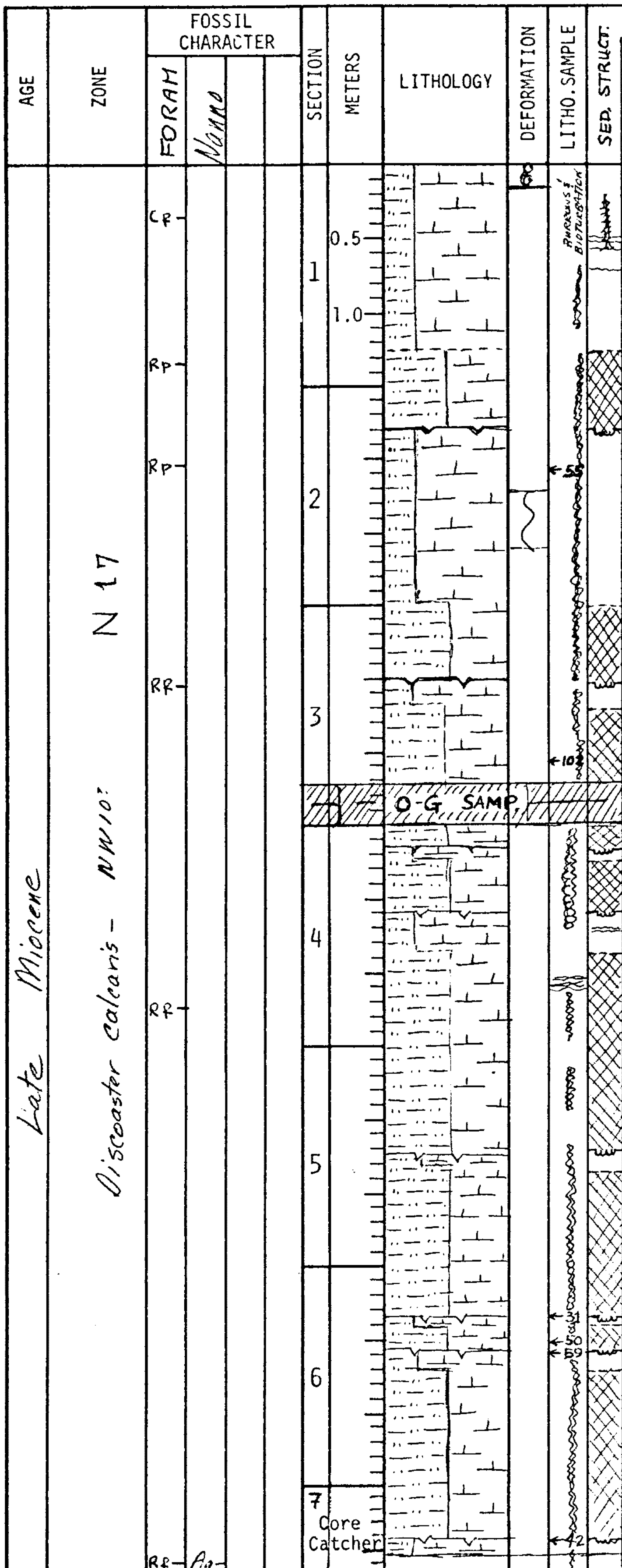
SMEAR 2-17 [5,20,75] FORAM-NANNO OOZE
60% nannos
16% clay
15% forams
5% carb. unspec.
2% quartz
1% mica
1% pyrite
tr. heavy mins, dolom., sponge spics.

SMEAR ave. 2-22, 2-26, 2-36 [3,25,72] MARLY NANNO OOZE
50% nannos
34% clay
5% forams
5% quartz
3% carb. unspec.
1% mica
1% pyrite
tr. – heavy mins, sponge spics, glauc., dolom., fish, rdds.

SMEAR 2-44 [5,20,75] NANNO OOZE
70% nannos
12% clay
10% forams
2% quartz
2% fecal pellets
2% carb. unspec.
1% mica
1% vole. glass
tr. pyrite, dolomite, sponge spics.

30

Site 398 Hole D Core 3 Cored Interval: 318.5–328.0



LITHOLOGIC DESCRIPTION

[SPECIAL SYMBOLS]
- dk. grn. diagenetic laminae
- sharp, burrowed, irreg. contact
- denotes gradation from dker-colored, bottom parts of rhythmic beds, to lter.-colored pelagic part

BETTER LITHIFIED → CHALKY

NANNO CHALK N-9

5GY 8/1 MARLY NANNO CHALK

NANNO CHALK N-9

5GY 8/1

N-9

5GY 8/1

5GY 8/1

N-9

5GY 8/1

N-9

slightly silty laminae

5GY 8/1

N-9

Zoophycus

5GY 8/1

N-9

5GY 8/1

N-9

5GY 8/1

N-9

Rhythmic Sequence of beds with sharp, but burrowed basal contacts, generally a color and $CaCO_3$ content gradation from base to top. 5GY8/1 (lt. grnish. gray) at base becoming lighter upward to 5B 9/1 (lt. bluish white) and N-9 (white), less calcareous (more clay-rich) at base. Intensely burrowed thruout, common unidentifiable mottles and halo burrows, also Zoophycus, chondrites, and numerous composite burrows.

Material from base of rhythm burrowed downward into underlying lter. colored chalk usually as much as 10 cm.

Diagenetic laminations present in association with more organic rich mottles or intervals, usually above approx 5 mm. outward from organic layer. laminae <1mm thick

[SMEAR] 2-55 [1, 20, 79]
- 65% nannos
- 23% clay
- 5% quartz
- 3% forams
- 3% carb. unspec.
- 1% dolomite
- tr. pyrite, zeolite, mica, organic matter

[PYRITIC BURROW] [SMEAR] 3-102 [0, 10, 90]
- 80% pyrite
- 10% nannos
- 5% clay
- 3% quartz
- 2% carb. unspec.
- tr mica

[SMEAR] 6-31 [3, 15, 82] MARLY NANNO CHALK
- 58% clay
- 30% nannos
- 4% quartz
- 3% dolomite
- 2% carb. unspec.
- 2% heavy mins
- tr. mica, glauconite, forams, sponge spics
- 1% pellets

[SMEAR] 6-50 [2, 8, 90] MARLY NANNO CHALK
- 50% clay
- 40% nannos
- 3% quartz
- 2% heavy mins.
- 2% carb. unspec.
- 2% dolomite
- 1% pellets
- tr mica, pyrite, forams

[SMEAR] 6-59 [3, 15, 82] MARLY NANNO CHALK
- 44% clay
- 40% nannos
- 5% quartz
- 3% dolomite
- 2% heavy mins
- 2% carb unspec.
- 1% mica
- 1% pyrite
- 2% pellets
- tr. glauconite

[SMEAR] 7-42 [0, 5, 95] MARLY NANNO CHALK
- 50% nannos
- 42% clay
- 3% quartz
- 3% carb. unspec.
- 2% forams
- tr. mica, tourmaline, organic matter, fish remains, dolomite

$CaCO_3$ (BOMB) 2, 10-12 = 65%

Explanatory notes in chapter 1

Site 398 Hole D Core 4 Cored Interval:

AGE: Middle Miocene (LATE MIOCENE)
ZONE: Discoaster exilis/Discoaster kugleri - NN 6/7 (N16-N17)
FOSSIL CHARACTER: FORAMS
SECTION: 1, 2, 3, 4, 5, 6, Core Catcher
METERS: 0.5, 1.0
LITHOLOGY
DEFORMATION
LITHO. SAMPLE: 70, 96, 50, 15, 25, 34, 58.3
SED STRUCTURES

LITHOLOGIC DESCRIPTION

NANNO CHALK to MARLY NANNO CHALK

core shows numerous repetitions of following sequence:

bluish white (5B 9/1) with common burrows and bioturbation mottling
grades downwards into
very light gray (5B 8/1), burrows & mottles less common, with sharp basal contact, followed by bluish white unit again
several intervals of dark grayish green parallel laminae, sometimes inclined, often burrowed
colors vary from 5Y 5/2 - 5Y 4/1 - 5G Y 8/1
usually occur within very light gray unit

often burrows are concentrated at top of white (5B 9/1) unit and occassionally are truncated(?) indicating erosion followed by deposition of gray unit?.
burrows are varied and usually unident. fiable; some show halos

5B 9/1
5B 8/1
dark gray laminations

note: smear slide analysis shows little difference in carbonate content between light and dark units

$CaCO_3$ - (BOMB) - 4, 80-82cm = 77%

SMEAR (2-70) [2,10,88]
50% nannos
39% clay
3% pellets
3% quartz
2% carb unspec
1% heavy mins
1% dolomite
1% foramo
tr spongespics, mica

SMEAR (2,94) [2,20,28]
60% nannos
29% clay
3% fecal pellets
3% foramo
2% qtz
2% carb unspec.
1% dolomite
tr mica, heavy mins, glauconite

SMEAR (3-50) [2,10,88]
60% nannos
27% clay
5% foramo
3% pellets
2% qtz
2% carb unspec.
1% dolomite
tr mica, glauconite, pyrite, fishre

SMEAR (4-15) [2,8,90]
60% nannos
27% clay
5% foramo
3% carb unspec
2% dolomite
2% qtz
2% pellets
1% mica
tr heavy mins, pyrite

SMEAR (4-25) [6,6,88]
50% nannos
40% clay
2% carb unspec
2% foramo
2% qtz 2% pellets
1% mica
1% heavy mins
tr pyrite

SMEAR (4-34) [5,15,80]
42% nannos
40% clay
5% pellets
4% carb unspec.
3% qtz 2% mica 1% heavy mins.
1% pyrite
2% dolomite
tr glauconite, foramo, spongespics

SMEAR (5-51) [5,15,80]
60% nannos
26% clay
3% foramo
1% dolomite, 1% carb unspec.
2% qtz, 1% mica
5% pellets
tr heavy mins, glauconite

SMEAR (5-63) [5,18,77]
50% nannos
39% clay
2% foramo, 2% dolomite,
2% carb unspec
1% mica, 1% heavy mins, 2% q
1% pellets
tr pyrite, glauconite

Core Catcher

Explanatory notes in chapter 1

Site 398 Hole D Core 5 Cored Interval: 394.5 – 404.0 m

AGE: Middle Miocene
ZONE: N 12 – N13; D. exilis / O. kugleri – NN6/7
FOSSIL CHARACTER: FORAM; Nannno
SECTION: 1, 2, 3, 4, 5, 6, Core Catcher
METERS: 0.5; 1.0
LITHOLOGY
DEFORMATION
LITHO. SAMPLE: 59; 66; 10; 74/77
SED STRUCTURES

LITHOLOGIC DESCRIPTION

MARLY NANNO CHALK throughout

Very light gray (N8) with green and black laminations, sometimes cutting through burrows
moderately burrowed, colors dark gray & greenish gray with chondrites common, plus other oval burrows some halos; N7 burrowed intervals 120-126cm, 135-140cm
numerous black blebs & vertical fillings
burrowed contact with:

white (N9) with numerous N8 burrows at top, gradually darkens slightly to
Very light gray (N8)
scattered olive gray burrows, usually composite, chondrites & zoophycos
very faint mottling distinguished by subtle colors of white & very pale gray
rare black blebs

light gray (N7)
extensively burrowed dark gray & white chondrites & halo perhaps so intensely because of good color contrast
common very fine black blebs

very light gray (N8) dominant, with intervals of gray (N6) extensively burrowed (often composite) at 60-67cm, 106-109cm
dominant unit shows composite chondrites zoophycos burrows common, gray in color,
scattered black blebs

CC SAMPLE REMOVED

very light gray (N8) grading darker with depth
becomes more indurated towards bottom - increasing forams?
base is perhaps cross bedded silt size

light gray (N7) as above with common burrowing

very light gray (N8)
scattered oval burrows (~3mm across) & inclined zoophycos

light brownish gray (2.5Y 6/2)
numerous light gray chondrites burrows & large ovals
sharply defined inclined, cross-bedded silty laminations at base

bluish white (5B 8/1) grades to very light gray (N8)
intense burrowing, faint at top, becoming more distinct with dark, composite fillings
perhaps silt/dr at base

light bluish gray 5B 7/1 to very light gray (N8)
gray (N6) intensely burrowed, ovals ~ ½ cm
silty lamination at base

light bluish gray (5B 7/1) with numerous gray, very fine chondrites plus rare haloed ovals
sharp inclined basal contact

very light gray (N8) with subtle variations - faint mottling grades to gray (N/6), with scattered black blebs,
sharp, irregular basal contact

White (N/9) with scattered oval burrow mottles, some halos
with intervals of very light gray (N8) intensely burrowed

SMEAR (1-59) [3,15,82]
55% nannos
37% clay
2% fecal pellets
2% qtz
2% carb unspec
1% dolomite
1% forams
tr mica, pyrite

SMEAR (3,66) [7,7,86]
50% nannos
35% clay
4% quartz
2% mica
2% forams
2% sponge spics.
2% fecal pellets
1% heavy mins
1% glauconite
1% carb unspec.
tr pyrite

SMEAR (5-10) [7,7,86]
55% nannos
34% clay
2% qtz
2% carb unspec
2% dolomite
2% forams
2% fecal pellets
1% mica
tr heavy mins; pyrite

SMEAR (5-24) [8,12,86]a, [15,30,55]b
75% nannos
39% clay
1% qtz
2% sponge spics
2% forams
1% mica
1% heavy mins
1% glauconite
1% carb unspec
1% dolomite
tr plant debris

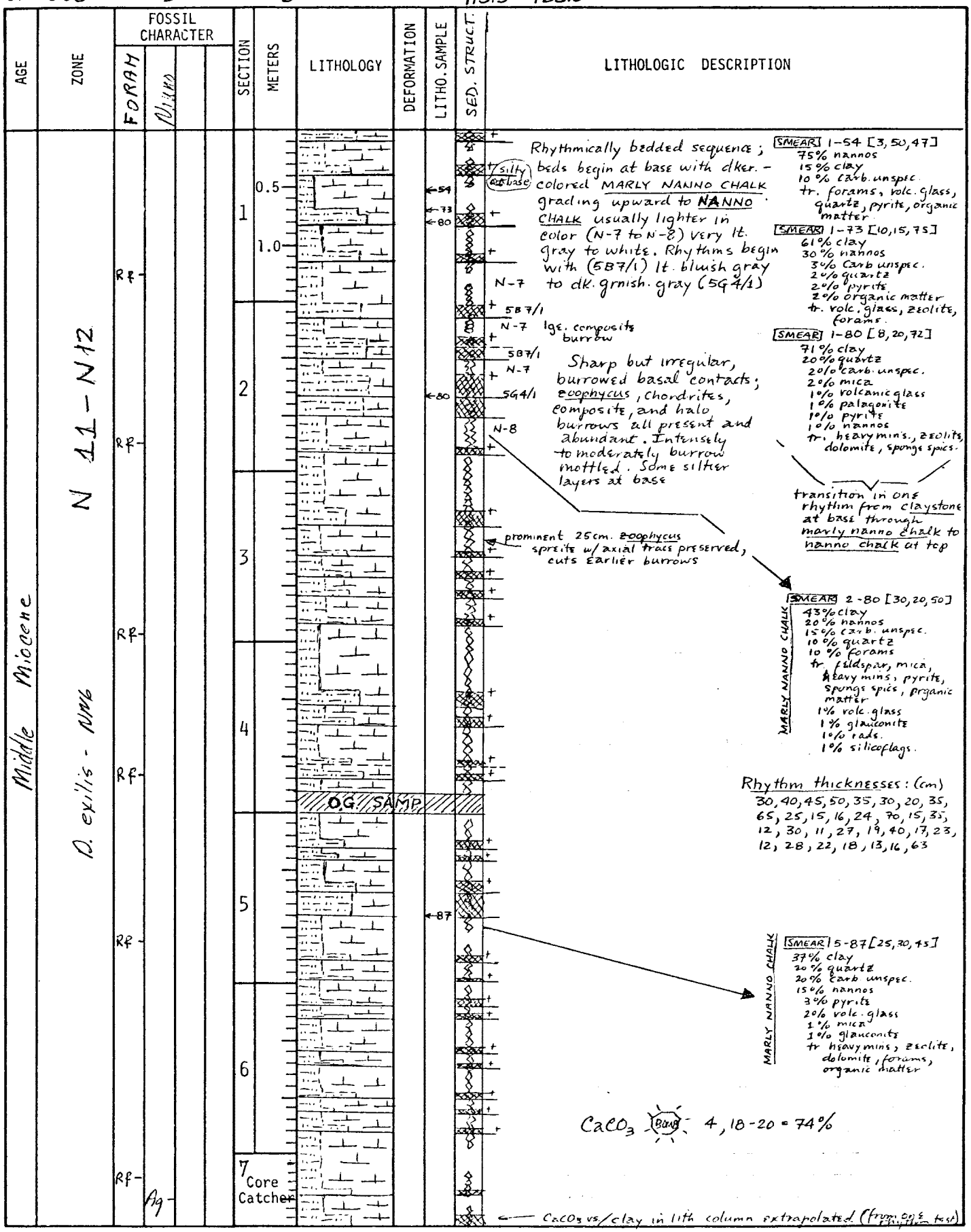
SMEAR (5-27) [7,5,88]
55% nannos
30% clay
5% fecal pellets
3% carb unspec
2% qtz
2% dolomite
2% forams
1% sponge spics.
tr mica, heavy mins, pyrite

$CaCO_3$ - BOMB 5, 10-12cm = 56%

Explanatory notes in chapter 1

* irregular, sharp contact

Site 398 Hole D Core 6 Cored Interval: 413.5-423.0



Explanatory notes in chapter 1

Site 398 Hole D Core 7 Cored Interval:

AGE: Middle Miocene

ZONE: Sphenolithus heteromorphus - NN5

FOSSIL CHARACTER: FORAM: RP; Cp; Cp; Cp; Rf-Cf

NANNO: N8 - N10?

SECTION: 1, 2, 3, 4, 5, 6, Core Catcher

METERS: 0.5, 1.0

LITHOLOGY

DEFORMATION

LITHO. SAMPLE: 33, 45, 131, 133, 107, 38

SED STRUCTURES

LITHOLOGIC DESCRIPTION

Rhythmic strata as in core 6 with addition of massive to laminated thin, micro-cross laminated siltstone & sandstone, partly indurated, relatively porous with good sorting; faint suggestion of grading; intensely to moderately bioturbated throughout.

Typical pattern:
greenish gray (5G 6/1) or ltbluish gray (5B 7/1) grading upward to
bluish white (5B 9/1) or slightly darker
sands and silts at base, salt & pepper colors of medium gray (5B 7/1, 5G 6/1, N5)
total group usually 15-30 cm at top of core, increasing in thickness downwards to 20-60 cm

MARLY NANNO CHALK

SMEAR (1-33) [20, 16, 64]
54% clay
20% nannos
20% carb unspec.
2% forams
2% sponge spics.
2% quartz
tr rads, silicoflags, plant detris

GLAUCONITIC CALCAREOUS SANDSTONE

SMEAR (1-93) [40, 40, 25]
28% carb unspec
20% forams
15% clay
10% qtz
5% nannos
5% sponge spics
3% feldspar
3% volc glass
5% glauconite
2% heavy mins
2% dolomite
2% rads
tr diatoms

MARLY NANNO CHALK

SMEAR (2-131) [25, 40, 35]
25% clay
20% carb unspec
20% forams
10% nannos
5% qtz
3% rads 3% sponge
2% volc glass
1% glauconite 1% feldspar
1% dolomite
tr mica heavy mins

MARLY NANNO CHALK

SMEAR (2-133) [2, 28, 70]
40% clay
20% carb unspec
20% nannos
tr qtz, volc glass, pyrite, foram, rad, sponge, plant detris

CALCAREOUS SANDSTONE

SMEAR (4-107) [30, 40, 30]
25% clay
23% carb unspec
30% foram
5% sponge spics, 1% rads
5% nannos 1% dolomite
2% glauconite, 1% pyrite
5% qtz, 1% mica, 1% heavy mins

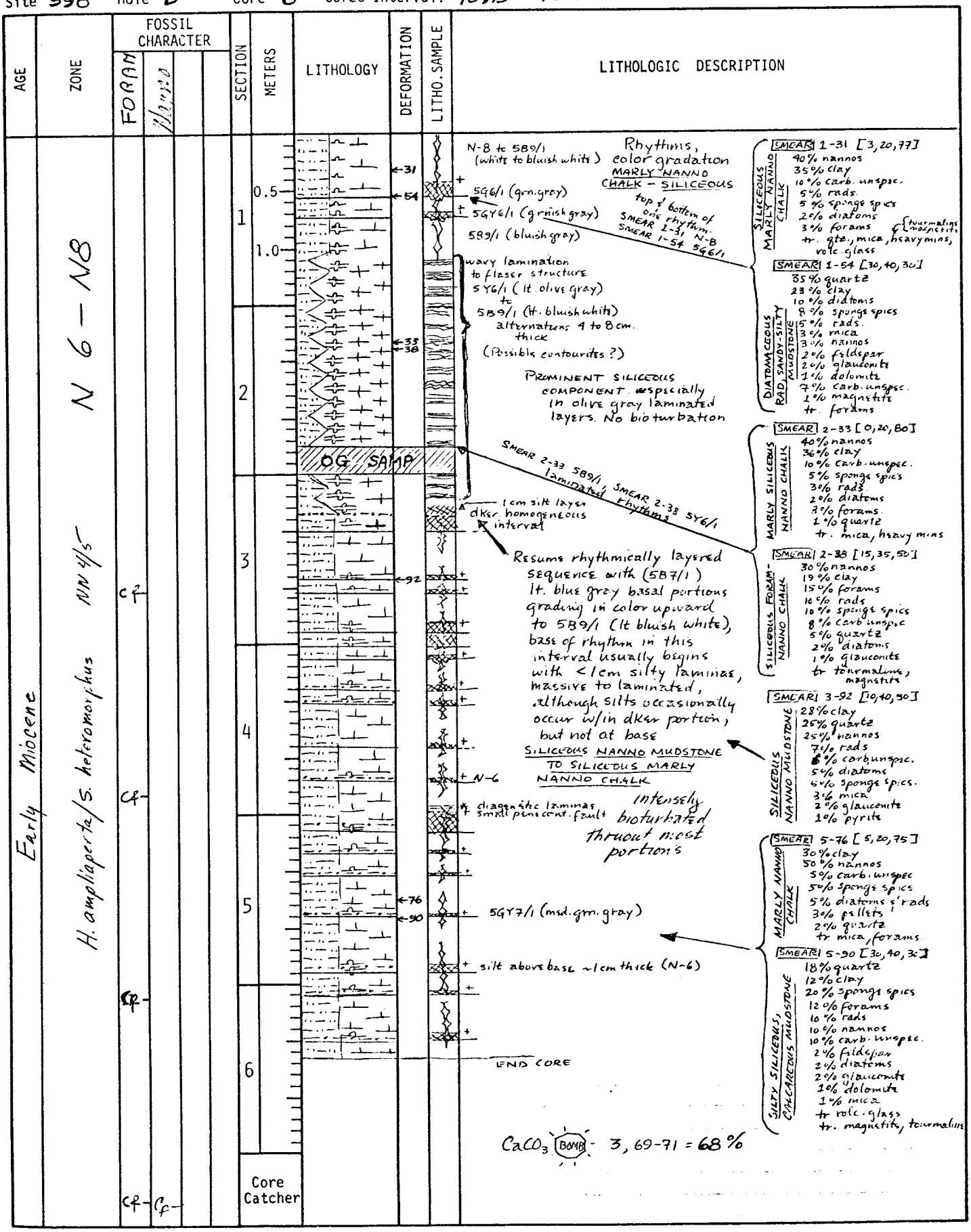
MARLY SILIC-CALC CHALK

SMEAR (5-38) [40, 20, 40]
36% clay
20% carb unspec
20% sponge spics
10% nannos
5% rads
5% qtz
3% pyrite
1% glauconite
tr volc glass, Foraams, fish remains

$CaCO_3$ (PCMB)
2, 140-142 = 69%
3, 33-35 = 37%

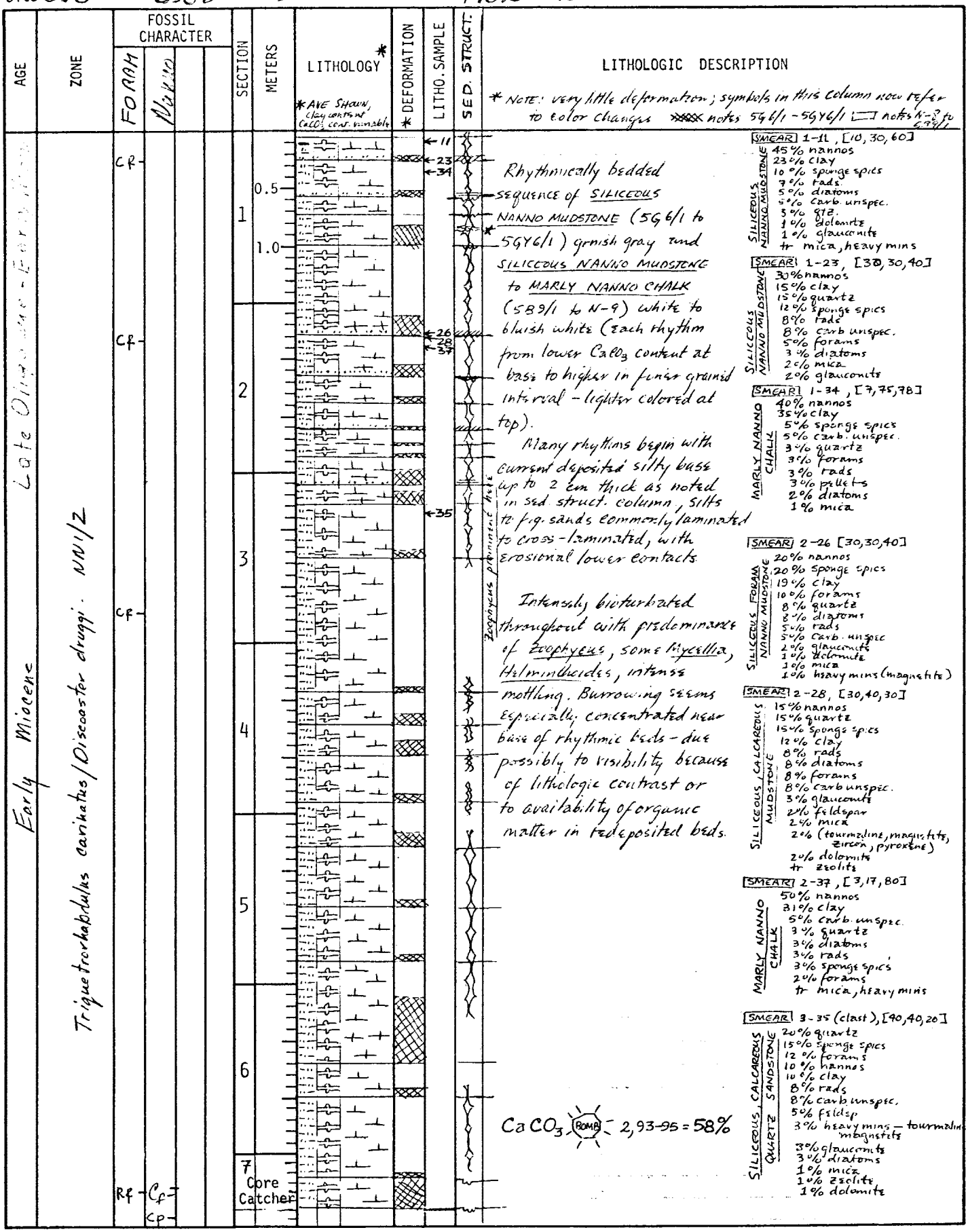
Explanatory notes in chapter 1

Site 398 Hole D Core 8 Cored Interval: 451.5 – 461.0



Explanatory notes in chapter 1

Site 398 Hole 398D Core 9 Cored Interval: 470.5 -460.0



Explanatory notes in chapter 1

Site 398 Hole D Core 10 Cored Interval: 489.5 -499.0

AGE	ZONES: FORAM	ZONES: NANNO	FOSSIL CHARACTER: FORAM	FOSSIL CHARACTER: NANNO	FOSSIL CHARACTER	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Early Miocene	Tp	Reticulofenestra abisecta	Tp	Cg			Core Catcher						5G6/1 (grnish gray) NANNO CHALK

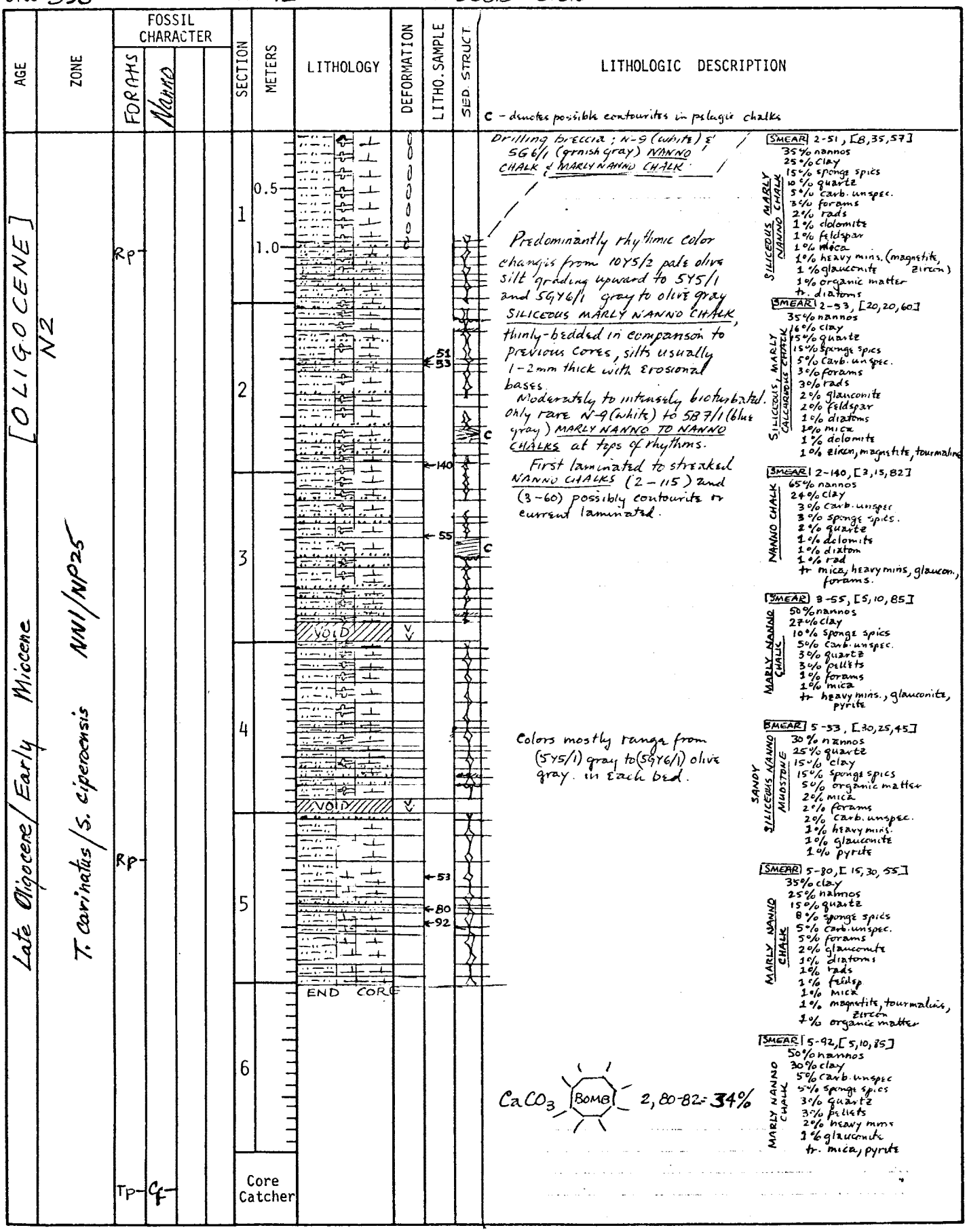
Explanatory notes in Chapter 1

Site 398 Hole D Core 11 Cored Interval: 499.0 – 508.5

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
			1	0.5 1.0					NO RECOVERY
			Core Catcher						

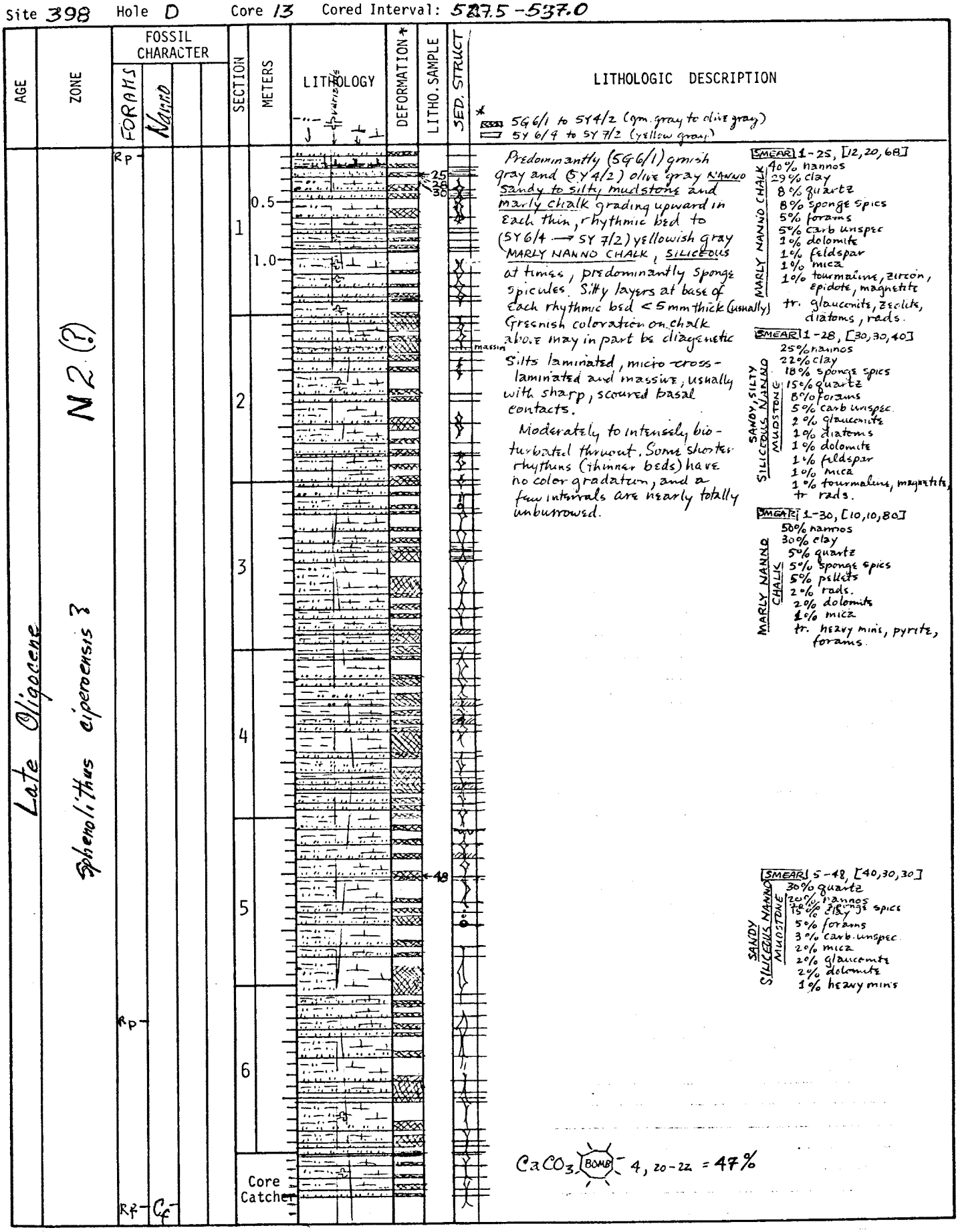
Explanatory notes in Chapter 1

Site 398 Hole D Core 12 Cored Interval: 508.5 -518.0



Explanatory notes in chapter 1

Site 398 Hole D Core 13 Cored Interval: 527.5-537.0



LITHOLOGIC DESCRIPTION

5G 6/1 to 5Y 4/2 (grn. gray to olive gray)
5Y 6/4 to 5Y 7/2 (yellow gray)

Predominantly (5G 6/1) grnish gray and (5Y 4/2) olive gray NANNO sandy to silty mudstone and marly chalk grading upward in each thin, rhythmic bed to (5Y 6/4 → 5Y 7/2) yellowish gray MARLY NANNO CHALK, SILICEOUS at times, predominantly sponge spicules. Silty layers at base of each rhythmic bed < 5 mm thick (usually). Grecnish coloration on chalk above may in part be diagenetic. Silts laminated, micro-cross-laminated and massive, usually with sharp, scoured basal contacts.

Moderately to intensely bioturbated throuout. Some shorter rhythms (thinner beds) have no color gradation, and a few intervals are nearly totally unburrowed.

MARLY NANNO CHALK
SMEAR 1-25, [12,20,68]
40% nannos
29% clay
8% quartz
8% sponge spics
5% forams
5% carb unspec
1% dolomite
1% feldspar
1% mica
1% tourmaline, zircon, epidote, magnetite
tr. glauconite, zeolite, diatoms, rads.

SANDY, SILTY SILICEOUS NANNO MUDSTONE
SMEAR 1-28, [30,30,40]
25% nannos
22% clay
18% sponge spics
15% quartz
8% forams
5% carb unspec.
2% glauconite
1% diatoms
1% dolomite
1% feldspar
1% mica
1% tourmaline, magnetite, tr rads.

MARLY NANNO CHALK
SMEAR 1-30, [10,10,80]
50% nannos
30% clay
5% quartz
5% sponge spics
5% pellets
2% rads.
2% dolomite
1% mica
tr. heavy mins, pyrite, forams.

SANDY SILICEOUS NANNO MUDSTONE
SMEAR 5-48, [40,30,30]
30% quartz
20% nannos
15% sponge spics
15% clay
5% forams
3% carb. unspec.
2% mica
2% glauconite
2% dolomite
1% heavy mins

$CaCO_3$ (BOMB) 4, 20-22 = 47%

Site 398 Hole D Core 14 Cored Interval: 537.0 – 546.5

AGE	ZONE	FOSSIL CHARACTER: FORAM	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCT
UPPER OLIGOCENE (?)	Sphenolithus ciperoensis/Sphenolithus distentus - NP24/25	Rp – Cf –	1	0.5			←36 ←47 ←70	
			2	1.0	END CORE			
			Core Catcher					

CONTINUE RHYTHMIC SEQUENCE

(5G 4/1) dk grnish gray at base grades up to (N-7) lt. gray at top of each rhythm, silty @ base grades up to NANNO [illegible] and MARLY NANNO [illegible] From QUARTROSE NANNO CHALK

SMEAR 1-36, [1,45,54]
NANNO CHALK
83% nannos
12% clay
4% carb unspec.
1% quartz
tr mica
tr heavy mins.
tr glass
tr pyrite
tr. sponge spics

SMEAR 1-47, [13,75,22]
QUARTROSE NANNO SILTSTONE
43% nannos
32% quartz
8% clay
5% sponge spics
4% glauconite
3% carb. unspec.
2% forams
1% mica
1% pyrite
1% pellets
tr glass, feldsp, heavy mins

$CaCO_3$ BOMB 1; 33-35 = 60%

SMEAR 1-70, [2,43,55]
MARLY NANNO CHALK
53% nannos
18% quartz
15% clay
5% carb. unspec
2% pyrite
2% sponge spics
2% glauconite
2% mica
tr dolomite
tr. org. matter
tr. heavy mins

Site 398 Hole D Core 15 Cored Interval: 546.5-556.0

AGE: LATE OLIGOCENE

ZONE: Sphenolithus ciperoensis/Sphenolithus distentus – NP25/NP24

FOSSIL CHARACTER: FORAM. Rp; NANNO N2; Fp – Cg

SECTION: 1, 2, 3, 4, 5, 6, Core Catcher

METERS: 0.5, 1.0

LITHOLOGY

DEFORMATION

LITHO. SAMPLE: 11, 16, 20; 100, 102; 143; 139, 142, 143

SED. STRUCT.: A, B, C, D, E, F, G

LITHOLOGIC DESCRIPTION

* IN DEFORMATION COLUMN – COLOR SYMBOLS [xxxx denotes lamination or rapid rhythmic color changes]: 5GY6/1 to 5G6/1; 5B7/1 as before

Rhythmic sequence, similar to previous cores, beginning base of each rhythm w/ grnish. gray (5GY6/1) film (<1cm) silt layer, laminated, followed by massive, homogeneous (5G6/1) grnish gray marly nanno chalk, lightening in color up ward, burrowed intensively in lower part, followed by lt. bluish gray (5B 7/1), intensely burrowed NANNO CHALK to MARLY NANNO CHALK.

2 slump units (A & B) of different lithology – thinly laminated & rhythmic alternation of 5G6/1 (5GY6/1) and 5B 7/1, rare Chondrites burrows at top of interval, isoclinal, recumbent, & monoclinal folding grading downward to yellowish gray (5Y7/2) more flat-lying chalk w/ occas. 5B7/1 laminations. unit B is a folded, contorted, pebbly conglomerate (5Y7/2 & 5B7/1 w/ white granules of hard, subrounded calcite & angular quartz.

MARLY NANNO CHALK INTERVALS C, D, E, F, G

Colors lt. gray (5Y7/2), yellowish gray (5Y8/1), pale olive (5Y6/3), lt. bluish gray (5B7/1), and grnish. gray (5G6/1); rapidly alternating laminae, absence of bioturbation, laminae (1mm to 3cm) of flat laminations, cross-bedding, cut-and-fill (truncations of sets of laminae) crenulations, isoclinal folding, axial cleavage in folds, microfaulting w/ as much as 3mm offset of laminae, microfaults w/ shallow dip, possibly related to current shear of water-charged sediment.

unit E – laminated w/ calcite granules in one layer

2 to 10 cm intervals of color change w/ fine laminae w/in

Slumps & folds in D & G

unit F – x-bedded, truncated sets.

Intensely burrowed, rhythmic sequence as typical of first part of core, colors 5G6/1, 5GY6/1 and 5B7/1 as before, but w/ some faint 5Y 7/2 stain at some intervals

SMEAR 1-14 [10,30,60] MARLY NANNO CHALK
32% clay
30% nannos
10% carb. unspec.
10% sponge spics
5% forams
5% quartz
2% dolomite
1% feldspar
1% mica
1% heavy mins (tourmaline, magnetite, zircon)
1% glauconite
1% diatoms
1% rads

SMEAR 1-16 [25,40,35] QUARTZOSE, SANDY FORAM-NANNO MUDSTONE
23% clay
23% nannos
15% carb unspec.
15% quartz
10% forams
5% sponge spics
2% diatoms
2% feldspar
2% dolomite
1% mica
1% heavy mins (tourmaline, apatite, magnetite)
1% glauconite
tr rads.

SMEAR 11-20 [30,20,77] MARLY NANNO CHALK
45% nannos
44% clay
5% quartz
3% carb. unspec.
3% sponge spics
tr heavy mins
tr. dolomite
tr glauconite

SMEAR 1-100 [3,30,67] MARLY NANNO CHALK
40% nannos
34% clay
15% carb unspec
5% quartz
2% forams
2% sponge spics
1% dolomite
1% mica
tr glauconite
tr heavy mins

SMEAR 1-102 [2,10,88] NANNO CHALK
60% nannos
29% clay
5% carb unspec.
2% forams
2% quartz
2% sponge spics
1% dolomite
tr glauconite

SMEAR 2-143 [8,10,82] MARLY NANNO CHALK
44% nannos
40% clay
5% forams
5% carb unspec.
2% quartz
2% sponge spics
1% mica
1% dolomite
tr heavy mins

SMEAR 5-139 [8,30,62] MARLY NANNO CHALK
37% clay
35% nannos
10% carb unspec.
5% quartz
5% sponge spics
3% forams
2% dolomite
1% glauconite
1% heavy mins (tourmaline, magnetite, zircon)
1% mica
tr org. matter

SMEAR 5-143 [3,20,77] MARLY NANNO CHALK
95% nannos
43% clay
5% carb. unspec
2% sponge
2% foraths
2% quartz
1% dolomite
tr. mica
tr. heavy mins

SMEAR 6-142 [25,40,35] SILICEOUS, CALCAREOUS SANDY MUDSTONE
38% clay
20% nannos
10% sponge spics
10% forams
8% carb unspec
5% quartz
2% feldspar
2% glauconite
2% rads
1% dolomite
1% heavy mins
1% mica
tr diatoms

$CaCO_3$ (BOMB): 1, 21-23 = 40%
3, 97-99 = 65%

END CORE

Site 398 Hole D Core 16 Cored Interval: 556.0 - 565.5 m

AGE	ZONES	FOSSIL CHARACTER: FORAM	FOSSIL CHARACTER: NANNO	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	*Sphenolithus ciperoensis*/*Sphenolithus distentus* NP 25/NP24	RP-	Cf-	Core Catcher						Greenish gray (5G 7/1) marly nanno chalk burrowed 1 cm of hard sandy mudstone at base 20 cm long

Explanatory notes in Chapter 1

Site 398 Hole D Core 17 Cored Interval: 565.5 - 575.0 m

AGE	ZONE	FOSSIL CHARACTER: FORAM			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
MIDDLE OLIGOCENE	Sphenolithus predistentus - NP25	Tp	Cf		1	0.5 1.0	Siliceous		10		Siliceous Marly Nanno Chalk yellowish olive (5Y7/2, 5Y6/2) laminated - parallel and thin irregular, wavy folded (?) similar do interval below 59 cm in core 15 Smear (1-10) [7, 13, 80] 50% nannos 24% clay 5% fecal pellets 5% carb unspic 2% dolomite 2% quartz 10% sponge spics. 1% mica 1% heavy mins tr forams
					Core Catcher						

Explanatory notes in Chapter 1

Site 398 Hole D Core 19 Cored Interval: 5845 - 5940

AGE: LATE EOCENE – EARLY OLIGOCENE

ZONE: ?

FOSSIL CHARACTER: FORAM: Rp – Cf – ; Nanno:

SECTION: 1, 2, 3, 4, 5, 6, Core Catcher

METERS: 0.5, 1.0

LITHOLOGY: OG SAMPLE

DEFORMATION

LITHO. SAMPLE: 50, 59, 68, 73, 94, 68, 95, 8

SED STRUCTURES

LITHOLOGIC DESCRIPTION

bioturbation throughout

four visual sedimentary units, repeated rhythmically:

(a) NANNO CHALK to MARLY NANNO CHALK dusky yellow, 5Y 6/4 grades down to

(b) MARLY NANNO CHALK, rarely NANNO CHALK dusky yellow, 5Y 6/4, occassionally a sharp contact with

(c) MARLY NANNO CHALK, usually with significant silt-sized quartz, olive gray 5GY 4/2, sharp contact with

(d) CALCAREOUS SANDY (QUARTZOSE) MUDSTONE to SANDSTONE dusky yellow green 5GY 6/2

this last unit often sharply overlies a greenish transitional unit in contact with the (a) unit below, beginning the next sequence downwards

NANNO CHALK — SMEAR (1-50) [3,15,82]
60% nannos
23% clay
5% qtz
5% carb unspec
3% sponge spics.
2% forams
1% dolomite
1% mica
tr feldspar, heavy mins

MARLY NANNO CHALK — SMEAR (1,59) [5,25,70]
40% nannos
21% clay
10% qtz
5% carb unspec
3% sponge spics
3% forams
2% dolomite
2% feldspar
2% mica
1% heavy mins
1% diatoms

MARLY NANNO CHALK — SMEAR (1-63) [10,25,65]
50% nannos
20% qtz
10% clay
7% sponge spics
5% pellets
3% dolomite
3% mica
1% heavy mins
1% carb unspec
tr glauconite, pyrite

MARLY NANNO CHALK — SMEAR (1-68) [10,20,70]
50% nannos
17% clay
15% qtz
5% sponge spics.
5% pellets
4% mica
3% dolomite
1% heavy mins.

CALCAREOUS SANDY MUDSTONE — SMEAR (1-73) [50,20,30]
45% nannos
25% qtz
10% clay
8% sponge spics
5% forams
2% mica
2% glauconite
2% pyrite
1% dolomite
tr heavy mins.

MARLY NANNO CHALK — SMEAR (1-78) [3,15,78]
60% nannos
23% clay
7% qtz
3% mica
3% sponge spics
2% heavy mins
1% dolomite
1% glauconite
tr pyrite

CALCAREOUS SANDY MUDSTONE — SMEAR (3-68) [15,30,55]
35% nannos
28% clay
10% qtz
8% sponge spics
5% forams
5% carb unspec
2% feldspar
2% mica
2% dolomite
1% heavy mins
1% glauconite
1% diatoms tr rads

CALCAREOUS QUARTZ SANDSTONE — SMEAR (4-15) [45,25,30]
30% qtz
15% nanno
15% clay
8% carb unspec
10% zeolite ?
5% forams
5% mica
3% feldspar
3% sponge spics
2% heavy mins
2% diatoms
1% glauconite

Explanatory notes in chapter 1

Site 398 Hole D Core 20 Cored Interval: 594.0 - 603.5

AGE	ZONE	FOSSIL CHARACTER: FORAM.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCT.	LITHOLOGIC DESCRIPTION
Early Oligocene · LATE · EOCENE	?	CP -	1	0.5					Rhythmically bedded MARLY NANNO CHALK w/ QUARTZOSE, CALCAREOUS SANDSTONE or SILTSTONE @ base, colors dusky yellow (5Y6/4) marly nanno chalk @ tops of rhythmic beds, highly burrow-mottled and olive gray to dusky yellow-green (5GY4/2 to 5GY6/2) siltstone, sandy silt or silty mud. Bioturbated throuout, zoophycus common. Erosional cut-and-fill basal contacts common, siltstones massive to thinly laminated Carbonate content in 5Y6/4 marly chalk to mudstone decreases markedly down-core.
			1	1.0					Silts: 1mm to 1cm thick
			2						
			3						
			4						
			5						
			6						
			Core Catcher						

QUARTZOSE, CALCAREOUS SANDY, SILTY MUDSTONE

SMEAR 3-133, [30,40,30]
25% Carb unspec
20% clay
20% quartz
10% zeolites
10% forams
10% nannos
5% feldspar
1% dolomite
tr mica
tr heavy mins.

$CaCO_3$ (BOMB) 5, 18-20 = 8%

Site 398 Hole D Core 21 Cored Interval: 603.5 - 613.0

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCT.	LITHOLOGIC DESCRIPTION
Late Eocene	?	TP - Rf	1	0.5					CONTINUATION of rhythmically bedded MARLY NANNO CHALKS & RADIOLARIAN MUDSTONE w/ thin SANDY to SILTY MARLY CHALKS @ base of each bed; persistent siliceous component in finer-grained "hemipelagic" intervals. Silt stones or sandstones more calcareous, up to 2 cm thick; color alternation begins at base of each rhythm w/ 5GY4/2 to 5GY6/2 olive gray to dusky yellow grn. grading upward to 5Y6/4 dusky yellow mudstone or marly chalk. Darker coloration stains chalk (diagenetic Fe reduction) abvs. and below silt layers from 3-8 cm.
				1.0					
			2						
			3				42 52 54	flaser, lamination	SMEAR 3-42, [20,40,40] RADIOLARIAN MUDSTONE: 39% clay, 20% rads, 15% quartz, 15% mica (chlorite?), 10% sponge spics, 1% zeolite, tr carb. unspec., tr plant debris
									SMEAR 3-52, [10,30,60] MARLY NANNO CHALK: 41% clay, 25% nannos, 10% chlorite? (mica), 10% carb. unspec., 5% quartz, 3% sponge spics, 1% brgdnic matter, tr rads, tr fish debris
			4					sharp break micro x-bedding	SMEAR 3-54, [50,30,20] SANDY MARLY CHALK: 40% carb. unspec., 19% clay, 20% mica (prob. chlorite?), 10% quartz, 5% nannos, 4% rads, 1% sponge spics, 1% feldspar, tr zeolite, tr dolomite
								THE END	
			5						$CaCO_3$ (BOMB) 3, 45-47 = 4% 3, 52-54 = 24%
			6						
			Core Catcher						

Explanatory notes in chapter 1

Site 398 Hole D Core 22 Cored Interval: 613.0 – 622.5

AGE: LATE EOCENE
ZONE: ?
FOSSIL CHARACTER: FORAM; RP – Rf –
SECTION: 1, 2, 3, 4, 5, 6, Core Catcher
METERS: 0.5, 1.0

LITHOLOGY / DEFORMATION / LITHO. SAMPLE / SED. STRUCT

LITHOLOGIC DESCRIPTION

Succession of silt – marl rhythms continues throughout core, base of bed w/ thin (1mm to 2 cm) silty or sandy layer of 5G6/1 grnish. gray grading in color to 5Y5/2 and 10 YR 6/2 mod. yel. brown. SILICEOUS MUDSTONE and MARLY CHALK, silts occasionally 5B7/1 lt. bluish gray.

Bioturbated throughout

cut-and-fill, lamination in silty-sand layers

SMEAR 1-43, [20, 25, 55]
SILICEOUS MUDSTONE
52% clay
15% quartz
15% mica (>10% chlorite?)
10% sponge spics
5% rads
2% zeolites
1% org. matter
tr nannos
tr. carb. unspec.
tr. pyrite

SMEAR 1-69, [75, 50, 25]
SANDY, MARLY NANNO CHALK
25% nannos
20% quartz
19% clay
15% carb unspec.
15% chlorite – mica?
5% sponge spics
tr feldspar
tr heavy mins
tr pyrite
tr zeolite
tr rads
tr organic matter

colors becoming darker in "hemi-pelagic" intervals

SMEAR 4-90, [5, 35, 60]
MARLY NANNO CHALK
44% clay
25% nannos
10% carb unspec
10–15% mica (>chlorite?)
5% quartz
5% sponge spics
1% organics
tr zeolites
tr rads

microfaulting in laminae below

10YR 4/2 – 5/4 (mod. to dk. yel. brown)

SMEAR 4-104, [10, 50, 40]
MARLY NANNO CHALK
30% carb. unspec.
29% clay
25% nannos
10% sponge spics
2% quartz
2% chlorite (?)
2% organic debris
tr forams, dolomite, zeolite, glass (?), heavy mins.

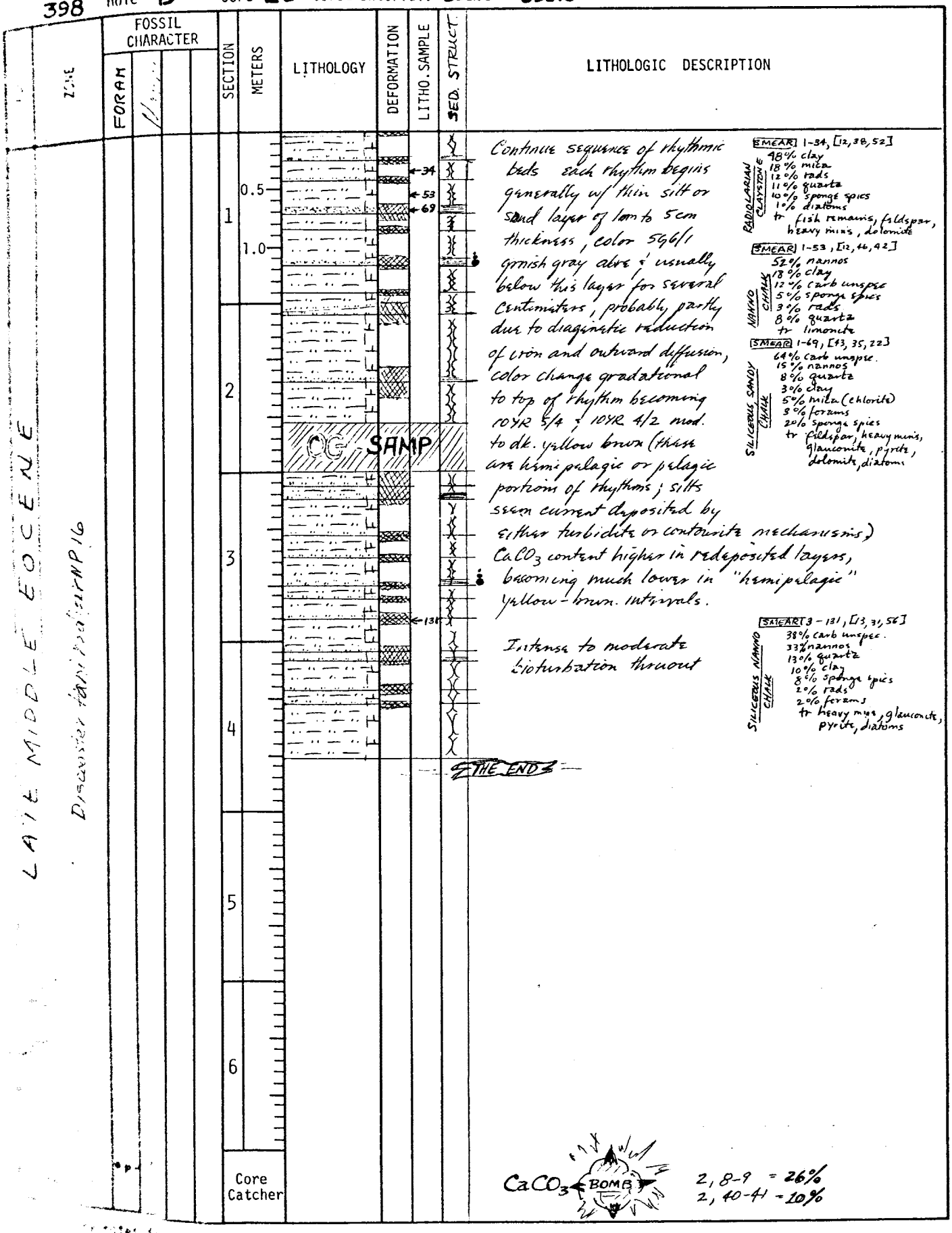
SMEAR 4-108, [30, 50, 20]
SILICEOUS NANNO CHALK
25% carb. unspec.
20% nannos
20% sponge spics
10% quartz
12% clay
7% mica (chlorite?)
5% rads.
1% organic debris
tr zeolite, forams, diatom

10YR 4/2 (dk. yellowish brown.)
10YR 5/4 (mod. yellowish brown)
10YR 7/4 (grayish orange)
5B7/1 (med bluish gray)
THE END 10YR 5/4 (mod. yel. brown.)

$CaCO_3$ BOMB

5, 88-90 = 14%

398 Hole D Core 23 Cored Interval: 622.5 - 632.0



Site 398 Hole D Core 24 Cored Interval: 632.0–641.5

AGE: MIDDLE - LATE EOCENE
ZONE: Discoaster tani nodifer zone
FOSSIL CHARACTER: FORAM
SECTION: 1, 2, 3, 4, 5, 6, Core Catcher
METERS: 0.5, 1.0
LITHOLOGY: fault
DEFORMATION
LITHO. SAMPLE: 105, 110, 144, 142, 90
SED. STRUCT.

Changing sequence to some extent, with rhythmic beds, as in last 4 cores, but interspersed in part with current laminated, unburrowed hemipelagic sediment usually SILICEOUS MARLY CHALK to RADIOLARIAN MUDSTONE

Silts at base of rhythms are laminated, usually 5G 6/1 grnish gray, but some silts of rhythms are composed of calcite granules and are N-9 white. Silts occas graded

Hemipelagic muds are 10 YR 5/4 mod. yellow brown. Laminations and erosional surfaces occur Sects. 4 & 5, possibly contourite origin, truncated burrows, smeared-out burrows, flame structures evidence the current laminated origin as well as cross-cutting lamins. Some possibly synsedimentary faulting w/ offsets less than 3 cm.

current → smeared-out overturned burrows, truncated by laminated marly claystones & chalks. probably overturned in direction of current

flame structure & micro cross-lamination

RADIOLARIAN SILTY MUDSTONE
SMEAR 1-105, [10, 55, 35]
35% clay
25% mica (chlorite?)
15% rads
10% sponge spics
10% quartz
3% plant debris ?
1% pyrite
1% zeolite
tr carb. unspec.

SILICEOUS, CALCAREOUS SANDY MUDSTONE
SMEAR 1-110 [50, 30, 20]
15% forams
15% nannos
14% clay
15% mica (chlorite?)
10% carb. unspec.
10% rads
10% sponge spics
10% quartz
1% mica
tr heavy mins
tr dolomite, zeolite, glauconite, diatoms, plant debris

SILICEOUS MARLY CHALK
SMEAR 1-144 [5, 55, 40]
30% nannos
32% clay
20% mica (chlorite?)
10% sponge spics
5% carb unspec.
2% rads
3% quartz
tr zeolite, diatoms, dolomite, plant debris

RADIOLARIAN NANNO CHALK
SMEAR 5-142, [?]
60% nannos
13% sponge spics
11% rads
6% quartz
5% carb. unspec.
3% clay
2% mica
tr diatoms, feldspars

RADIOLARIAN CALCAREOUS SANDY, SILTY MUDSTONE
SMEAR 6-90, [30, 30, 40]
16% clay
15% forams
15% nannos
10% rads
10% carb. unspec.
8% sponge spics
3% zeolite
2% dolomite
2% diatoms
1% feldspar
1% mica
1% heavy mins (apatite, magnetite)
1% glauconite

"THE END"

$CaCO_3$ (BOMB) 3, 123-125 = 21%

RP

Site 398 Hole D Core 25 Cored Interval: 641.5 - 651.0

AGE: MIDDLE EOCENE

ZONE: Discoaster tani nodifer - NP16

FOSSIL CHARACTER: FORAM RR; Nannos Cg

SECTION: 1, 2, Core Catcher

METERS: 0.5, 1.0

LITHOLOGY

DEFORMATION

LITHO. SAMPLE: ←73, ←83

SED. STRUCT.

LITHOLOGIC DESCRIPTION

2.5Y6/2, lt. brownish. gray "hemipelagic"

2.5Y5/2, 5YR4/4, N-6 to N-7 gray to gray-brown shades.

Rhythmically bedded as before, begins w/ N-6, N-7 lt gray silt and silty mudst. grading up to 2.5Y 6/2 RADIOLARIAN MUDSTONE and SILICEOUS MARLY NANNO CHALK and some CHALK

Burrowed throuout, composite burrows, Zoophycus

THE END

SMEAR 1-73, [3, 30, 67]

RADIOLARIAN MUDSTONE

57% clay (illite)
10% quartz
10% radiolarians
10% sponge spics
3% zeolite
3% carb. unspec.
3% nannos
2% dolomite
2% mica
tr heavy mins

SMEAR 1-83 [10, 40, 50]

SILICEOUS CHALK

30% nannos
15% sponge spics
11% clay
10% mica
10% quartz
5% carb unspec.
5% forams
5% rads
2% feldspar
2% zeolites
2% dolomites
1% diatoms
1% heavy mins
1% glauconite
tr glass

$CaCO_3$ BOMB 1, 46-48 = 10%

Site 398 Hole D Core 26 Cored Interval: 651.0-660.5

AGE	ZONE	FOSSIL CHARACTER: FORAM	FOSSIL CHARACTER: NANNO	FOSSIL CHARACTER:	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
MIDDLE :: EOCENE	Chiphragmithus alatus NP15	RP		RP	1	0.5	SILICEOUS		39, 43, 42		Continue rhythmic sequence as in previous cores w/slight color changes. Rhythm of N-7 to N-8 gray & white siltst. to sandst. @ base, usually laminated, occasionally graded (more typical than in previous cores), scoured, sharp basal contact grades upward to 5B7/1 lt. bluish gray SILICEOUS NANNO CHALK to MARLY NANNO CHALK and SILICEOUS CALCAREOUS MUDSTONE at top, 2.5YG/2 lt. brownish gray and 7.5R5/4 brown as in sect. 5.
						1.0			78		
					2			def.			
								def.			
					3						Burrowing occurs throout, but rare to intense, sparse in lower parts of rhythmic beds possibly due to higher depositional rates.
					4				32		Coloration of 5B7/1 Extends above and below lower parts of rhythms and may be, in part, diagenetic, irregular, gradational contacts.
											Composite burrows, Zoophycus occasional. Some burrows sand-filled w/no obvious source bed.
					5		SILICEOUS				Some 7.5YR 5/4 Brown ↓
					6				44, 46, 32		
					Core Catcher						

SMEAR 1-39, [8,22,70]
SILICEOUS MARLY NANNO CHALK
41% clay
30% nannos
10% sponge spics
5% quartz
5% mica
3% carb unspec.
3% rads
2% dolomite
1% heavy mins
tr zeolite, diatoms

SMEAR 1-43, [20,40,40]
SILICEOUS FORAM NANNO MARLY CHALK
34% clay
20% forams
20% nannos
5% quartz
5% carb unspec.
5% rads
5% sponge spics
2% zeolite
2% dolomite
1% mica
1% heavy mins
tr diatoms
tr feldspar

SMEAR 1-48, [10,40,50]
SILICEOUS NANNO CHALK
40% nannos
15% clay
15% sponge spics
8% forams
8% quartz
3% mica
3% carb unspec.
2% rads
2% zeolites
1% feldspar
1% heavy mins (magnetite, tourmaline)
1% glauconite
tr diatoms
1% dolomite

SMEAR 1-78, [5,30,65]
SILICEOUS CALCAREOUS MUDSTONE
51% clay
20% nannos
8% sponge spics
5% carb unspec.
5% quartz
3% mica
3% rads
2% zeolite
1% feldspar
1% diatoms
1% dolomite
tr heavy mins

SMEAR 4-32, [55,20,25]
CALCAREOUS SANDY MUDSTONE
70% forams & carb. unspec.
15% nannos
10% clay
5% quartz
tr zeolite

SMEAR 6-44, [30,50,20]
QUARTZOSE SANDY SILTY MUDSTONE
34% quartz
20% clay
10% mica
10% carb unspec
8% nannos
3% dolomite
3% magnetite
5% feldspar
1% heavy mins
1% zeolite
tr sponge spics

SMEAR 6-46, [0,30,70]
SILTY MUDSTONE
80% clay
5% mica
5% quartz
3% nannos
3% carb unspec
2% forams
2% dolomite
tr heavy mins
tr sponge spics

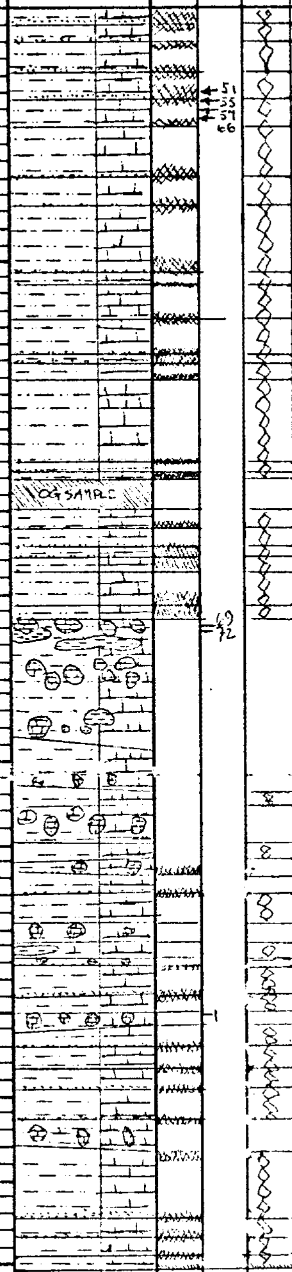
SMEAR 6-52, [3,30,67]
QUARTZOSE MUDSTONE
68% clay
15% quartz
5% mica
5% carb unspec.
2% dolom.
2% forams
2% nannos
1% sponge spics
tr rads, tourmaline, magnetite

$CaCO_3$ BOMB 4, 60-62 = 28%

THE END

Site 398 Hole D Core 27 Cored Interval: 660.5-670.0 m

AGE	ZONE	FOSSIL CHARACTER: FORAM	SECTION	METERS
MIDDLE EOCENE	*Chiphragmalithus alatus* NP15	Rp	1	0.5 – 1.0
			2	
			3	
			4	
			5	
			6	
			Core Catcher	



LITHOLOGIC DESCRIPTION

10YR 5/3 - 6/3
5G 7/1

Four sediment types occuring in sequence, from top:

(1) MARLY NANNO CHALK, greenish gray (5G 7/1)
(2) MARLY NANNO CHALK, pale brown (10YR 6/3) to brown (10YR 5/3)
(3) MARLY NANNO CHALK, greenish gray (5G 7/1)
(4) QUARTZ SANDSTONE to CALCAREOUS MUDSTONE, greenish gray (5G 7/1)

these four units occur with generally sharp contacts; the base of the sequence (4) is generally an erosional contact overlying the top of the next sequence; the greenish gray color crosses this boundary and is apparently diagenetic

bioturbation throughout the core; some burrows are infilled with clean sand; identified: Zoophycos, helminthoides; composites

below 65cm, section 3: conglomerate breccia of well-crystallized white (N9) limestone/marble pebbles plus silty, clay-rich sandstone pebbles all in a matrix of MARLY NANNO CHALK (greenish gray 5G 6/1); limestone pebbles are subrounded, maximum size 2x3 cm; no apparent grading; poorly sorted

THE END

SMEAR 1-51 [5, 30, 65] — MARLY NANNO CHALK
- 40% nannos
- 30% clay
- 8% quartz
- 8% foraminifera
- 5% carb. unspec.
- 3% mica
- 2% zeolite
- 2% dolomite
- 1% feldspar
- 1% Heavy Mins

SMEAR 1-55 [30, 45, 25] — QUARTZ SANDSTONE
- 42% quartz
- 15% clay
- 15% nannos
- 5% feldspar
- 5% mica
- 5% carb. unspec.
- 8% foraminifera
- 2% zeolite
- 2% heavy mins.
- 1% glauconite.
- tr. sponge spic (magnet.; tourmaline; zircon; apatite)

SMEAR 1-57 –, 30, 70 — CALCAREOUS MUDSTONE
- 58% clay
- 28% calc. nannos
- 5% quartz
- 3% carb. unspec.
- 2% dolomite
- 2% mica
- 1% zeolite
- 1% sponge spic.

SMEAR 1-66 [3, 30, 67] — MARLY NANNO CHALK
- 44% clay
- 40% calc. nannos
- 7% quartz
- 5% carb. unspec.
- 2% heavy mins.
- 2% dolomite

SMEAR (3-69) [0, 20, 80] — ZEOLITIC CLAYSTONE
- 76% clay (illite?)
- 20% zeolite
- 3% quartz
- 1% mica

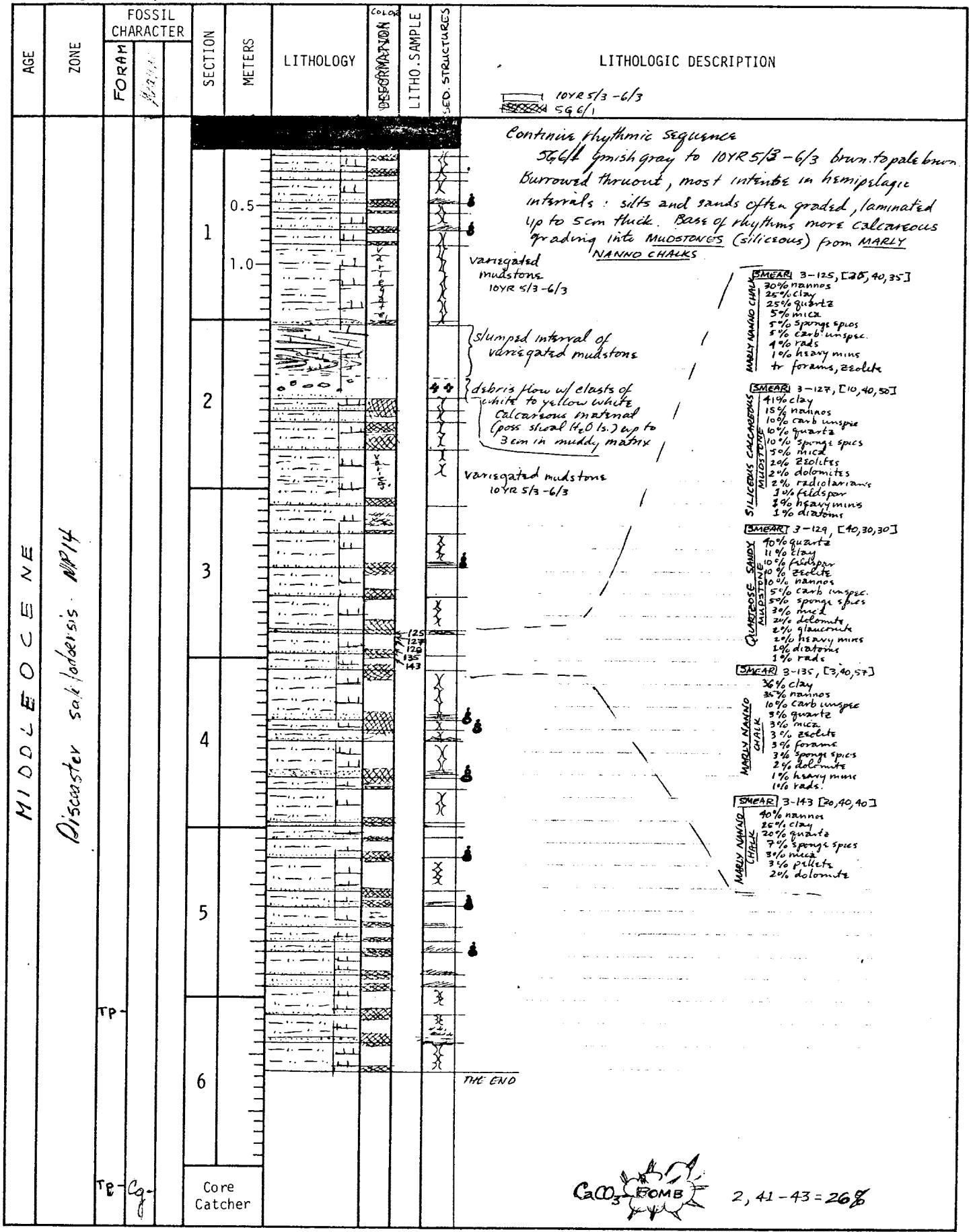
SMEAR (3-72) [5, 30, 65] — MARLY NANNO CHALK
- 50% nannos
- 20% clay
- 10% quartz
- 5% mica
- 5% zeolite
- 5% carb. unspec.
- 2% dolomite
- 2% forams
- 1% heavy mins

SMEAR (5-1) [10, 20, 70] — MARLY NANNO CHALK
- 63% clay
- 20% nannos
- 8% forams
- 3% zeolite
- 3% carb unspec
- 2% dolomite
- 1% quartz

$CaCO_3$

Explanatory notes in chapter 1

Site 398 Hole D Core 28 Cored Interval: 670.0 – 679.5



Explanatory notes in Chapter 1

Site 398 Hole D Core 29 Cored Interval: 679.5 - 689.0

AGE: MIDDLE EOCENE
ZONE: Discoaster sublodoensis/Discoaster lodoensis NP14/NP15
FOSSIL CHARACTER: FORAM; NANNO
SECTION
METERS
LITHOLOGY
DEFORMATION
LITHO. SAMPLE
SED. STRUCTURES

LITHOLOGIC DESCRIPTION

Continue rhythmic sedimentation from Core 28 10YR 5/3 - 6/3 @ top rhythm is MARLY NANNO CHALK to QUARTROSE MUDSTONE decrease in siliceous fossil component, base most rhythms are 5G 6/1 grnish gray siltst to sandstone possible slumped debris flow, no large distinctive clasts

Bioturbation less apparent in this core, intense in some portions, rare in sects. 1, 5, 6. zoophycos and other unidentifiable mottles

SMEAR 1-65, [2, 20, 78]
CALCAREOUS MUDSTONE
68% clay
20% nannos
5% dolomite
2% sponge spics
2% quartz
1% zeolite
1% dolomite
1% rads
tr mica, heavy mins

SMEAR 3-52, [5, 55, 45]
MARLY NANNO CHALK
35% nannos
34% clay
21% dolomite
10% zeolite
5% quartz
5% carb. unspec.
5% sponge spics
2% rads
1% mica
1% diatoms
tr heavy mins

SMEAR 3-55, [10, 30, 60]
MARLY NANNO CHALK
30% clay
30% nannos
20% quartz
7% sponge spics
3% pellets
2% mica
1% heavy mins
1% glauconite
1% zeolite
tr forams

SMEAR 3-62, [20, 45, 35]
QUARTROSE NANNO MUDSTONE
30% clay
30% quartz
20% nannos
8% sponge spics
5% pellets
2% rads
2% dolomite
2% mica
1% glauconite

SMEAR 3-63, [40, 25, 35]
QUARTROSE SANDY MUDSTONE
40% quartz
20% nannos
17% clay
7% sponge spics
3% feldspar
2% mica
2% heavy mins
2% glauconite
2% zeolite
3% carb. unspec.
2% dolomite

SMEAR 6-14, [10, 40, 50]
SILTY MUDSTONE
55% clay
30% quartz
8% sponge spics
5% nannos
1% dolomite
1% heavy mins

$CaCO_3$ BOMB 3, 57-59 = 28%

Core Catcher

THE END

Explanatory notes in Chapter 1

Site 398 Hole D Core 30 Cored Interval: 689.0-698.5

AGE: MIDDLE EOCENE
ZONE: Discoaster sublodoensis/[illegible] lodoensis
FOSSIL CHARACTER: FORAM; NANNO
SECTION: 1, 2, 3, 4, 5, 6, Core Catcher
METERS: 0.5, 1.0
LITHOLOGY
DEFORMATION
LITHO. SAMPLE: 91, 96, 97, 100
SED. STRUCTURES
LITHOLOGIC DESCRIPTION

5G 6/2, 6/1, 7/2 (grnish gray)
10YR 6/3 - 5/3 (pale - brown)

Continuation of rhythmic sequence of Cores 19-29, same colors as core 29 (5G 6/1, 6/2, 7/2) grnish gray sandstone & siltstone laminae at base of each bed grading into MARLY NANNO CHALK or CALCAREOUS MUDSTONE of 10YR 6/3 - 5/3, pale brown w/ some variegation or mottling of 5G 6/1
Quartz an important component in all sediments, especially coarser-grained basal intervals.
Bioturbation generally moderate to intense, some intervals unburrowed, especially at base of rhythms.
Occasionally a rhythm lacks basal sand-silt; sandy or silty intervals usually <3cm thick, typically as mm laminae, graded-bedding occurs but not predominant, lamination & micro-cross lamination common

THE END

SMEAR 3-91 [0,20,80]
CALCAREOUS MUDSTONE
53% clays
15% nannos
10% carb. unspec
10% zeolites
5% quarts
5% mica
2% dolomite
tr heavy mins, sponge spics

SMEAR 3-96, [40,30,30]
MARLY NANNO CHALK
35% nannos
30% quarts
28% clay
3% mica
2% heavy mins
2% dolomite
1% carb unspec.
tr. sponge spic

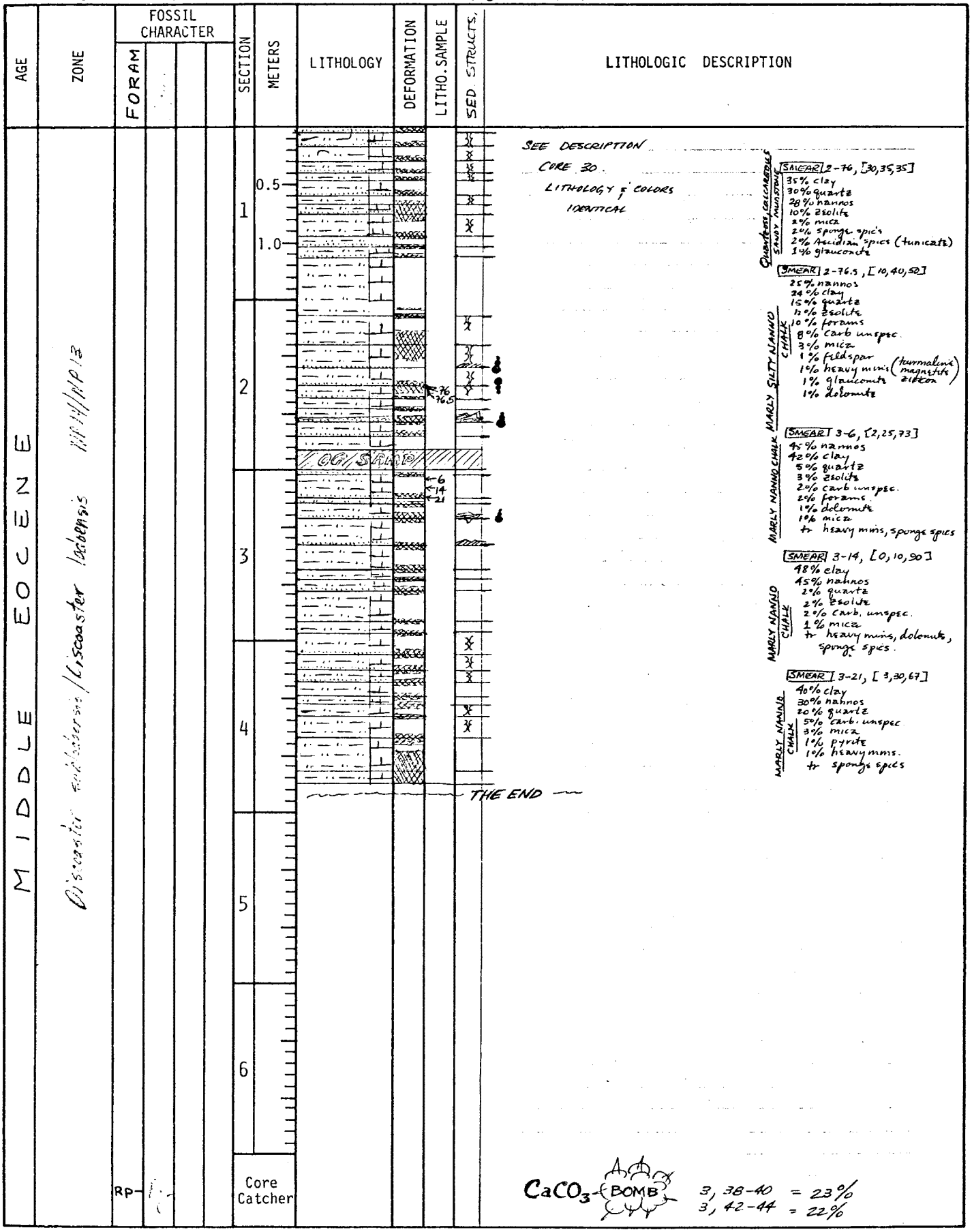
SMEAR 3-97, [25,50,25]
QUARTZOSE SILTY MUDSTONE
50% quarts
12% clay
12% zeolite
5% feldspar
5% mica
3% carb. unspec
8% nannos
2% forams
1% tourmaline, magnetite
1% glauconite
1% dolomite

SMEAR 3-100, [10,50,40]
MARLY NANNO CHALK
40% nannos
35% clay
20% quarts
3% mica
2% sponge spic
1% heavy mins

$CaCO_3$ BOMB 2, 85-87 = 45%

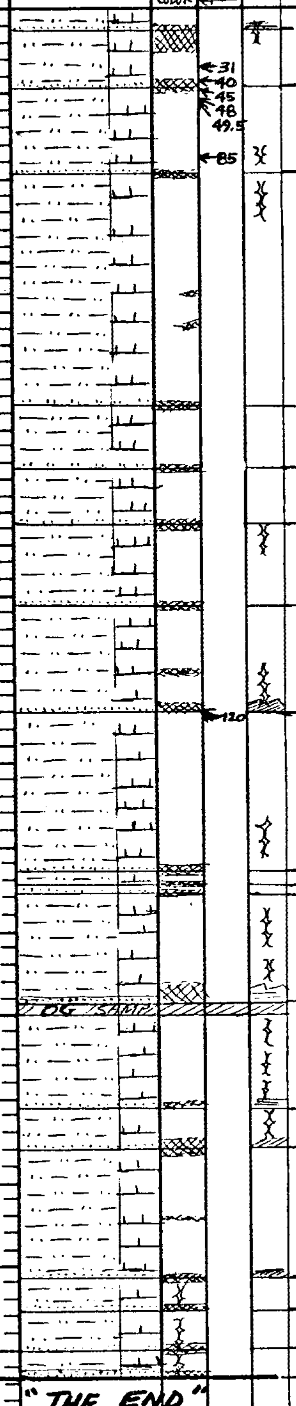
Rp-

Site 398 Hole D Core 31 Cored Interval: 698.5 – 708.0



Site **398** Hole **D** Core **32** Cored Interval: **708.0 - 717.5**

AGE	ZONE	FOSSIL CHARACTER: FORAM	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCT.
EARLY EOCENE	*Tribrachiatus orthostylus* NP12		1, 2, 3, 4, 5, 6	0.5, 1.0			31, 40, 45, 48, 49.5, 85, 120	
		RP-	Core Catcher					



LITHOLOGIC DESCRIPTION

[cross-hatched symbol] 5G6/1-5GY6/1, N-9, 10G5/2
[open symbol] 5YR 5/6 - 6/6

RHYTHMIC sequence as before but with fewer rhythms expressed, possibly due to increase in sedimentation rate or decrease in silt-sand influx. Two types of siltstones or sandstones: (1) N-9, white calcareous sandstones, granules of sparry to micritic calcite (poss. shoal-H_2O origin), quartz, and foraminifera

(2) 10G5/2 pale grn. sandst. to siltst., predominant in this core, graded, laminated to massive, usually < 2cm, often 1-4mm thick, quartz-rich, usually poorly-sorted, f.g. to v.f.g.

These generally occur as defined @ base of a rhythm. Associated are silty NANNO CHALKS to MARLY CHALKS AND MUDSTONES of 10G5/2, pale grn. and 5G6/1 to 5GY6/1 grnish. gray color, usually < 5-10cm abv. & below silt or sand bed, gradational change, coloration may be partly diagenetic; higher $CaCO_3$ in this color than in ① 5YR 5/6 to 6/6 yellowish-red and reddish yellow, MARLY NANNO CHALK and QUARTZOSE ① CLAYSTONE composing most of a bed.

Bioturbation low throuout (not extremely visible)

MARLY (SILT) NANNO CHALK — SMEAR 1-31, [8,50,42]
30% nannos
20% sponge spics
20% quartz
20% clay
5% carb. unspec.
3% mica
2% heavy mins

QUARTZOSE CLAYSTONE — SMEAR 1-40, [3,30,67]
69% clay
15% quartz
5% mica
5% nannos
3% carb unspec.
2% heavy mins.
1% dolomite

MARLY NANNO CHALK — SMEAR 1-45, [5,20,75]
30% nannos
30% clay
25% quartz
8% zeolite
2% carb. unspec.
2% feldspar
2% heavy mins
1% dolomite

QUARTZOSE SILTSTONE — SMEAR 1-48, [60,20,20]
50% quartz
29% clay
10% mica
5% heavy mins
4% nannos
2% zeolites

QUARTZOSE MUDSTONE — SMEAR 1-49.5, [8,25,67]
55% clay
30% quartz
6% nannos
3% mica
3% carb. unspec.
2% heavy mins
1% dolomite

MARLY NANNO CHALK — SMEAR 1-85, [12,25,63]
40% nannos
25% clay
20% quartz
5% carb unspec.
5% mica
2% dolomite
1% heavy mins
1% pyrite
1% zeolite

SANDY NANNO CHALK — SMEAR 3-120, [35,30,35]
40% nannos
25% carb. unspec.
23% clay
7% quartz
3% mica
2% zeolites

$CaCO_3$ (BOMB) 3, 98-100 = 40%

Explanatory notes in chapter 1

Site 398 Hole D Core 33 Cored Interval: 717.5 – 727.0

AGE: EARLY EOCENE
ZONE: Discoaster lodoensis NP 11

FOSSIL CHARACTER: FORAM; NANNO

SECTION: 1, 2, 3, 4, 5, 6, Core Catcher

METERS: 0.5, 1.0

LITHOLOGY: OG SAMPLE; VOID; THE END

DEFORMATION

LITHO. SAMPLE: 35, 37, 55, 37

SED. STRUCT.

LITHOLOGIC DESCRIPTION

NOTE: Most bedding surfaces inclined,

Same rhythmic series seen in previous cores: from bottom of sequence upwards there are three lithologic units

(1) basal silt with erosional lower contacts, sandy-silty MARLY NANNO CHALK, greenish gray (5G 6/1)

(2) light blush gray (5B 7/1) MARLY NANNO CHALK

(3) very pale brown (10YR 7/3) or light brown (5YR 5/6) MARLY NANNO CHALK; this is overlain by a grayish-blue interval much like unit (2), above which the sequence repeats

Various shades of brown - unit (3) - are dominant, almost entirely very fine grained, with the exception of a few very light brown, grayish brown, and white sand-sized specks (forams? limestone fragments?) which are laminated in a few intervals within unit (3)

In general the silty unit (1) shows an erosional basal contact and occassionally grades upwards in color & grain size into unit (2) with no apparent bioturbation; unit (2) generally darkens over a short interval and becomes burrowed, sometimes intensely, with oval burrows ~ ½ x ¼ cm; the change upwards to unit (3) is often very sharp but is obviously post-depositional as the color change cuts through burrows; bioturbation is usually intense in the lighter intervals of unit (3), but occassionally the unit is massive, homogeneous and unburrowed within the darkest intervals; the change to grayish-blue at the top of unit (3) is sharp; occassionally unit (1) is lacking

other units, not in above sequence

1-34-40 cm: grayish orange (10YR 7/4), soft, "fluffy" MARLY NANNO CHALK, with very dark brown sandy/silty layer at 35cm

1-51-57 cm: greenish gray (5G 6/1), soft, "fluffy" SILTY CALC MUDSTONE

3-115-116 cm: white coarse sand- to granule-sized graded limestone fragments

6-55-60 cm: mud-pebble conglomerate, dark gray clasts in light blush gray matrix

6-72-80 cm: limestone-pebble conglomerate

SMEAR 1-37, [30, 30, 40] — Sandy-silty MARLY NANNO CHALK
37% nannos
29% clay
20% quartz
10% mica
3% heavy mins
3% pellets
2% carb. unspec.
1% pyrite

SMEAR 1-35, [5, 35, 60] — MARLY NANNO CHALK
50% nannos
37% clay
7% quartz
3% mica
2% dolomite
1% heavy mins

SMEAR 1-55, [30, 30, 40] — SILTY CALCAREOUS MUDSTONE
50% clay
10% nannos
30% carb. unspec.
5% quartz
2% mica
2% glauconite
1% heavy mins.

SMEAR 5-37, [5, 25, 70] — MARLY NANNO CHALK
50% nannos
36% clay
5% quartz
3% carb. unspec.
2% mica
2% heavy mins.
1% glauconite
1% pyrite

$CaCO_3$ BOMB 2, 24-26 = 62%

Site 398 Hole D Core 34 Cored Interval: 727.0 – 736.5

AGE	ZONE	FOSSIL CHARACTER: FORAM	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCT	LITHOLOGIC DESCRIPTION
Late Eocene – Early Eocene	P6 Marthasterites NP10	Cp– Cg		1 2 3 4 5 6 7 Core Catcher	0.5 1.0			105 117 79 46 114		Continuation of 3-part sequence: (1) basal silty, sandy MARLY NANNO CHALK, (2) light bluish gray MARLY NANNO CHALK (3) brown MARLY NANNO CHALK at top, with a change to bluish gray before unit is repeated. In section 1 only. From section 2 to the bottom of the core, the brown of unit (3) becomes far more dominant with variations: very pale brown (10YR 7/3) which is intensely burrowed, very pale brown (10YR 8/4) also with intense but very faint burrowing, and dark brown (10YR 4/3) which is massive and largely without burrows; the latter is represented here as "▮"; occassional silty laminations of forams appear within the lighter of these brown layers. evidence for current working and slumping: (a) flame structures, current ripples, eg. 110 cm, sec 2 (b) high angle erosional(?) contacts (up to 45°) with diagenetic(?) coloration of unit (2) maintaining horizontal contacts (e.g. sec 5) (c) contorted bedding, overturned folds (on the scale of mm) (eg sec 2-65cm) (d) clay-pebble breccia resting on steep (20°) bedding planes (eg 7-50) (e) faulting, at various angles within core, generally all 45° to bedding planes, apparently both normal & reverse (sec 6, 80cm) (f) numerous erosional breaks within all units, indicated by truncated mottles and, rarely, by basal silt laminations. MARLY NANNO CHALK: SMEAR 2-105, [3, 20, 77] 50% nannos, 31% clay, 7% quartz, 5% carb unspec., 3% mica, 1% heavy mins. DOLOMITIC MARLY NANNO CHALK: SMEAR 2-113 [2, 15, 83] 35% clay, 25% nannos, 15% dolomite, 10% carb. unspec., 6% quartz, 3% zeolite, 2% mica, 2% heavy mins, 2% ? volc. glass? CLAYSTONE: SMEAR 3-79, [2, 5, 93] 90% clay, 5% nannos, 2% quartz, 2% carb. unspec., 1% mica. MARLY FORAM-NANNO CHALK: SMEAR 4-46, [20, 50, 30] 32% clay, 25% nannos, 15% carb. unspec., 15% foraminifera, 5% dolomite, 5% mica, 3% quartz. MARLY NANNO CHALK: SMEAR 5-114, [3, 35, 62] 50% nannos, 36% clay, 5% dolomite, 5% carb. unspec., 2% mica, 2% quartz.

THE END

$CaCO_3$ (coulo): 2, 68–70 = 3%

Explanatory notes in chapter 1

Site 398 Hole D Core 35 Cored Interval: 736.5 - 746.0

AGE: LATE PALEOCENE
ZONE: Discoaster multiradiatus NP9
FOSSIL CHARACTER: FORAM; Nanno
SECTION: 1, 2, 3, 4, 5, 6, Core Catcher
METERS: 0.5, 1.0
LITHOLOGY
DEFORMATION
LITHO. SAMPLE: 23, 26, 34, 18, 87, 90
SED. STRUCT.

LITHOLOGIC DESCRIPTION

0-80cm: folded very pale brown (10YR 8/4) MARLY NANNO CHALK with faint mottles, color gradually darkening to light bluish gray (5B7/1) except for unfossiliferous clays in sections 4 & 5 the remainder of this core is a continuation of the rhythmic lithologies noted in the previous cores, ie. basal silty/sandy laminations (quartz- and/or foram-rich) around which the dominantly brown MARLY NANNO CHALK has been altered to light bluish gray; the latter is rarely burrowed as much as the brown interval; little evidence for erosion other than the sharp sand/silt laminations, which occassionally show current ripples and cross bedding

SMEAR 2-23, [20,60,20] — SILTY QUARTZOSE FORAM CHALK
- 25% quartz
- 20% forams
- 20% carb. unspec.
- 19% clay
- 5% nannos
- 3% feldspar
- 3% dolomite
- 2% mica
- 1% glauconite
- 1% heavy mins { zircon, tourmaline, magnetite

SMEAR 2-26, [0,20,80] — MARLY NANNO CHALK
- 51% clay
- 30% nannos
- 5% dolomite
- 5% carb. unspec.
- 3% forams
- 3% quartz
- 1% mica
- 1% zeolite
- 1% sponge spics
- tr heavy mins.

SMEAR 2-34, [3,43,57] — MARLY NANNO CHALK
- 55% nannos
- 34% clay
- 5% dolomite
- 5% carb. unspec.
- 5% forams
- 1% quartz
- tr mica, heavy mins, fish remains

4-114 to 5-98cm: dark yellowish brown 10YR 4/4 soft, rapidly expanding unfossiliferous CLAY, very homogeneous except for very faint mottling and a silty/sandy lamination with characteristic discoloration of dominant sediment associated with it, as in the rhythmic series. The rhythmic lithologies below 5-98 are the same as before, but slightly darker overall. In addition, there are coarser intervals:

5-140: white to yellow white foram sandstone

6-35 to 45: poorly sorted limestone fragments

SMEAR 5-18, [0,17,83] — CLAYSTONE
- 83% clay
- 5% quartz
- 5% mica
- 3% zeolite
- 1% heavy mins.
- 1% dolomite
- 2% org matter?

SMEAR 5-87, [0,20,80] — MUDSTONE
- 76% clay
- 5% mica
- 5% quartz
- 5% carb. unspec
- 3% zeolite
- 3% dolomite
- 2% nannos
- 1% heavy mins (magnetite, tourmaline)

SMEAR 5-90, [5,50,45] — QUARTZOSE CALCAREOUS MUDSTONE
- 40% clay
- 20% quartz
- 18% carb. unspec.
- 10% dolomite
- 7% zeolite
- 3% mica
- 2% glauconite
- 2% nannos
- 1% feldspar
- 1% heavy mins (magnetite, tourmaline, zircon)

$CaCO_3$ BOMB 4, 140-142 = 5%.

"THE END"

Site 398 Hole D Core 36 Cored Interval: 746.0 – 755.5

AGE: Late Pliocene
ZONE: P6 Discoaster multiradiatus NP9
FOSSIL CHARACTER: FORAM, NANNO
SECTION
METERS
LITHOLOGY
DEFORMATION
LITHO. SAMPLE
SED. STRUCT.
LITHOLOGIC DESCRIPTION

5GY 7/2, 5B7/1, N-7
10YR 6/3

Rhythmic sequence continues as in previous cores, somewhat darker brown color to lithologic MARLY NANNO CHALKS and MUDSTONES w significant quartz & foram component

Faulting prominent in sects. 5 & 6

SMEAR 1-44, [0, 40, 60]
MARLY NANNO CHALK
40% nannos
34% clay
10% carb. unspec.
5% dolomite
5% zeolite
5% quartz
2% glauconite
tr mica, heavy mins

SMEAR 1-46, [5, 55, 40]
MARLY NANNO CHALK
34% clay
30% nannos
12% quartz
8% carb. unspec.
5% zeolite
3% mica
3% feldspar
2% forams
1% heavies (tourmaline, zpatite, magnetite)
1% glauconite
1% dolomite

SMEAR 3-126, [45, 35, 20]
SANDY-SILTY QUARTZOSE FORAM MUDSTONE
25% carb. unspec.
20% forams
15% clay
12% quartz
10% zeolite
10% nannos
3% dolomite
2% feldspar
1% mica
1% heavy mins.
1% glauconite
tr diatoms, rads, sponge spics

SMEAR 3-130, [0, 35, 65]
CALCAREOUS MUDSTONE
53% clay
20% carb. unspec.
5% quartz
3% mica
3% zeolite
3% dolomite
10% nannos
2% sponge spics
1% diatoms
tr heavy mins

126/130 gte-foram sandst., well-cemented

pale coloration intensely mottled

sand-filled burrow.

~2mm offset reverse fault (30° off vertical)

laminated MARLY CHALK w/ normal fault, drag apparent w/ wrong sense, may be post-faulting sag w/ extensional fractures. 1.5cm slip

faulted interval, planes dip 15° from vertical, offset indeterminate

59/60/66

SMEAR 6-59, [3, 37, 60]
MARLY NANNO CHALK
40% nannos
29% clay
15% carb. unspec.
5% sponge spics
3% rads
3% dolomite
2% forams
1% pyrite
1% quartz
1% mica
tr heavy mins

SMEAR 6-60, [40, 40, 20]
SANDY, SILICEOUS FORAM MUDSTONE
20% forams
20% clay
15% sponge spics
10% carb. unspec.
10% nannos
8% quartz
6% rads
3% zeolite
2% dolomite
1% mica
1% feldspar
tr heavy mins

SMEAR 6-66, [10, 40, 50]
SILICEOUS NANNO CHALK
30% nannos
28% clay
20% sponge spics
10% carb. unspec.
5% quartz
5% radiolarians
3% dolomite
3% forams
1% mica
1% diatoms
tr heavy mins, zeolite

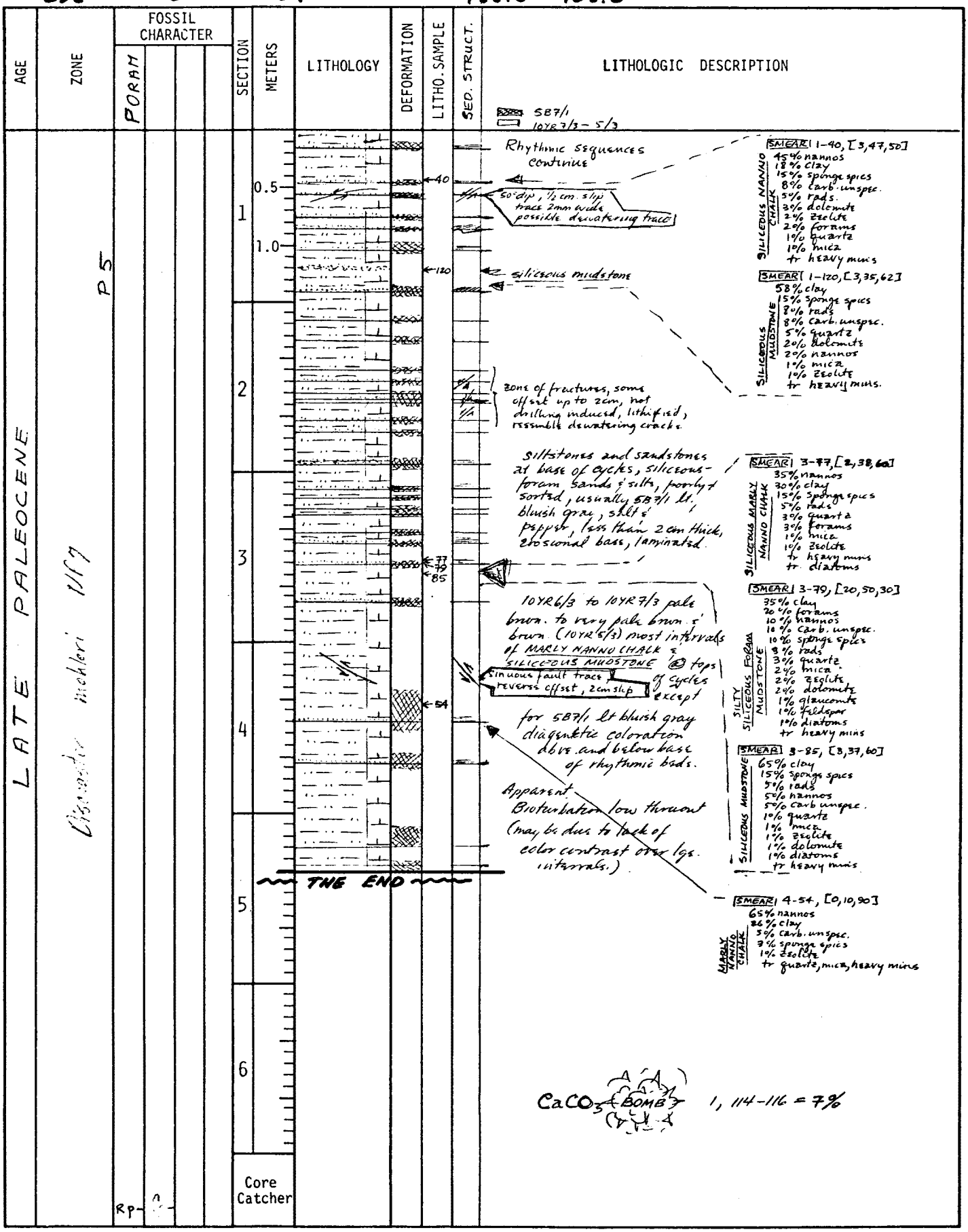
Core Catcher

THE END

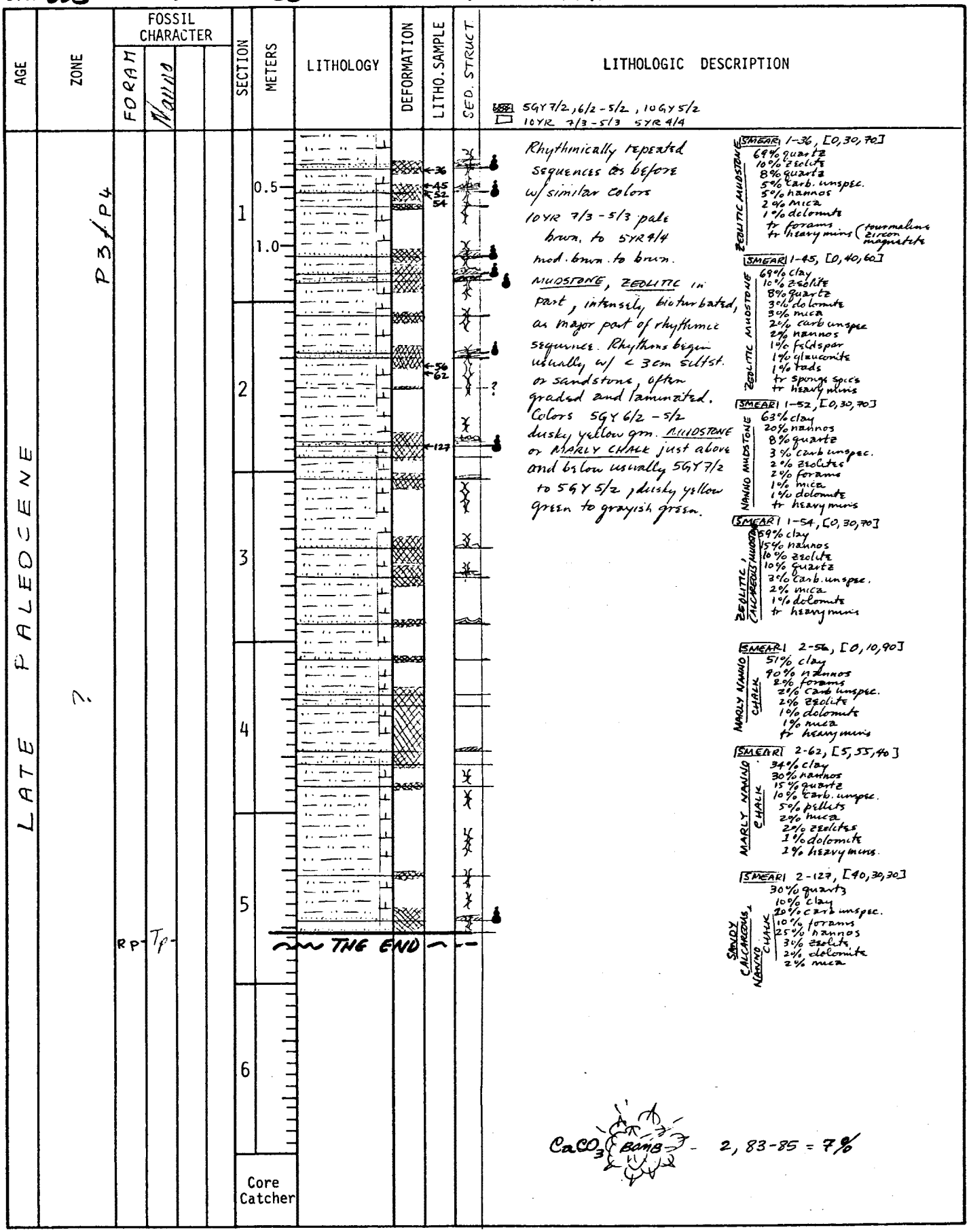
$CaCO_3$ (BOMB)

3, 92-94 = 33%

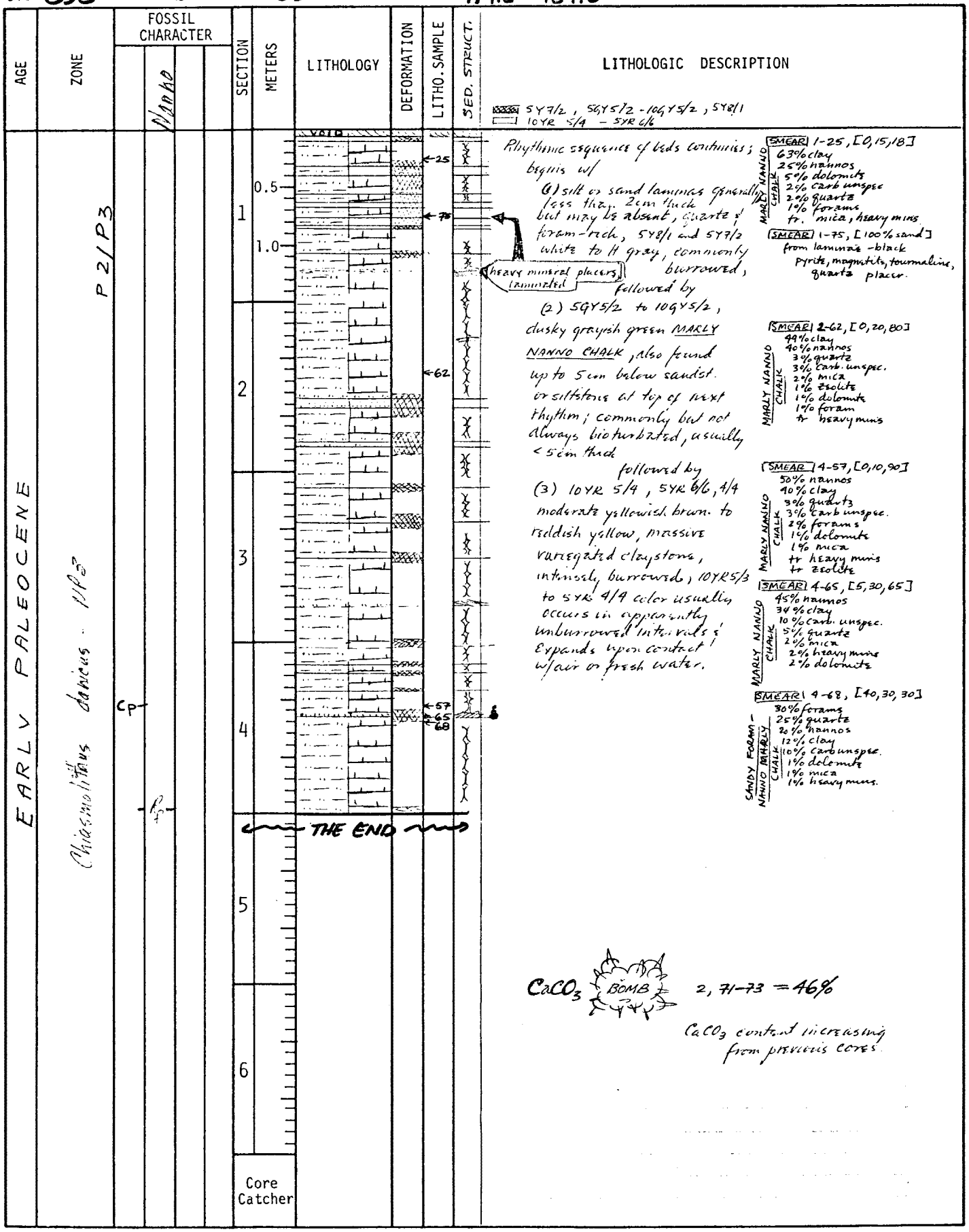
Site 398 Hole D Core 37 Cored Interval: 755.5 - 765.0



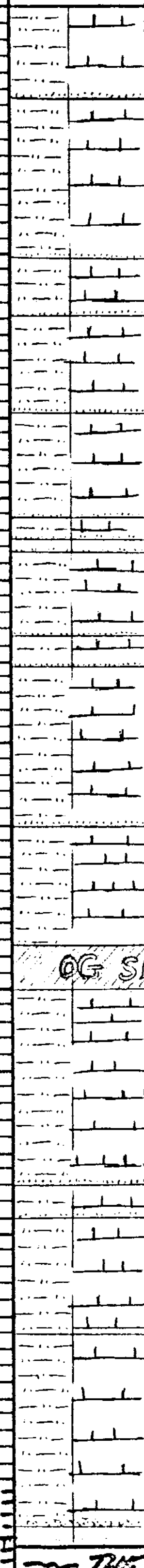
Site 398 Hole D Core 38 Cored Interval: 765.0 — 774.5



Site 398 Hole D Core 39 Cored Interval: 774.5 - 784.0



Site **398** Hole **D** Core **40** Cored Interval: **784 - 793.5**

AGE	ZONE	FOSSIL CHARACTER: FORAM.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCT.	LITHOLOGIC DESCRIPTION
EARLY PALEOCENE	Globigerina eugubina Zone ? ; Cruciplacolithus tenuis Zone	RP, RP, CP, RP, CP - Cg	1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0			2-85, 2-93, 2-97, 4-50, 7-20, CC-35		see below

5GY6/2 to 5Y8/1 & 5Y7/2
10YR 5/4 – 5YR 6/6

Higher $CaCO_3$ as in Core 39, not as rhythmic appearing as in younger cores, but succession of lithologies and colors same as before (generally)

Each sequence begins with 5Y8/1 and 5Y7/2 white to lt. gray sandstone, siltstone & silty mudstone. Marly chalk for several centimeters above and below is stained 5GY6/2 yellow green, probably diagenetic reduced iron associated with silt beds. Most of rest of interval consists of 10YR 5/4 to 5YR 6/6 moderate yellowish brown to reddish yellow variegated, usually expandable (upon drying and/or contact w/fresh H_2O) MARLY NANNO CHALKS.

Silts and sands predominantly calcareous but w/important quartz component.

Intensively bioturbated throughout, some *Zoophycus*, most traces unidentified. Some grn. halos around burrows (5GY6/2)

SMEAR 2-85, [0,20,80] MARLY NANNO CHALK
60% nannos
25% clay
5% dolomite
3% quartz
2% carb unspec.
1% mica
1% heavy mins
1% rads

SMEAR 2-93, [5,10,85] MARLY NANNO CHALK
60% nannos
25% clay
6% carb unspec.
5% quartz
2% heavy mins
1% mica
1% dolomite
tr glauconite

SMEAR 2-97, [45,30,25] SANDY QUARTZOSE, FORAM-NANNO CHALK
30% nannos
25% quartz
20% forams
14% clay
3% mica
3% dolomite
1% glauconite

SMEAR 4-50, [15,45,40] CALCAREOUS FORAM MARLY CHALK
34% clay
25% forams
15% carb unspec
10% quartz
10% nannos
2% dolomite
1% feldspar
1% mica
1% heavy mins
1% glauconite

OG SAMP

SMEAR 6-20, [5,43,52] MARLY NANNO CHALK
55% nannos
23% clay
7% carb unspec.
5% quartz
5% dolomite
3% heavy mins
2% mica

SMEAR 7-35, [35,35,30] SANDY, CALCAREOUS FORAM, CHALK
35% forams
26% carb unspec.
20% clay
10% nannos
5% quartz
2% glauconite
2% mica
tr heavy mins

2.5YR 4/6
2.5YR 4/6 } red claystones

coarse-grained calcite granule rich sandstone

$CaCO_3$ (BOMB) 4, 90-92 = 61%

THE END

Site 398 Hole D Core 41 Cored Interval: 793.5 - 803.0

AGE: Maastrichtian | Early Paleocene

ZONE: Micula mura Zone | Globigerina eugubina Z. / Parvularugoglobigerina eugubina P.

FOSSIL CHARACTER: FORAM, NANNO

SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | SED. STRUCT.

LITHOLOGIC DESCRIPTION

5Y7/2
10YR5/4 to 5YR6/6

5Y8/1 to 5Y7/2 lt. gray to white sandy QUARTZOSE NANNO CHALK (MARLY) massive

2.5YR 4/4 to 5YR 5/6 reddish brown, variegated, massive intensively bioturbated MARLY NANNO CHALK

Probable Cretaceous - Tertiary boundary, thick diagenetic, 5Y7/2 gray stain for ca. 5cm. above & below 1cm silt layer; burrowing extends 7cm below, but an interval of laminated MANNO MUDSTONE below this: color 10YR 5/4 → 5YR 6/6 mod. yellow-brown to reddish yellow, variegated, massive claystone. Burrowing again intense below 80cm, SECT 2.

Continue more rhythmic sequence typical of previous cores but w/ more variable spacing, all intervals intensely bioturbated, one possible syndepositional fault in SECT 3.

Siltstones and sandstone layers at base of "rhythms" are generally less than 15cm thick, color (5Y7/2) lt. gray to white as well as color of mudstone and chalk above and below. Stained intervals generally thinner than in previous cores. A few laminations suggest contourites in muddy intervals in SECT 3, 60-80cm; SECT. 5, 40-55cm

Predominant color 10YR 5/4 to 5YR 6/6 mod. yel. brown to reddish yellow

Smear 1-65 [10, 40, 50]
MARLY NANNO CHALK
35% nannos
35% clay
6% forams
10% carb. unspec.
8% dolomite
7% quartz
2% mica
2% heavy miner.

Smear 2-42 [3, 45, 52]
QUARTZOSE MUDSTONE
40% quartz
28 clay
15 nannos
5 carb unspec.
4 dolomite
4 mica
2 zeolite
2 heavy mins

Smear 2-48 [10, 20, 70]
MARLY NANNO CHALK
60% nannos
27 clay
5 carb unspec
3 quartz
2 mica
2 dolomite
1 heavy mins

Smear 5-46 [3, 10, 87]
NANNO CHALK
75% nannos
20 clay
3 spicula
1 quartz
1 mica

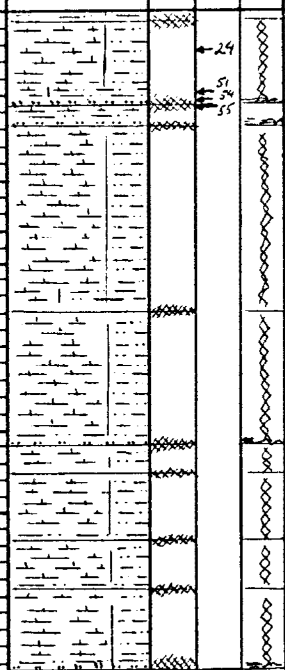
$CaCO_3$ BOMB 1, 64-66 = 34%

Core Catcher

~ THE END ~

Site 398 Hole D Core 42 Cored Interval:

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCT.	LITHOLOGIC DESCRIPTION
Late Cretaceous (Campanian to Maastrichtian) (Maastrichtian)	(Campanian or Maastricht) Micula mura Zone	Rp X	Cg	1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0	THE END		24, 51, 54, 55		see below



Rhythmic sedimentation on the basis of sedimentary facies, bioturbation and color changes. Two main groups of facies are present (a) thin sequences of silty-sandy laminated, structured mudstone grading upward into fine grained mudstone, siltstones layers at base of sequences are 1-3mm maximum and they show minor bioturbation; (b) intensively burrowed brown to light brown MARLY NANNO CHALK. occasionally there are greenish gray layers (>2cm) whithin this units which may be attributed to the top layer of the sequences (a)

$CaCO_3$

Smear 1-24 [8, 12, 80] — MARLY NANNO CHALK
- 55% nannos
- 25 clay
- 5 carb. unspec.
- 5 pellets
- 5 quartz
- 2 mica
- 2 dolomite
- 1 heavy mins

Smear 1-51 [8, 15, 77] — MARLY NANNO CHALK
- 55% nannos
- 26 clay
- 5 carb. unspec.
- 3 mica
- 3 pellets
- 2 dolomite
- 2 heavy mins

Smear 1-54 [10, 15, 75] — MARLY NANNO CHALK
- 55% nannos
- 25 clay
- 5 quartz
- 4 mica
- 3 dolomite
- 3 carb. unspec.
- 2 pellets
- 2 heavy mins
- 1 pyrite

Smear 1-55 [12, 20, 68] — MARLY NANNO CHALK
- 60% nannos
- 20 clay
- 10 quartz
- 5 carb. unspec.
- 2 mica
- 2 dolomite
- 1 heavy mins

Site 398 Hole D Core 43 Cored Interval: 812.5 - 822.0

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannofossil	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
Late Cretaceous Maastrichtian	Lithraphidites quadratus (?)	Cp x	Cf —	1	0.5					Continuation of rhythmic sedimentation as noted in previous cores (1) basal silty/sandy laminations 0-3 mm thick, salt and pepper colors of blues and grays, quartzose MARLY NANNO CHALK (2) light bluish gray (5B 7/1) MARLY NANNO CHALK that darkens and increases upwards in bioturbation from scarce to intense (3) dominant brown (7.5YR 5/4) to light brown (7.5YR 6/4) MARLY NANNO CHALK, intensely bioturbated, some burrows with a greenish gray (5B 7/1 & 5G 6/1) halo; this unit usually grades upwards into a thin (<5 cm) interval of light bluish gray before the sequence is repeated
					1.0					
				2						Section 2 - 136 cm to section 3 - 100 cm: different lithologic unit - "cloud-like" ragged mottles (several cm across) of brown (7.5YR 5/4) and light gray (10YR 7/2) MARLY NANNO CHALK; no apparent bedding; mottled (faint to moderate), but it is questionable that these are burrows. possible fold structures, truncated laminations, calcite breccia at base; this entire unit is overlain by 15 cm and itself overlies a MARLY NANNO CHALK unit of parallel laminated browns and bluish grays much like units (2) and (3) above, intensely burrowed as well
				3						
				4						
				5						
				6						
				Core Catcher						

Smear 3-58 [10, 10, 80] — MARLY NANNO CHALK

50%	nannos
29	clay
10	carb. unspec.
5	quartz
2	dolomite
2	mica
2	heavy mins.

Smear 3-62 [0, 10, 90] — MARLY NANNO CHALK

40%	nannos
57	clay
1	quartz
1	dolomite
1	carb. unspec

Smear 6-33 [6, 10, 84] — MARLY NANNO CHALK

50%	nannos
30	clay
8	carb? unspec
5	quartz
3	heavy mins
2	mica
2	dolomite

$CaCO_3$ BOMB: 1: 77-79 cm 52%
4: 75-77 cm 63%

Site 398 Hole D Core 44 Cored Interval: 822.0-831.5

AGE	FOSSIL CHARACTER: Forams	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
late Cretaceous Maastrichtian Forams: Abathomphalus mayaroensis? Nannos: Lithraphidites quadratus?	Cf Cf-		1 2 3 4 5 6 Core Catcher	0.5 1.0	OOZE SAMPLE		32 35 36 124		Continuation of rhythmic sedimentation (see previous cores) except for: sec 1: 73-103cm: faulted, folded, sheared, distorted interval of MARLY NANNO CHALK; apparently not burrowed; sand-sized calcite fragments and forams peppered into dark, homogeneous interval from 87 to 105cm; 45° normal fault at 78cm, apparent dip-slip = ½ cm. sec 1: 103-131cm: finely laminated, pervasively sheared MARLY NANNO CHALK, faults at various angles sec 2: 120-126 cm: dark brown, massive unburrowed carbonate-poor claystone sec 3: 30-65cm: dark brown claystone with parallel laminations of brown and pale brown offset by ½ cm along a 45° normal fault; deformed burrows imply horizontal shear as well sec 5: 105-112cm: dark brown, massive, unburrowed claystone again, as above Smear 2-32 [0, 30, 70] MARLY NANNO CHALK: 45% nannos; 47 clay; 3 carb. unspec.; 3 quartz; 1 dolomite; 1 mica Smear 2-35 [2, 20, 78] MARLY NANNO CHALK: 46% clay; 35 nannos; 10 quartz; 3 carb. unspec.; 3 mica; 2 forams; 1 dolomite Smear 2-36 [10, 25, 65] MUDSTONE: 43% clay; 30 nannos; 15 quartz; 3 mica; 3 carb. unspec.; 2 forams; 1 dolomite; 2 organic mat; 1 feldspar Smear 2-124 [0, 10, 90] CLAYSTONE: 70% clay; 20 nannos; 3 quartz; 3 mica; 2 carb. unspec.; 1 dolomite; 1 organic mat. $CaCO_3$ BOMB: 2: 96-98cm - 68%

Explanatory notes in chapter 1

Site 398 Hole D Core 45 Cored Interval: 831,5 – 841,0

AGE	Foram. Nannofossil ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCT.	LITHOLOGIC DESCRIPTION
late Cretaceous Maastrichtian	Abundant Maastrichtian	cf	Rf	1	0.5 – 1.0					
				2						
				3						
				4						
				5						
				6		THE END				
				Core Catcher						

Rhytmic sedimentation as noted in previous cores:
(1) basal silty/sandy laminations to silty mudstone 1-3 mm thick, color blues and grays (5B 7/1), basal contact usually erosional and marked by a thin pyritized siltstone laminae. It grades upward into
(2) light bluish gray (5B 7/1) MARLY NANNO CHALK that become brown upward and increases in bioturbation, usually of the type "layer by layer". Some halow burrows. Thickness 3-10 cm.
(3) brown (7.5 YR 5/4 – 5 YR 5/4) to yellowish brown (10 YR 5/4) variegated MARLY NANNO CHALK, generally intensely bioturbated, some halow burrows (bluish gray). This is the predominant facies type in this core (about 90% of total thickness). This facies usually display a layer 3-10 cm thick of bluish gray before the sequence is repeated. Slight changes in facies whithin this unit are attributed to small changes in bottom current activity, dissolution and terrigenous input.

Smear 1-8 [0, 10, 90]
MARLY NANNO CHALK: 56% nannosclay; 35 nannos; 4 quartz; 2 carb. unspec.; 1 mica; 1 dolomite; 1 feldspar; tr heavy mins

Smear 1-19 [0, 10, 90]
MARLY NANNO CHALK: 64% clay; 22 nannos; 3 quartz; 2 carb. unspec.; 1 mica; 1 dolomite; 1 organic mat.; tr Heavy Mins.

Smear 1-21 [0, 30, 70]
MUDSTONE: 50% clay; 28 nannos; 8 quartz; 8 organic mat.; 3 mica; 2 dolomite; 1 heavy mins.

Smear 1-24 [0, 10, 90]
MARLY NANNO CHALK: 61% clay; 30 nannos; 3 quartz; 2 mica; 2 carb. unspec; 1 dolomite; 1 organic mat.; tr heavy mins

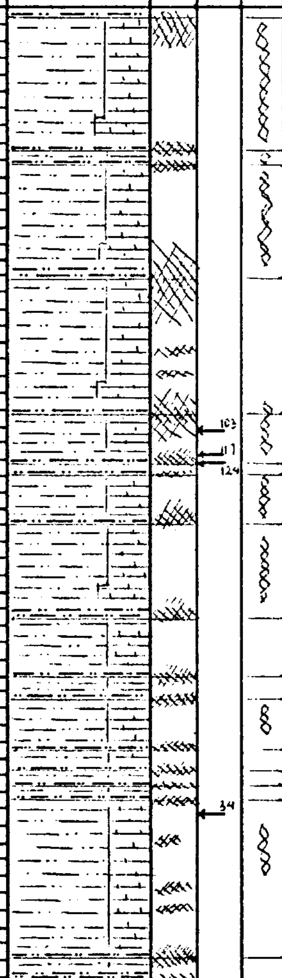
Smear 6-113 [1, 15, 84]
MARLY NANNO CHALK: 62% clay; 22 nannos; 3 mica; 3 quartz; 1 feldspar; 1 dolomite; tr heavy mins

Smear 6-121 [2, 15, 83]
MARLY NANNO CHALK: 55% clay; 30 nannos; 8 quartz; 3 mica; 3 carb. unspec.; 1 organic mat.; tr heavy mins

Smear 6-122 [15, 35, 50]
Pyritized SILTSTONE: 32% clay; 22 nannos; 20 quartz; 8 pyrite; 3 carb. unspec; 2 mica; 1 dolomite; 1 feldspar; 2 forams; 2 glauconite; 1 heavy mins.

$CaCO_3$ – BOMB – 6: 118-120 – 41%

Site 398 Hole D Core 46 Cored Interval: 841,0 – 850,5

AGE	Foram / Nanno ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCT.	LITHOLOGIC DESCRIPTION
Late Cretaceous	Campanian – Tetralithus trifidus; Campan. or Maast.	Cf	Cg			1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0			103, 117, 124, 34		see below

Rhythmic sedimentation as in previous cores:
(1) basal silty laminations 0-1 mm thick, color blues and grays (5B 7/1), basal contact planal and/or erosional; no apparent current ripples laminations.
It grades upward into
(2) bluish gray (5B 7/1) MUDSTONE and MARLY NANNO CHALK on top, that become brown and increase in the grade of bioturbation thickness 1-5 cm
(3) variegated moderate brown (10YR 5/4) to yellowish brown (5YR 5/4) with some bluish gray halo (5B 7/1) CLAYSTONE and MARLY NANNO CHALK
Many small sequences, usually type 2-3. Unit (3) constitute over 90% of the core.
No evidences of bottom current activity show by sedimentary structures, except some basal erosional surfaces.

CaCO₃ – BOMB
2: 103-105 30%
: 115-117 35%
: 120-122 25%

CLAYSTONE — Smear 2-103 [0, 10, 90]
80% clay
10 nannos
3 quartz
2 mica
2 organic mat.
1 feldspar
1 dolomite
1 carb. unspec.
tr heavy mins

MARLY NANNO CHALK — Smear 2-117 [0, 10, 90]
57% clay
32 nannos
3 quartz
3 mica
1 feldspar
1 dolomite
1 organic mat.
tr heavy mins.
2 carb. unspec.

MUDSTONE — Smear 2-124 [3, 20, 77]
55% clay
25 nannos
9 quartz
5 mica
1 dolomite
1 feldspar
1 organic mat
tr heavy mins
3 carb. unspec

SILTSTONE — Smear 4-34 [5, 45, 50]
43% clay
25 - nannos
18 - quartz
5 - mica
3 - carb. unspec
2 - organic mat.
2 - heavy mins
1 - glauconite
1 - dolomite

THE END

Site 398 Hole D Core 47 Cored Interval: 850,5-860,0

AGE: U. Cretaceous - L. Campanian - E. Maastrichtian

FORAM ZONE: Tetrabelus trifidus Zone

FOSSIL CHARACTER: Foram: Tp; Nannos: Cg

SECTION: 1, 2, 3, 4, 5, 6

METERS: 0.5, 1.0

LITHOLOGY

DEFORMATION

LITHO. SAMPLE: 82, 90, 97, 100, 103, 150

SED. STRUCT.

THE END

LITHOLOGIC DESCRIPTION

Rhytmic sedimentation as noted in previous cored. However this core is characterized by the occurrence of thin layers and laminae (2-8mm) of sand. There are two types of sand: (a) quartzose, and (b) calcareous. These sands form the base of the cycles. From the sedimentological point of view, two cycles are distinguishable: (a) upward fining, grading sequences, well structured, and (b). short sequences no gradational.

The complete cycle is as follows:

(1) grayish-blush (5B 7/1) basal sandstone (2-8mm) or siltstone (0 – 10mm).

(2) light blush gray (5B 7/1) mudstone that become brown upward

(3) variegated moderate brown (10YR 5/4) to yellowish brown (5YR 7/4) marly nanno chalk, which show sliphly differences in colour, texture and bioturbation, Darker zones are claystone.

(4) grayish yellow green (5GY 7/2) claystone in top of facies (3) before the sequence is repeated.

$CaCO_3$ BOMB 1: 76-78 30%

CLAYSTONE — Smear 1-82 [0,10,90]

65 %	clay
25	nannos
3	mica
2	quartz
2	carb. unspec.
1	dolomite
1	organic mat
tr	heavy mins
tr	rad.

MARLY NANNO CHALK — Smear 1-90 [0,20,80]

49%	clay
38	nannos
4	quartz
4	mica
2	dolomite
2	carb. unspec.
1	organic mat
tr	heavy mins

MUDSTONE — Smear 1-97 [0,30,70]

60 %	clay
18	nannos
10	quartz
5	mica
2	dolomite
2	carb. unspec.
1	heavy mins
1	organic mat.
1	feldspar

QUARTZOSE SANDSTONE — Smear 1-100 [50,30,20]

35 %	quartz
20	nannos
15	carb. unspec.
10	clay
5	mica
5	forams
5	organic mat
3	heavy mins
2	glauconite

SILTSTONE — Smear 2-103 [30,30,40]

30 %	nannos
25	clay
15	carb. unspec.
15	forams
10	quartz
4	mica
1	heavy mins

CALCAREOUS SANDSTONE — Smear 2-150 [40,40,20]

50 %	carb. unspec.
15	quartz
10	mica
10	nannos
5	clay
4	glauconite
2	dolomite
2	heavy mins
2	organic mat.

Site 398 Hole D Core 48 Cored Interval: 860.0 - 869.5

AGE	Foram / Nannofossil ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannofossil	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SEDIM. STRUCT.	LITHOLOGIC DESCRIPTION
Late Cretaceous / Maastrichtian	Tetralithus trifidus Zone	RF		1	0.5					Rhythmic sedimentation as noted in previous cores. This core in particular is characterized by the lack or the poor representation of facies (1) - basal sandstone or siltstone - of the complete cycle. The different cycles are defined by the sharp basal contact, color changes and slight changes in lithology. Core burrowed throughout except a layer of thin laminated mudstone at 140 cm in core 1. See core 47 for cycle description.
				2	1.0			Bcue		
				3		O.G. SAMPLE		3		
				4				51 53 59		
				5						40: (artifact?)
				6						(artifact?)
										40: (artifact!)
				7						(?)
				TA	(1)					
				CC						

CLAY-STONE — Smear 4-3 [0, 0, 100]: 82% clay, 10 nannos, 8 iron oxides

MUDSTONE — Smear 4-51 [0, 20, 80]: 55% clay, 28 nannos, 8 quartz, 5 mica, 2 dolomite, 2 organic mat.

Smear 4-58 [0, 15, 85]: 56% clay, 35 nannos, 5 quartz, 3 mica, 1 dolomite, tr heavy mins.

MUDSTONE — Smear 4-59 [3, 47, 50]: 30% clay, 28 nannos, 20 quartz, 8 carb. unspec., 5 mica, 3 forams, 2 dolomite, 2 feldspar, 2 heavy mins

$CaCO_3$ BOMBA? 2: 38-40 22%

Site 398 Hole D Core 49 Cored Interval: 869.5 - 879.0

AGE	ZONE	FOSSIL CHARACTER: foram	FOSSIL CHARACTER: nannofossil	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SEDIM. STRUCT.	LITHOLOGIC DESCRIPTION
Late Cretaceous	Campanian - Globotruncana calcarata Zone	R	G	1	0.5	THE END				Rhythmic sedimentation as noted is cores 48 and 47. See core 47 for description of the cycles.
				2	1.0					
				3						
				4						
				5						
				6						
				Core Catcher						

Site **398** Hole **D** Core **50** Cored Interval: **879.0 - 888.5**

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Late Cretaceous	Campanian	x C f		1	0.5, 1.0					
	Campanian or early Maastr.	C f x		2				86		
	Campan. or Maastr.	R x P		3				51, 52, 65		
	Campan. or Maastr.	R x f		4						
	Barren			5						
	Campan. or Maastr.	T p x, T p x		6						
	?	x x T p	0	Core Catcher						

As before, core shows 3 units in sequence:

(1) basal laminations of silt to medium sand-sized CALCAREOUS SILTSTONE to SANDSTONE, salt & pepper colors of light & dark grays

(2) light bluish gray (5B 7/1) MARLY NANNO CHALK TO CLAYSTONE, often with an underlying interval of rarely burrowed medium bluish gray 5B 5/1

(3) dark reddish brown (5YR 3/4) and brown (7.5YR 5/4) MARLY NANNO CHALK TO CLAYSTONE, the brown intervals intensely burrowed

Sec 2: 84cm - a 45° fault, offset not apparent

Sec 3: 45-58cm - poorly sorted angular to subrounded to well rounded micritic limestone with a few nannofossils under smear slide; coarse sand- to pebble-sized

Sec 3: 58cm - 45° fault (drilling artifact?)

below sec 3: the 3-part sequence is continued, but the brown unit (3) is darker than above, more massive and homogeneous, less frequently burrowed, and is very low in carbonate; is very tacky and expands as much as 10% in length as the core dries

several more faults - all 45° with normal offsets, approximately 1 cm of apparent dip slip - appear in sections 6 & 7

Smear 2-86 [35,30,35] — CALCAREOUS SANDSTONE
- 50% carb. unspec.
- 18 quartz
- 15 mica
- 10 clay
- 3 heavy mins
- 2 dolomite
- 2 nannos

Smear 3-51 [3,35,62] — MUDSTONE
- 53% clay
- 20 quartz
- 10 carb. unspec.
- 6 heavy mins.
- 5 dolomite
- 4 mica
- 2 zeolite

Smear 3-52 [5,15,80] — LIMESTONE
- 50% carb. unspec.
- 20 nannos
- 19 clay
- 5 quartz
- 3 mica
- 2 dolomite
- 1 heavy mins

Smear 3-63 [3,40,57] — MUDSTONE
- 48% clay
- 20 quartz
- 15 carb. unspec.
- 10 mica
- 4 dolomite
- 3 heavy mins.

Smear 6-135 [5,30,65] — MUDSTONE
- 52% clay
- 15 quartz
- 15 carb. unspec.
- 10 mica
- 6 heavy mins
- 2 dolomite

$CaCO_3$ BOMB 3: 112-113 cm - <2%

Site 398 Hole D Core 51 Cored Interval: 888,5 - 898,0

AGE	Foram. Nann. ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannofo	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
	?	Rf x		1	0.5					Continuation of three unit sequence, similar to bottom of core 50: (1) basal sandy/silty SILTSTONE, SANDSTONE laminations (2) bluish gray (5B7/1) MUDSTONE (3) dark reddish gray (5YR 4/2) MUDSTONE Scarce evidence of bioturbation; only a few halo burrows, bluish gray
					1.0					"biscuit" deformation throughout
				2				50 53		
				3						
	?. ?.	Rf x	O			END				
				4						
				5						
				6						
				Core Catcher						

Smear 2-50[3,40,57]
MUDSTONE: 54 % clay; 15 quartz; 10 mica; 10 calc. unspec.; 5 heavy mins.; 4 oxides; 2 dolomite; 1 zeolite

Smear 2-53[3,35,62]
MUDSTONE: 64 % clay; 15 quartz; 8 mica; 6 calc. unspec.; 5 heavy mins; 2 dolomite

$CaCO_3$ BOMB 2+135-136 cm - 2%

Site 398 Hole D Core 52 Cored Interval: 898.0 - 907.5

AGE	Foram. / Nannofossil ZONE	FOSSIL CHARACTER: Foram.	FOSSIL CHARACTER: Nannofossil	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
? N.	Ag Xg	O-		1	0.5			7 15 92		UNFOSSILIFEROUS MUDSTONE with layers of QUARTZOSE SILTSTONE predominantly homogeneous, totally unburrowed dark reddish gray (5YR 4/2); soft, semi-lithified, expands as it dries; sec 1, 0-8cm: greenish gray (5G 6/1) MUDSTONE scattered layers of cemented siltstones (light bluish gray, 5G 7/1), laminated and in oval fillings with dark reddish brown (2.5YR 3/4) halos "biscuit" deformation throughout
				2	1.0					
				3						
				4						
				5						
				6						
				Core Catcher						

Smear 1-7 [0, 20, 80]
CLAYSTONE: 82% clay; 8 quartz; 3 mica; 3 dolomite; 2 organic mat.; 1 feedspar; 1 heavy mins

Smear 1-15 [0, 20, 80]
CLAYSTONE: 77% clay; 8 quartz; 5 mica; 3 dolomite; 5 oxides; 2 feedspar

Smear 1-92 [0, 55, 45]
QUARTZOSE SILTSTONE: 45% clay; 35 quartz; 5 mica; 5 chert; 3 feedspar; 3 dolomite; 3 oxides; 1 heavy mins

$CaCO_3$ BOMB 2:134-136cm · 5%

Site 398 Hole D Core 53 Cored Interval: 907.5 - 917.0

AGE | ZONE | FOSSIL CHARACTER (Foram, Nannno) | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | SED STRUCTURES | LITHOLOGIC DESCRIPTION

Very similar to core 52:
Predominantly homogeneous, unburrowed unfossiliferous CLAYSTONE dark reddish gray (5YR 4/2); soft; expands as it dries

Rare light bluish gray (5G 7/1), layers occassionally with cemented silty/sandy quartz-rich laminations

Plus light bluish gray oval mottles, fillings, with halos of dark reddish brown (2.5YR 3/4)

45° normal fault offsets sandy lamination at 85cm of section 2

Section 4, 0-50cm: some slightly darker brownish gray intervals, with small (1mm?) black blebs
- Manganese micronodules?
- Pyrite?

"biscuit" deformation throughout

Smear 2-70[0,10,90] CLAYSTONE
89 % clay
5 quartz
5 oxides
1 mica
tr feldspar
tr heavy mins

Smear 2-140[0,10,90] CLAYSTONE
90 % clay
6 quartz
3 mica
1 feldspar
tr heavy mins.

Smear 2-141[10,50,40] QUARTZOSE SILTSTONE
45 % quartz
37 clay
5 feldspar
5 mica
3 carb. unspec.
2 glauconite
2 heavy mins
1 dolomite

CaCO3 BOMB 3:58-60 : 3%

OG SAMPLE

Core Catcher

END

Explanatory notes in chapter 1

Site 398 Hole D Core 54 Cored Interval: 917,0 - 926,5

AGE	ZONE	FOSSIL CHARACTER				SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SEDIM. STRUCT.	LITHOLOGIC DESCRIPTION
Late Cretaceous	Barren	Rg				1	0.5, 1.0	I. W. SAMPLE		58, 92	45°	
	?	Rg				2		THE END		60		
						3						
						4						
						5						
						6						
	?	Tx	0			Core Catcher						

Similar to cores 52 and 53
Predominantly homogeneous, unburrowed, unfossiliferous CLAYSTONE dark reddish gray (5YR 4/2).
Two variations:
(1) Rare light bluish gray (5B 7/1) layers with silty laminations
(2) Mottle and variegated intervals dark gray (5YR 4/1) 1-5 cm thick
In section two there are some light brownish gray (10YR 6/2) mottled laminations

$CaCO_3$ (BOMB) 2: 98-100, 3%

Smear 1-58 [0,15,85] CLAYSTONE
- 85% clay
- 5 quartz
- 4 dolomite
- 3 oxides
- 2 chert
- 1 feedspar
- tr mica
- tr heavy mins.

Smear 1-59 [0,30,70] CLAYSTONE
- 65% clay
- 10 dolomite
- 8 authig. opal
- 5 quartz
- 3 mica
- 3 zeolite
- 1 feedspar
- 5 oxides
- tr heavy mins

Smear 2-60 [0,20,80] CLAYSTONE
- 80% clay
- 8 zeolite
- 3 quartz
- 3 mica
- 3 oxides
- 2 dolomite
- 1 feldspar
- tr heavy mins.

Explanatory notes in chapter 1

Site 398 Hole D Core 55 Cored Interval: 926,5 - 936,0

AGE	ZONE	FOSSIL CHARACTER: Forams	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SEDIM. STRUCT.	LITHOLOGIC DESCRIPTION
Cenomanian	? Foram. ? ? ? Barren			1	0.5			50		Predominantly homogeneous or faintly laminated, unburrowed unfossiliferous dark reddish brown to yellowish red (5YR 4/2 - 5YR 5/8) CLAYSTONE. Some thin sequences formed by (1) basal silty or sandy MUDSTONE bluish gray (5G 6/1), laminated, graded (?) and with sharp based contact: 0-2 mm thick (2) it is followed by a layer 1-2 cm thick of bluish gray (5G 6/1) MUDSTONE, which grades into the dark reddish CLAYSTONE. Two variations in the CLAYSTONE: (a) laminated yellowish red (5YR 5/8) claystone, which expands as it dries, and (b) massive claystone, homogeneous
				1	1.0					
				2		THE END		19 24 24.5		
				3						
				4						
				5						
				6						
				Core Catcher						

Smear 1-50 [0,20,80] — CLAYSTONE
79 % clay
10 zeolite
3 quartz
3 mica
3 oxides
1 feldspar
1 dolomite
tr heavy mins

Smear 2-19 [0,20,80] — CLAYSTONE
77% clay
12 zeolite
5 quartz
5 mica
1 feedspar
tr heavy mins

Smear 2-24 [0,30,70] — CLAYSTONE
71 % clay
20 zeolite
5 quartz
3 mica
1 feedspar
tr heavy mins

Smear 2-24,5 [0,30,70] — MUDSTONE
70 % clay
15 quartz
8 zeolite
5 mica
2 feedspar
tr heavy mins

$CaCO_3$ 1-62.64 4%

Site 398 Hole D Core 56 Cored Interval: 945.5 - 955.0

AGE | ZONE | FOSSIL CHARACTER: Foram, Nannos | SECTION | METERS | LITHOLOGY | LITHO. SAMPLE | SEDIM. STRUCT. | LITHOLOGIC DESCRIPTION

Early Cretaceous — Early Cretaceous undifferentiated — Eiffellithus turriseiffelii Zone

Core Catcher — THE END

there are six main facies in this core:

(1) Variegated grayish-green, greenish-gray and reddish brown (10 GY 5/2 - 5 GY 5/2 - 5 GY 4/1 - 5 YR 4/4) ZEOLITIC CLAYSTONE, massive homogeneous, structureless or faintly laminated and non bioturbated. This facies is present in section 1 and extends throughout the first half of section 2.

(2) Grayish-green (10 GY 5/2 - 5 GY 5/1) MARLY NANNO CHALK to MUDSTONE and CALCAREOUS MUDSTONE, with medium bedding (1-3 cm) to irregular fine laminated an eventually parallel laminated bedding; burrowed at some levels (i.e. sect. 5 and 6) but not very intensely. White specks of calcareous concretions are present here and there. Small differences in facies are based on lamination and color changes. This facies begins in the lower part of section 2 and is predominant in sections 4, 5 and 6

(3) Variegated grayish-green and greenish gray (5 GY 5/2 - 5 G 4/1) finely laminated ZEOLITIC CLAYSTONE to SILTY CLAYSTONE. Parallel lamination to wavy or very low angle lamin.

(4) White to bluish greenish (N 9 - 5 BG 9/1 - 5 G 8/1) QUARTZOSE SANDSTONE or SILTSTONE, well structured, ripples, graded bedding, cross laminated. Basal contact erosional.

Facies 1, 3 and 4 show graded gradation from top to bottom; they are attributed to turbidite sequences and are well represented throughout sect. 3

(?) (5) Dark gray - grayish black (N2-N3) claystone (black shales), thin parallel laminated (varve like) or structureless. Not bioturbated

(6) Grayish green to grayish black (10 GY 5/2 - N 3) mud chip sandstone to mud chip siltstone and claystone, graded bedding, thin parallel lamination, no erosional based contact. This facies group is attributed to a deposit resulting from the settling and sorting (grading) of particles through the water column in a quiet environment (stratified basin) rather than from a classical turbidite flow.

$CaCO_3$ BOMB 33 2:66-68 < 2

Smear 1-42 [0, 50, 50]
ZEOLITIC CLAYSTONE: 50 % clay, 30 zeolite, 10 quartz, 5 dolomite, 1 mica, tr heavy mins

Smear 2-14 [0, 30, 70]
ZEOLITIC CLAYSTONE: 75 % clay, 25 zeolite

Smear 2-24 [0, 30, 70]
ZEOLITIC CLAYSTONE: 72 % clay, 20 zeolite, 5 quartz, 3 mica, tr heavy mins

Smear 2-85 [5, 40, 55]
ZEOLITIC CLAYSTONE: 45 % clay, 30 zeolite, 10 carb. unspec., 5 quartz, 5 mica, 3 dolomite, 2 heavy mins

Smear 2-94 [40, 30, 30]
QUARTZOSE SANDSTONE: 40 % quartz, 15 zeolite, 12 mica, 12 clay, 10 carb. unspec., 7 glauconite, 3 heavy mins, 1 dolomite

Smear 2-130 [0, 10, 90]
CLAYSTONE: 70 % clay, 10 zeolite, 20 organic mat.

Smear 3-25 [0, 100]
ZEOLITIC CLAYSTONE: 50 % zeolite, 47 clay, 1 quartz, 1 mica, 1 dolomite, tr heavy mins

Smear 3-57 [5, 40, 55]
CALCAREOUS MUDSTONE: 31 % clay, 30 carb. unspec., 20 zeolite, 5 quartz, 5 forams, 5 nannos, 2 mica, 2 dolomite

Smear 3-73 [5, 45, 50]
47 % clay, 15 forams, 10 carb. unspec., 10 zeolite, 5 quartz, 5 dolomite, 5 nannos, 2 mica, 1 feldspar

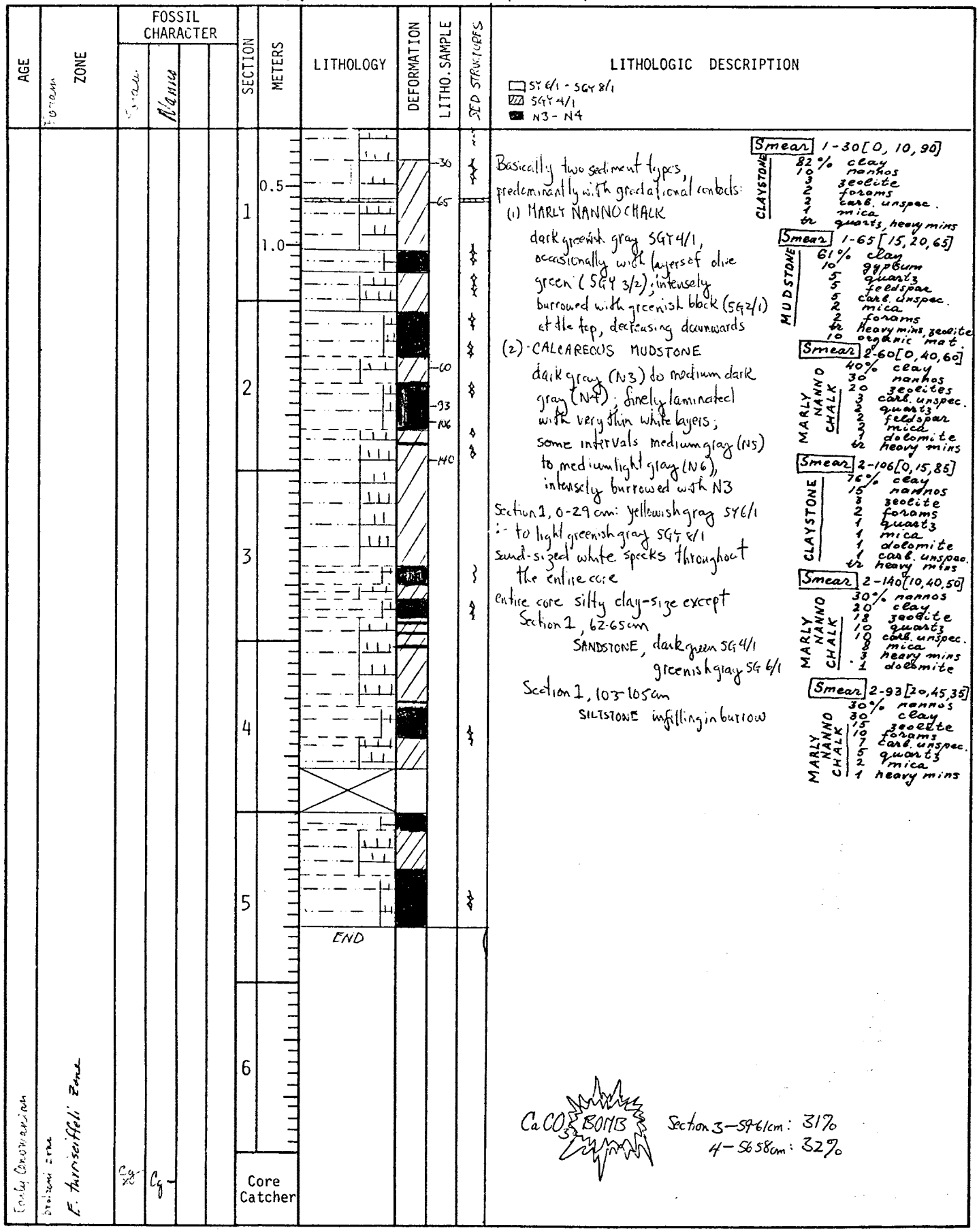
Smear 3-111 [15, 40, 45]
MUDSTONE: 35 % nannos, 30 clay, 20 zeolite, 6 carb. unspec., 5 quartz, 2 mica, 2 heavy mins

Smear 6-50 [0, 30, 70]
MARLY NANNO CHALK: 41 % clay, 35 nannos, 15 zeolite, 3 quartz, 3 carb. unspec., 2 dolomite, 1 feldspar

Smear 6-90 [5, 30, 65]
MARLY NANNO CHALK: 40 % clay, 35 nannos, 10 zeolite, 5 quartz, 5 carb. unspec., 3 forams, 1 mica, 1 dolomite

Explanatory notes in chapter 1

Site 398 Hole D Core 57 Cored Interval: 955.0-964.5



Explanatory notes in chapter 1

Site 398 Hole D Core 58 Cored Interval: 964,5 - 974,0

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannofossil	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
Early Cenomanian	E. turriseifeli Zone	Rg	Cf	1	0.5, 1.0					MARLY CHALK - light bluish gray (5B7/1) to greenish gray (5G6/1) faintly laminated, mottled, gray streaks at some levels slightly burrowed - Chondrites and others Section 2, 65-95 cm: dark gray to medium dark gray (N3 to N4) well-laminated, but not varve-like Ca Co3 BOMB 1 - 67.68 32%
				2		END				
				3						
				4						
				5						
				6						
				Core Catcher						

LITHOLOGY: 5B7/1 - 5G6/1; N3 - N4

Site 398 Hole D Core 59 Cored Interval: 974.0 - 983.5

AGE | ZONE | FOSSIL CHARACTER (Foram, Nannos) | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | SED STRUCTURES

5GY4/1
5B6/1
N3, N2

LITHOLOGIC DESCRIPTION

Drilling breccia: dominantly greenish gray, bluish white and light bluish gray, with angular granules of white calcite, plus mud clasts and hard fragments of dark shale

Two colors of sediment, bluish gray (5B6/1) and dark gray (N2), with minor dark greenish gray (5GY4/1), all with the same lithology: MARLY NANNO CHALK

The bluish gray intervals have numerous burrows (zoophycus, chondrites) and unidentifiable mottles of very dark gray usually oval and flattened; these intervals expand more than 5% in length, giving a "splintered" texture to the surface

The very dark gray intervals do not expand

The contacts between the two major units are usually sharp, slightly irregular, sometimes inclined; occassionally a "transition" unit between these two is found, consisting of interlaminations of the two

Sand-sized white specks (calcite fragments?) are found throughout the core

Mud Clast Conglomerate, very little matrix, each clast an elongated oval ~1.5 x 0.5 cm; colors are v dark gray, dark greenish gray, bluish gray,

$CaCO_3$ BOMB Section 2: 40-41 cm = 25%

MARLY NANNO CHALK

Smear	1-100 [15, 35, 50]
40%	clay
25	nannos
10	carb. unspec.
5	zeolite
5	quartz
4	organic mat
3	mica
3	dolomite
3	forams
2	heavy mins

Smear	1-130 [10, 40, 50]
46%	clay
30	nanno
5	carb. unspec.
1	forams
5	quartz
4	mica
3	dolomite
2	heavy mins
1	pyrite
3	organic mat.

Smear	2-110 [5, 35, 60]
40%	clay
30	nannos
10	carb. unspec.
5	quartz
5	mica
3	organic mat
2	dolomite
1	heavy mins
1	pyrite
1	zeolite
1	radiol.
1	sponge sp.

E. turriseiffeli zone

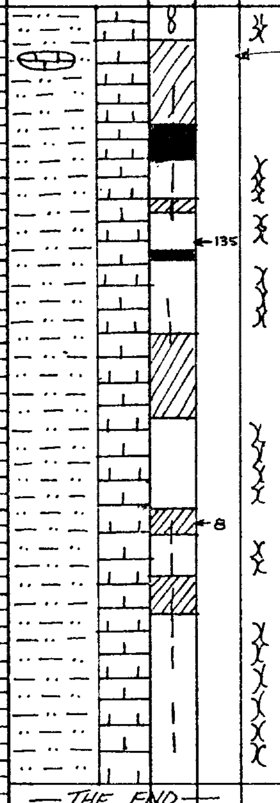
Cg Cf

Core Catcher

END

Site 398 Hole D Core 60 Cored Interval: 983,5 - 993,0

AGE	ZONE	FOSSIL CHARACTER				SECTION	METERS	LITHOLOGY	COLOR AND DEFORMATION	LITHO. SAMPLE	SED. STRUCT.	LITHOLOGIC DESCRIPTION
			Nanno									
						1	0.5, 1.0			135		
						2						
						3				8		
						4						
						5						
						6						
	E. turriseiffeli zone	Aa X6	Cf			Core Catcher						



□ 5B6/1
▨ 5GY4/1
■ N-2 to N-3

rounded, micritic ls. pebble

CALCAREOUS MUDSTONE TO MARLY NANNO CHALK

N-2 to N-3 (very dark gray) 5B6/1 bluish gray, and 5GY4/1 greenish gray, clayey sediment.

Intercalations of these colors with 5GY4/1, being a transitional unit between bluish-gray, splintering, expanding mudstone with black to gray flattened mottles, chondrites, and Zoophycus traces and dark gray to black, massive, unburrowed mudstone. Laminations in base of dark gray interval.

The contacts between color units are gradational and the 5Y4/1 intervals contain interlaminations of dark gray and bluish-gray.

small white specs - thruout, probably forams.

Smear 1-135 [3,30,67]
CALCAREOUS MUDSTONE
- 58 % clay
- 15 nannos
- 12 carb. unspec.
- 5 mica
- 3 quartz
- 2 dolomite
- 2 pyrite
- 1 zeolite
- 1 radiol.
- 1 organic mat.

Smear 3-8 [4,36,60]
MARLY NANNO CHALK
- 49 % clay
- 36 nanno
- 4 organic mat
- 3 quartz
- 3 pyrite
- 2 dolomite
- 1 zeolite
- 1 feedspar
- 1 mica

$CaCO_3$


ORG C = 0.4%

1, 107-108 = 31%

Site 398 Hole D Core 61 Cored Interval: 993,0 - 1002,5

AGE | ZONE | FOSSIL CHARACTER (Forams, Nannos) | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | SED. STRUCT. | LITHOLOGIC DESCRIPTION

5B6/1
5GY4/1
N-2 to N-3

Upper Miocene (Discoaster quinqueramus Zone) to Basal Pliocene (Discoaster tamalis Zone) / P. Cretacea ? Zone

Ag Cf

Continuation of lithology and color sequence of previous core.

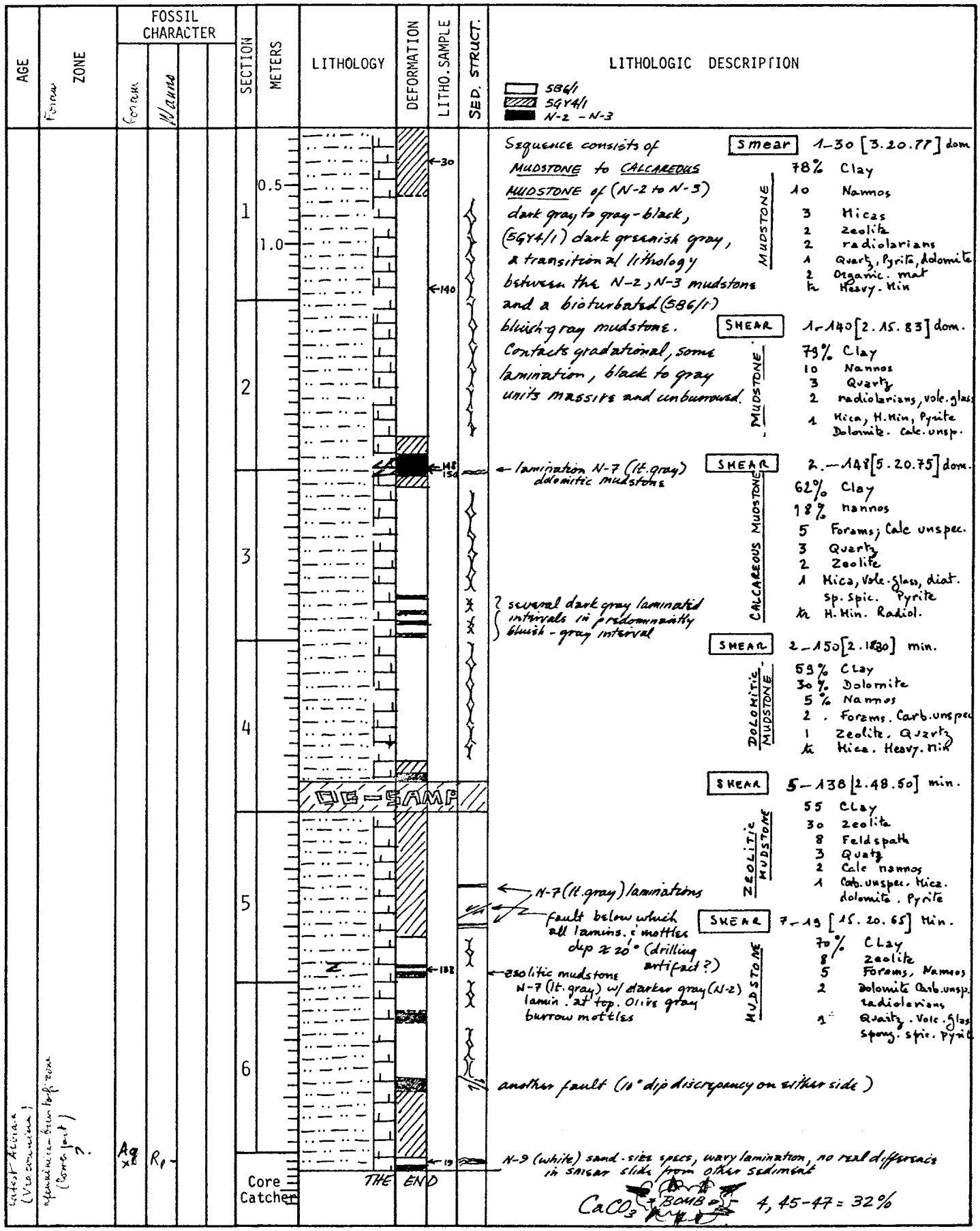
CALCAREOUS MUDSTONE
Smear 1-105 [0, 20, 80]
73 % clay
15 nannos
2 quartz
2 zeolite
2 dolomite
2 carb. unspec.
1 mica
1 pyrite
1 radiol.
1 organic mat.

CALCAREOUS MUDSTONE
Smear 1-146 [0, 20, 80]
70 % clay
20 nannos
2 quartz
2 zeolite
2 carb. unspec.
1 feldspar
1 mica
1 dolomite
1 radiol.
tr organic mat.

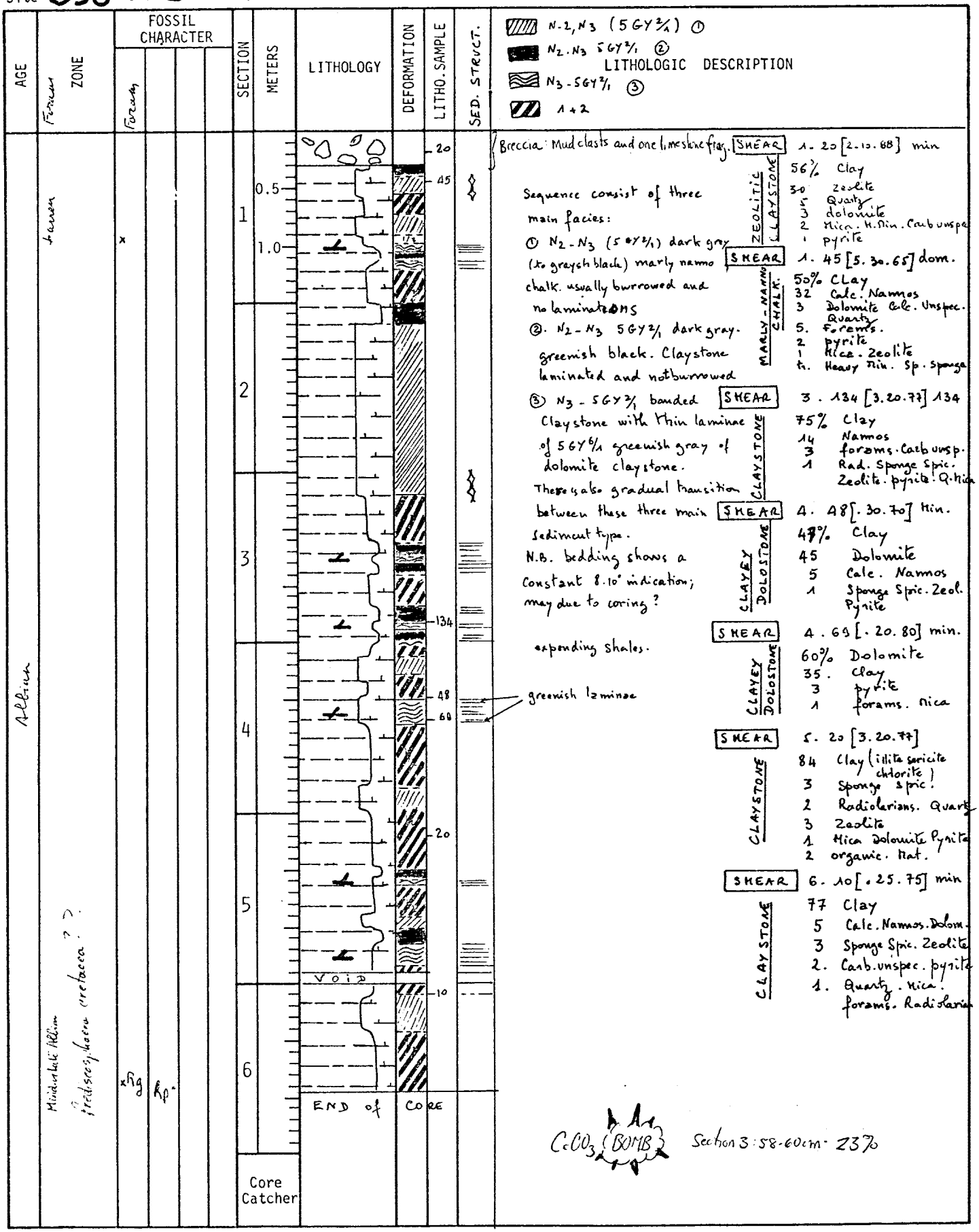
1: 0.5, 1.0 ← 105 ← 146
2: THE END
3
4
5
6
Core Catcher

$CaCO_3$ BOMB 1, 102-104 = 26%

Site 398 Hole D Core 62 Cored Interval: 1002.5 – 1012 m



Site 398 Hole D Core 63 Cored Interval: 1012 - 1021.5 m

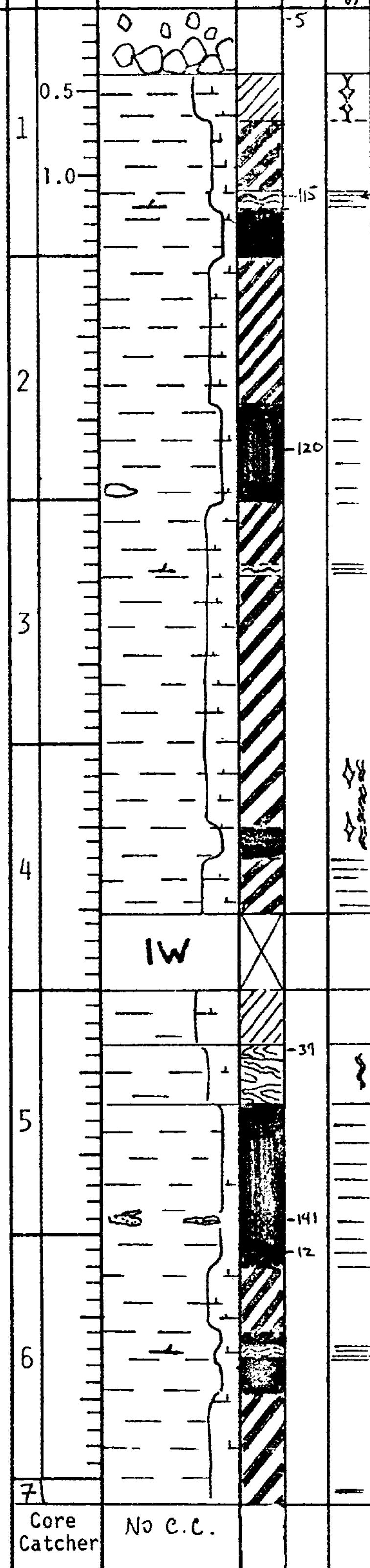


Site 398 Hole D Core 64 Cored Interval: 1021.5 - 1031 m

AGE	ZONE	FOSSIL CHARACTER			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
					Core Catcher						No RECOVERY

Site 398 Hole D Core 65 Cored Interval: 1031 – 1040.5

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Albian	Foram	Foram / Nanno							



Drilling breccia

three mean facies similar to core 63. This core 65 shows very little development of facies "3". – There are thick burrows, pyritised.

greenish laminae.

remark: bedding shows a constant dep of 8.10° may due to coring.

SHEAR 1.5 [5.35.60] dom

dolomitic CLAYSTONE
- 52% Clay
- 15 dolomite
- 10 Carb. unspec.
- 10 calc. nannos
- 5 Quartz. org. mat.
- 3 mica
- t. pyrite. H. min

SHEAR 1.115 [3.25.72] min

MARLY NANNO CHALK
- 49% Clay
- 25% Calc. Nannos
- 10 Carb. Unspec.
- 5. Org. mat.
- 3. dolom. Quartz mica.
- 1 pyrite. zeolite Heavy min.

diagenetic pyritised nodule

SHEAR 2.120 [10.25.65] D.

MARLY NANNO CHALK
- 40% Calc. Nannos
- 38 Clay
- 6 forams
- 5 Calc. unspec.
- 3 Quartz, Mica
- 2 dolom. Pyrite heavy. min
- 1 Radiol.

SHEAR 5.39 [3.20.77] min

CLAYSTONE
- 80% Clay
- 10 Calc. nannos
- 3 forams
- 1 Quartz, mica pyrite, dolomite zeolite
- tr. Radiolarians

SHEAR 5.141 [40.30.30] min

New facies " marble pyritised nanno Claystone pyritised burrows.

CALCAREOUS, QUARTZEOUS SANDSTONE
- 30% Quartz. Clay
- 20% Calc. nanno
- 7 forams
- 5 calc. unspec. mica
- 3 radiolarians
- 1 Heavy min.

SHEAR 6.12 [.10.90] dom.

CLAYSTONE
- 84% Clay
- 8 Calc. Nannos
- 3 Dolomite
- 1 Quartz, mica pyrite, calc. unsp. foram
- tr Heavy Min.

expanding clay

greenish thin bed

Albian — P. cretacea ?? — KRp — Rp–

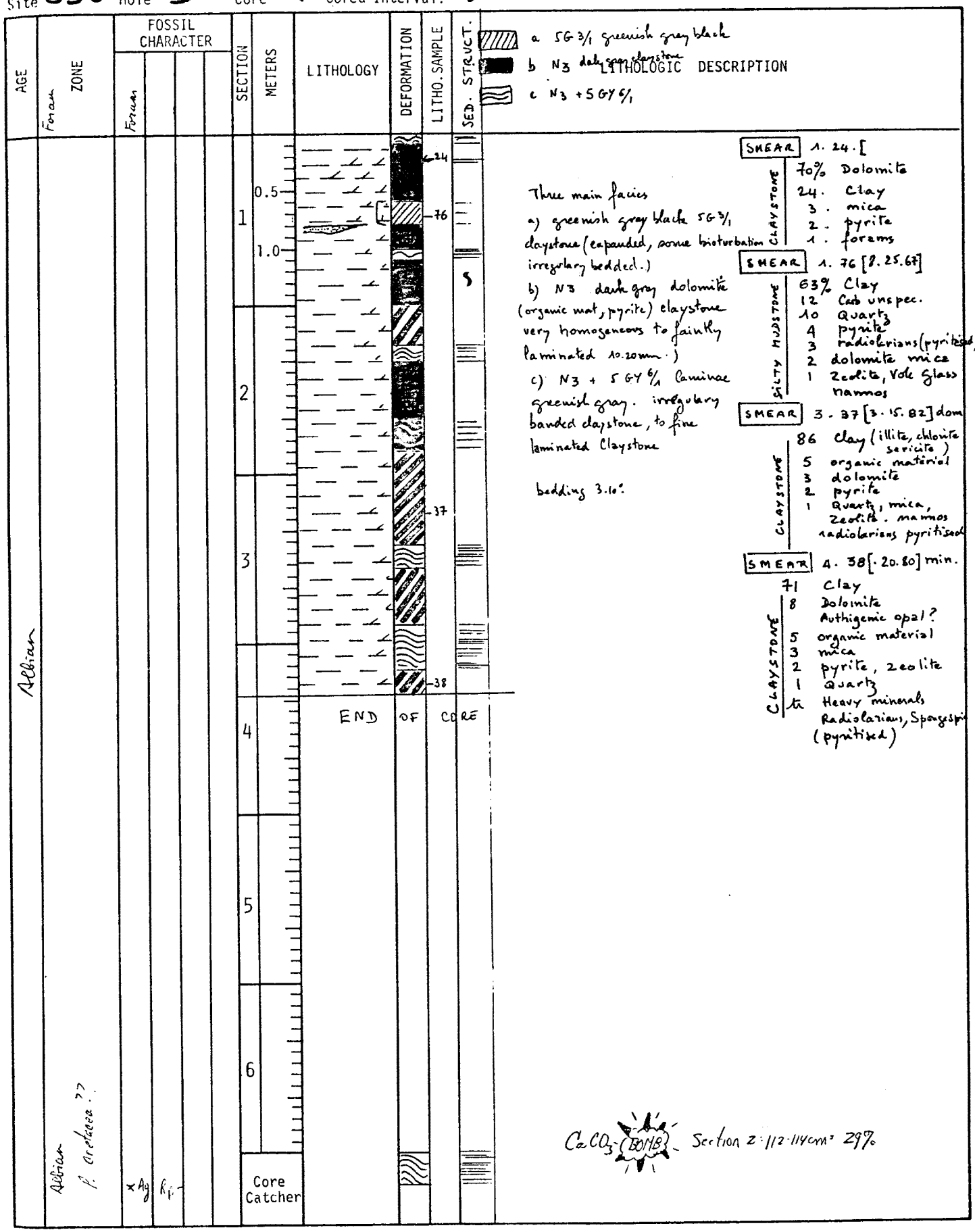
CaCO3 (BOMB) Section 2: 58-60cm: 21%

Site 398 Hole D Core 66 Cored Interval: 1040.5 – 1050 m

AGE	Fmcy ZONE	FOSSIL CHARACTER: Foram	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Albian	Albian *P. Cretacea* ? ?	xAg Rp	1	0.5					pyritised nodule facies also similar to core 63. Thin layer of drilling breccia. no bioturbation SMEAR 1. 5. [3.47.50] min CLAYEY DOLOSTONE: 70% dolomite; 20 Clay; 5 Calc. Namos; 2 forams. zeolite; 1 pyrite; tr Quartz. Heavy min
			1	1.0					
			2						SMEAR 1. 30 [. 15. 85] dom. CLAYSTONE: 90% clay; 2 dolomite, zeolite pyrite; 1 Quartz, mica; tr Heavy min.; 2. organic. mat.
			2		END of CORE				NO CORE CATCHER
			3						SMEAR 1. 60 [3.27.70] min CLAYSTONE: 49% clay; 10 dolomite Calc. unspec.; 15 Calc. Namos; 5 Quartz. Radiolar.; 3 organic materia; 2 mica; 1 Heavy min. Pyrite
			4						
			5						
			6						
			Core Catcher						

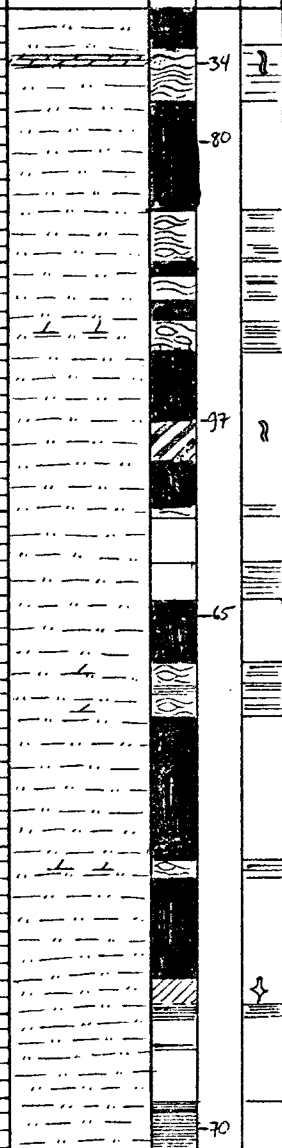
$CaCO_3$ (BOMB) Section 1: 76-78cm: 37%

Site 398 Hole D Core 67 Cored Interval: 1050. 1059.5



Site 398 Hole D Core 68 Cored Interval: 1059.5 – 1069 m

AGE	ZONE (Foram)	FOSSIL CHARACTER (Foram)				SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURE
Albian	Albian *Parhabdolithus angustus* ?	x Ag	Rp			1–5	0.5, 1.0			34, 80, 97, 65, 70	



LITHOLOGIC DESCRIPTION

four main facies

a) 5 GY 2/1 greenish black homogeneous, burrowed mudstone

b) N1 - N2 black, grayish black homogeneous to fairly laminated claystone

c) N2 5Y 2/1 grayish black to olive black banded claystone with laminae, clasts, and irregular thin beds of 5Y 2/1 dolostone.

d) N4 to 5Y 4/1 dark gray to olive gray laminated claystone (parallel laminae from 0.1 to 1 mm.)

pyrite nodules

irregular shaped layer of pyrite ≈ 1 cm thick

SMEAR . 1.34 [• 30.70] min

DOLOSTONE
- 92% Dolomite
- 5 Clay
- 2 organic mat.
- 1 pyrite

SMEAR 1.80 [5.10.85] dom

CLAYSTONE
- 86 % Clay
- 5 dolomite
- 4 radiolarians (pyritised)
- 2 Quartz, Carb. unspec.
- 1 mica
- 1 Heavy. mins
- tr Volc. glass.

SMEAR 2.97. [8.25.67] min.

CLAYSTONE
- 62% Clay
- 7% organic mat.
- 6 Quartz. radiol. dolomite
- 4 mica
- 3 zeolite
- 2 pyrite, calc. nannos
- 1 Sponge Spic. Heavy min.

SMEAR 3.65 [5.25.70] dom.

CLAYSTONE
- 65% Clay
- 10 Calc. nannos
- 6 dolomite
- 4 pyrite, radiolarians
- 3 Zeolite, Quartz
- 2 mica, organic material
- 1 Heavy min.

SMEAR. 5.70 [3.30.67] dom.

Nanno Claystone
- 47% Clay
- 20 calc. nannos
- 15 Carb. Unspec.
- 7 Quartz
- 4 Zeolite
- 3 mica
- 2 Heavy min
- 1 Volc. glass, pyrite, dolomite

END OF CORE

NO CORE CATCHER

Core Catcher

Explanatory notes in chapter 1

Site 398 Hole D Core 69 Cored Interval: 1069 – 1078.5 m

AGE | ZONE | FOSSIL CHARACTER (Foram, Nannofossil) | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | SED STRUCTURES

5GY 2/1 - 5GY 4/1
N1 - N2
N2 - 5Y 2/1
5Y 4/1 - N4

LITHOLOGIC DESCRIPTION

As in previous core, 4 sedimentary units:

(1) MARLY CHALK greenish black (5GY 2/1) to dark greenish gray (5GY 4/1); burrowing faint to moderate

(2) MUDSTONE, black (N1) to grayish black (N2); very, very faintly laminated and mottled

(3) MUDSTONE, grayish black (N2) to olive black (5Y 2/1) with clasts and wavy laminations of greenish gray (5GY 6/1)

(4) MUDSTONE to MARLY CHALK dark gray (N4) to olive gray (5Y 4/1), finely laminated with greenish gray (5GY 6/1), parallel, each laminae 0.1 to 1.0 mm thick

SAMPLE

← Flame Structures

SMEAR 1.1 [20.80] min
CLAYSTONE: 88% Clay; 5. dolomite; 4. Quartz; 2. calc. Nannos; 1. mica

SMEAR 2.70. [15.25.60] dom
MARLY FORAM-NANNO CHALK: 42% Clay; 20 Calc. Nannos*; 10 forams* *pyritised, recrist.; 5 Quartz. radiol. Carb. unspecified; 3 mica. dolomite pyrite; 2 Heavy rmins. Zeolite

SMEAR 3.95. [1.40.59] min
DOLOSTONE (pyritic): 84% Dolomite; 10 pyrite (infilling of forams); 5 Carb. Unspec.; 1 Heavy. min.

SMEAR 4.80 [8.10.82] dom.
MARLY CHALK: 38% Clay; 25% Calc. Nannos; 20 Calc Unspec; 5 dolomite; Quartz; 3 Pyrite; 2 mica; 1 zeolite; Heavy min.

Gray to bluish gray fibrous, radiating pinacoid crystals with satiny luster atop a massive, fibrous 10-cm thick layer of high density (~4.0 g/cc) mineral - BARITE?

$CaCO_3$ BOMB Section 3, 111-113cm: <3%

Core Catcher

Explanatory notes in chapter 1

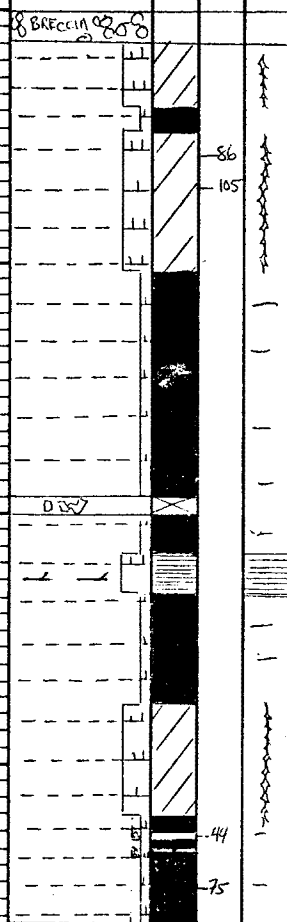
Site 398 Hole D Core 70 Cored Interval: 1078,5 - 1088,0

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	? Barren	XCC	0	0						Similar to previous core, 3 dominant units:
				1	0.5					(1) ..., burrowed
					1.0					greenish black (5GY 2/1) to dark greenish gray (5GY 4/1)
										(2) CLAYSTONE, massive to very, very faintly laminated, mottled
										black (N1) to grayish black (N2)
										(3) MUDSTONE ..., finely laminated, wavy
										grayish black (N2) to olive black (5Y 2/1)
				2				60		Smear 2-60 [7, 15, 78] — CLAYSTONE: 62% clay, 15 nannos, 7 quartz, 3 carb. unspec., 4 dolomite, 3 mica, 3 pyrite, 1 heavy mins, 1 zeolite, 1 volc. glass
								109		Smear 2-104 [0, 15, 85] — Carbonate bearing CLAYSTONE: 45% clay, 30 dolomite, 20 nannos, 5 carb. unspec., tr heavy mins, pyrite
				3		END				
				4						
				5						
				6						
				Core Catcher						

$CaCO_3$ BOMB Section 1: 107-109cm - 10%
2: 65-67cm - 13%

Site 398 Hole D Core 71 Cored Interval: 1088,0 - 1097,5

AGE	ZONE	FOSSIL CHARACTER (Foram)	FOSSIL CHARACTER (Nanno)	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
probably Albian	Barren	x R	0	0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0			86, 105, 44, 75		



As in previous cores, several sedimentary units:

(1) CLAYSTONE, burrowed
5GY 2/1 to 5GY 4/1

(2) CLAYSTONE, massive
N1 to N2

(3) CLAYSTONE, fine wavy laminations
N2 to 5Y 2/1

(4) CLAYSTONE, fine parallel laminations
N4 to 5Y 4/1

very fine white wavy laminae, much whiter than any others

lens-shaped, greenish gray (5GY 6/1) to yellowish gray (5Y 8/1) laminations of dolomite (?)

the laminated intervals are best preserved; the remainder of the core is fractured, brecciated

several more dolomite (?) lens-shaped laminae, often with internal structures (inclusions, claystone wisps)

these fine laminae appear to constitute "packages" of laminae; individuals amount to >20/cm, "packages" are 1 every 2cm, with very faintly laminated dark intervening sediment; most are parallel, few are wavy, some are convoluted wisps; some are probably load casts; 2mm clasts are often found at the top of "packages" of laminae

two very light gray (N8) distinct laminae, salt & pepper coloration; firm, clay-sized, distinctly different from dolomites.

Smear 1-86 [0,25,75] — CLAYSTONE

%	Component
63%	clay
20	nannos
5	zeolite
5	dolomite
3	mica
2	carb. unspec.
1	quartz
1	heavy mins

Smear 1-105 [10,30,60] — CLAYSTONE

%	Component
56%	clay
20	nanno
5	quartz
5	carb. unspec.
3	zeolite
3	mica
3	dolomite
2	heavy mins
2	radiol
1	volc. glass

Smear 4-44 [10,40,50] — CLAYSTONE

%	Component
65%	clay
8	quartz
6	radiol.
5	zeolite
5	carb. unspec.
4	dolomite
3	nannos
3	gypsum
1	heavy mins

SMEAR 4-75 [-, 25, 75] dom — CLAYSTONE

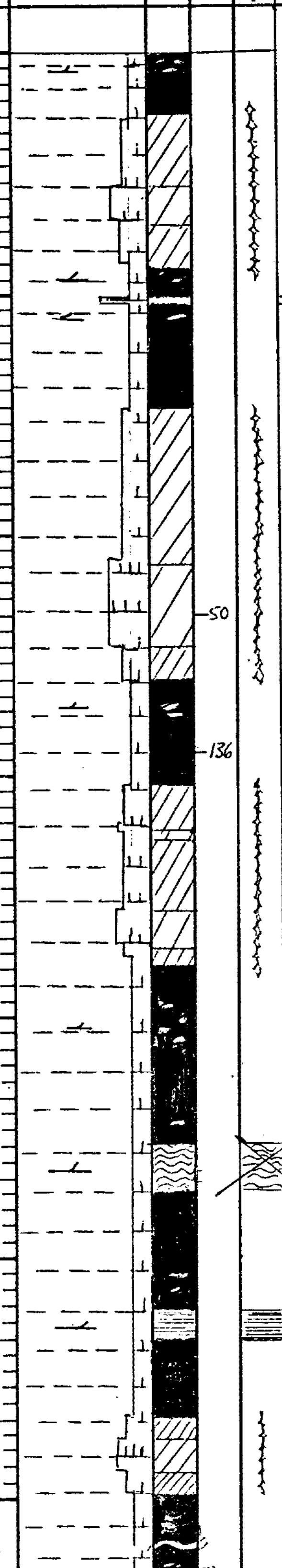
%	Component
59%	Clay
8	Radiolarians
7	Quartz, dolomite
5	pyrite. Carb. unspec.
4	Mica. Heavy Min.
1	zeolite

$CaCO_3$ BOMB — Section 1: 107-109 cm = 23%; 4: 68-70 cm = 5%

Explanatory notes in Chapter 1

Site 398 Hole D Core 72 Cored Interval: 1107,0 - 1116,5

AGE	Foram. ZONE	FOSSIL CHARACTER: Foram.	FOSSIL CHARACTER: Nanno		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
probably Albian	post Albian Barren	Rg	0		0–6, Core Catcher	0.5, 1.0			50, 136, 80cm		



As in previous cores, there are several sedimentary units (with same symbols):

- CLAYSTONE, burrowed, mottled, often with massive grayish black (N2) intervals 1-2 cm thick contained within, contacts sharp or gradational; unit grades from 5GY 2/1 at contacts inwards to 5GY 4/1
- CLAYSTONE, very faintly laminated and mottled
- CLAYSTONE, with wavy laminations
- CLAYSTONE, parallel laminated

and as before there are wavy or lens-shaped laminations and layers within the darkest claystone unit – dolomite

numerous white specks (coccolith concentrations??) scattered along bedding planes

Smear 3-50 [0, 20, 80]

CLAYSTONE

76%	clay
10	nanno
5	dolomite
1	forams
1	carb. unspec.
1	zeolite
1	pyrite
1	mica
1	quartz
2	organic mat.
tr	heavy mins
1	feldspar

Smear 3-136 [0, 15, 85]

CLAYSTONE

81%	clay
3	nannos
3	pyrite
2	dolomite
1	quartz
1	mica
1	zeolite
1	carb. unspec.
1	forams
1	radiol.
5	organic mat

1 triangular fragment of dolomite (apparently comparable to the lens-shaped laminae, but is porous (round, sand-sized vugs) with a large portion of the center weathered out; about 1 cm^3

as before, laminae are about 20/cm, in groups of about 10, each separated by a cm or so; conjugate faults

$CaCO_3$ BOMB Section 2: 53-55cm = 14%

Site 398 Hole D Core 73 Cored Interval: 1116,5 - 1126,0

AGE: Albian

ZONE: (?) Radiolaritlithus augustus Zone (?)

FOSSIL CHARACTER: Foram: Rp; Nanno: Rp

SECTION: 0, 1, 2, 3, 4, 5, 6, Core Catcher

METERS: 0.5, 1.0

LITHOLOGY: OG; END

DEFORMATION

LITHO. SAMPLE: 11, 8, 100, 120, 142, 100

SED. STRUCTURES

LITHOLOGIC DESCRIPTION

Units identical to those of previous cores, except that the intensely burrowed claystone interval characteristically greenish black (5GY 2/1) grading to dark greenish gray (5GY 4/1) towards the center of the unit, in this core grades very much lighter, to greenish gray (5G 6/1)

The "homogeneous" grayish black claystone is by no means homogeneous; as noted before, very faint mottles and laminations are visible, and in addition, partings parallel to bedding often reveal flattened infilled worm burrows that are greenish gray (5GY 6/1) and are nearly 100% pyrite

In addition, within the grayish black claystone are numerous very small (1-3 mm) shell fragments, some appear to be hinged molluscs; noted by ★

LIMESTONE — Smear 2-11 [fine grained]: 70% carb. unspec, 10 nannos, 5 dolomite, 7 mica, 3 quartz, 5 pyrite

MARLY NANNO CHALK — Smear 3-8 [3,17,80]: 51% clay, 35 nannos, 5 dolomite, 3 carb. unspec, 3 forams, 1 quartz, 1 mica, 1 pyrite, tr zeolite, tr heavy mins

CLAYSTONE — Smear 3-120 [0,20,80]: 81% clay, 3 pyrite, 3 zeolite, 2 mica, 2 carb. unspec, 2 nannos, 1 quartz, 1 dolomite, 1 radiol., 4 organic matter

MARLY NANNO CHALK — Smear 3-100 [0,25,75]: 54% clay, 30 nannos, 5 dolomite, 5 carb. unspec, 2 mica, 2 pyrite, 1 quartz, 1 radiol.

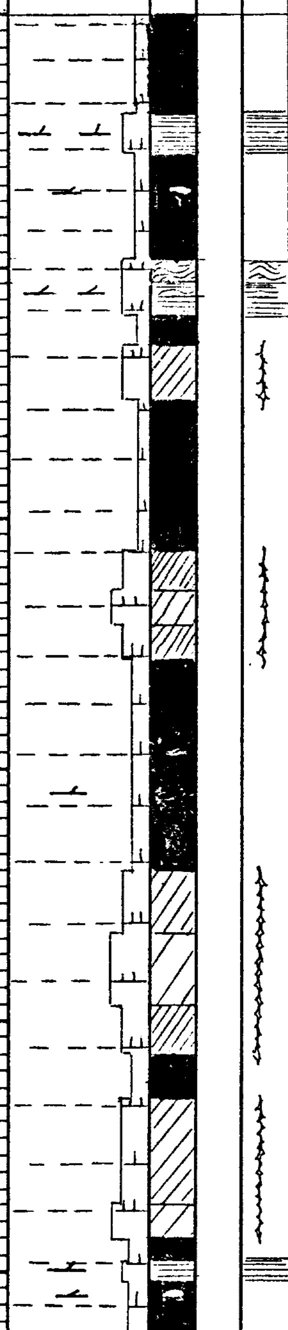
GYPSUM bearing CLAYSTONE — Smear 3-142 [5,10,35]: 84% clay, 10 gypsum, 2 quartz, 2 mica, 2 pyrite

DOLOSTONE — Smear 4-100 [0,50,50]: 70% dolomite, 17 clay, 8 carb. unspec, 2 pyrite, 2 nannos, 1 mica, tr heavy mins

$CaCO_3$ Bomb Section 3: 36-38 cm = 20%

Site 398 Hole D Core 74 Cored Interval: 5026 - 5035.5 m

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Albian	?	×Rg		0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0	END				
	Albian, prob early P. angustus Zone ?	Cg ×	Rp							



Four units as noted previously:

(1) CLAYSTONE, MARLY CHALK
yellow-olive green (5GY 4/2) intensely burrowed, homogeneous to faintly, irregularly laminated

(2) CLAYSTONE
dark gray (N3); homogeneous to faintly laminated and

(3) CLAYSTONE
dark gray (N3) to gray (5Y6/1) bands or laminae:

(4) CLAYSTONE
dark gray (N3) and greenish gray (5GY6/1) finely laminated, no burrowing

SMEAR 1. 100 [10. 40. 50] min
SANDY. DOLOSTONE
60% dolomite
10 Quartz Clay
5 Carb. unspec.
3 forams
2 Feldspar. mica pyrite, Zeolite. org. matt.
1 Heav. min glauconite

SMEAR 3. 66 [. . 100] dom.
CLAYSTONE
73% Clay
10 Calc. Nannos
3 dolomite
2 mica, pyrite calc. unspec.
1 Quartz, forams radiolarians. pyr.
5 org. matterial.

SMEAR 3. 60 [. 30. 70] dom
MARLY CLAYSTONE
63% Clay
18. Calc. Nannos
10 Dolomite
2 mica. Carbunsp
1 Quartz, pyrite forams. Radiolarians org. mat.

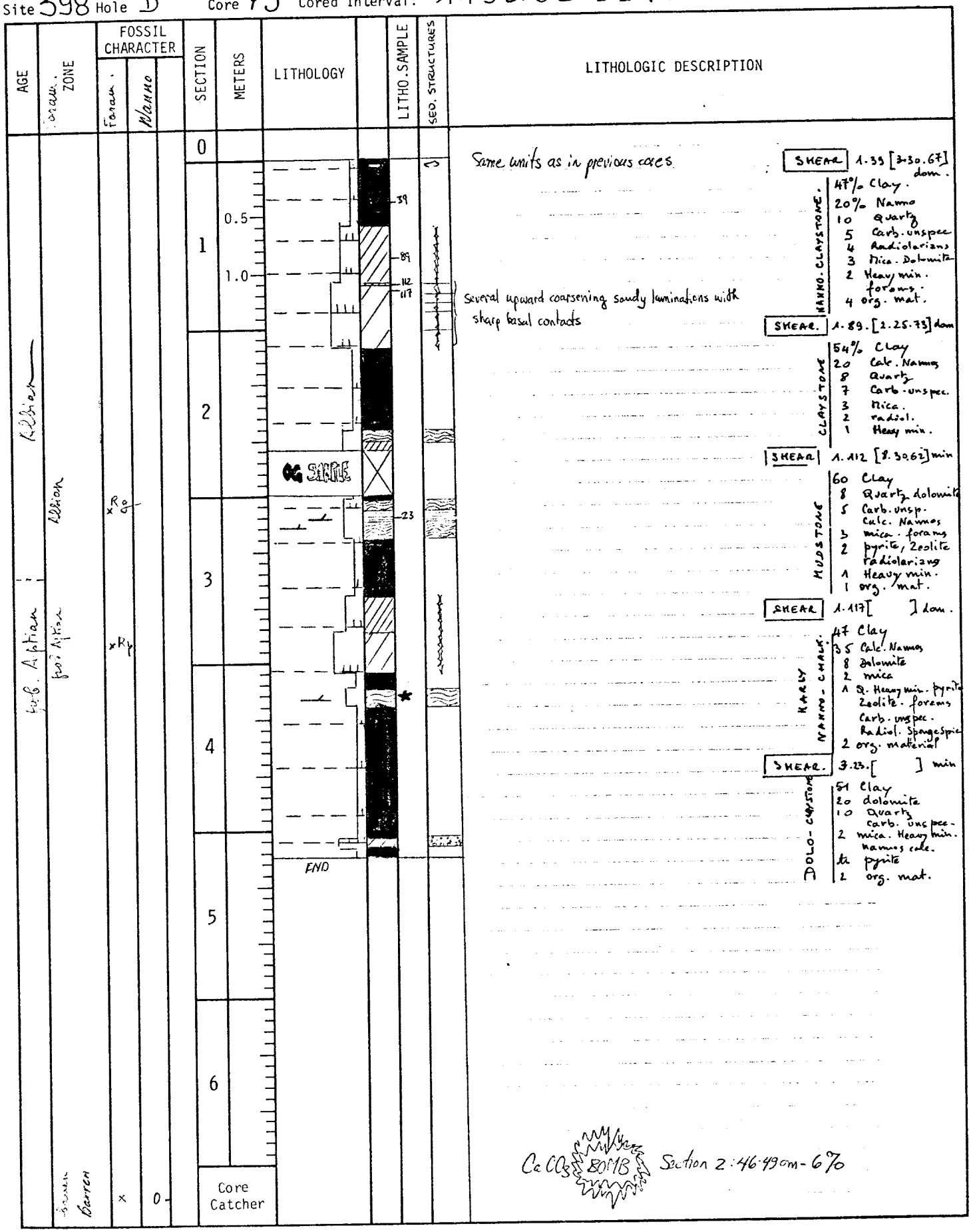
SMEAR .4. 70 [. 15. 85] dom
CLAYSTONE
82% Clay
4 pyrite
3 mica
2 Carb. unsp. organic opal.
1 Quartz, Zeolite dolomite. Calc Nannos Radiol.
5 organic. mat.

SMEAR 5. 145 [. 50. 50] min
MARLY DOLOSTONE
50 Dolomite
30 Clay
10 Calc. Nannos
2 micas, pyrite
1 Quartz
5 org. mat.

$CaCO_3$ BOMB Section 3, 61-63cm: 19%

Explanatory notes in Chapter 1

Site 398 Hole D Core 75 Cored Interval: 1135.5 – 1145 m.



Site 398 Hole D Core 76 Cored Interval: 1145 - 1154.5 m.

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	LITHO. SAMPLE	SED. STRUCTURES
?	? P. augustus Zone?	xRp	Rf-	0				
				1	0.5		65	
					1.0			
				2			119 120	
				3		END		
				4				
				5				
				6				
				Core Catcher				

LITHOLOGIC DESCRIPTION

Same units as in previous cores except:

(1) The fine, parallel laminations of N4 to 5Y4/1 are not present; rather, there is some laminated claystone, graded with sharp basal contact, possibly a turbidite - Section 2, 115-118cm

(2) Beneath the possible turbidite is a debris flow from 118-131cm, the matrix is dark claystone and the clasts (1-3 mm) are mud balls and fragments of calcite & dolomite

SHEAR 1.65 [1.20.75] dom

CLAYSTONE
- 79 Clay
- 6 Quartz
- 5 carb. unspec.
- calc. nannos.
- 3 mica
- 1 Heavy Min. radiol.
- tr pyrite.

SHEAR 2.118 [15.40.45] min

Quarty-Carbonate SILTSTONE
- 47 Clay
- 15 carb. unspec.
- 12 Quartz
- 7 dolomite
- 6 mica
- 3 pyrite
- tr. Heavy Min.

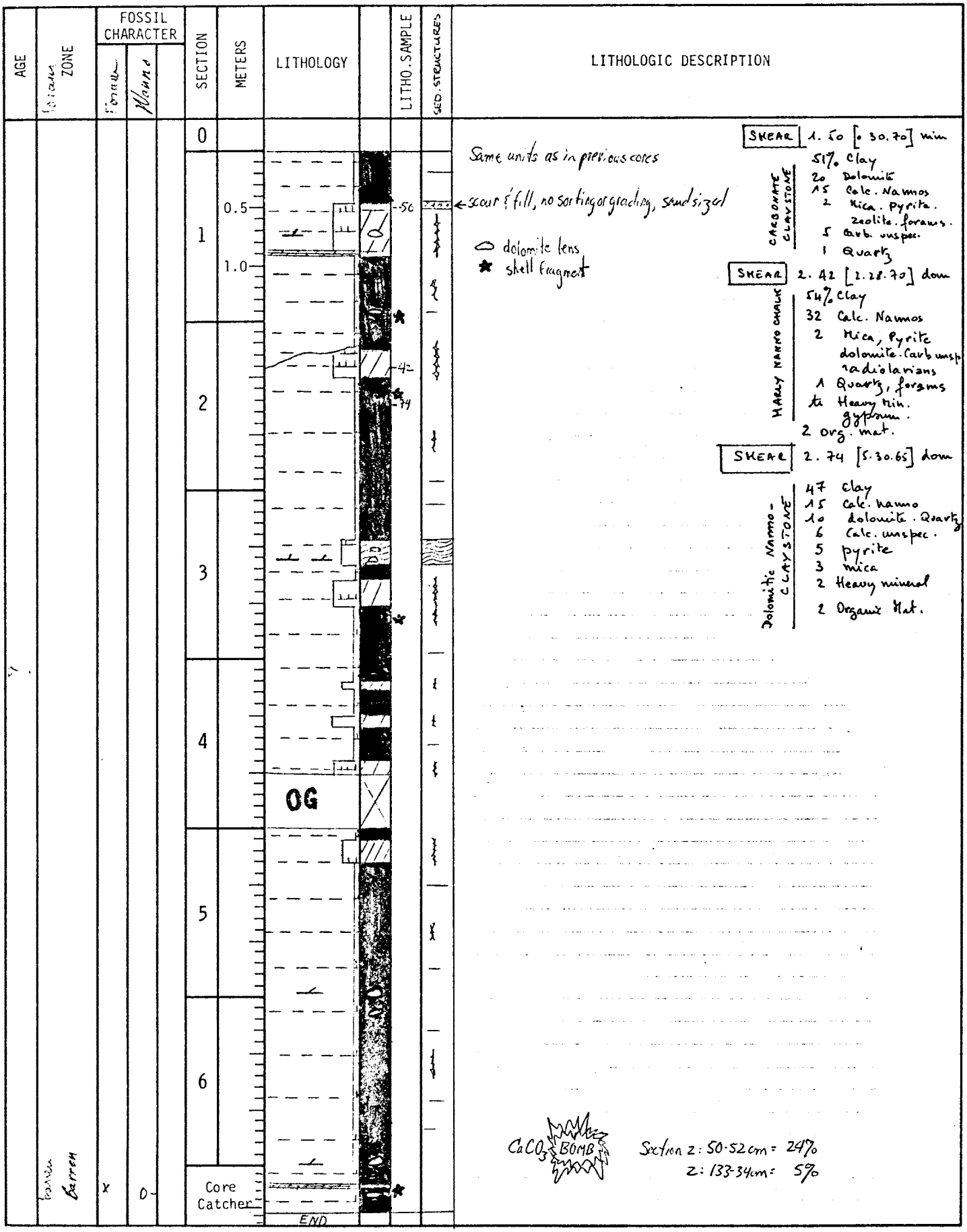
SHEAR 2.120 [-] minor

100% dolomite (recrystallized.)

DOLOSTONE

$CaCO_3$ Bomb Section 1: 85-87cm = < 2%

Site 398 Hole D Core 77 Cored Interval: 1164 – 1173.5 m.

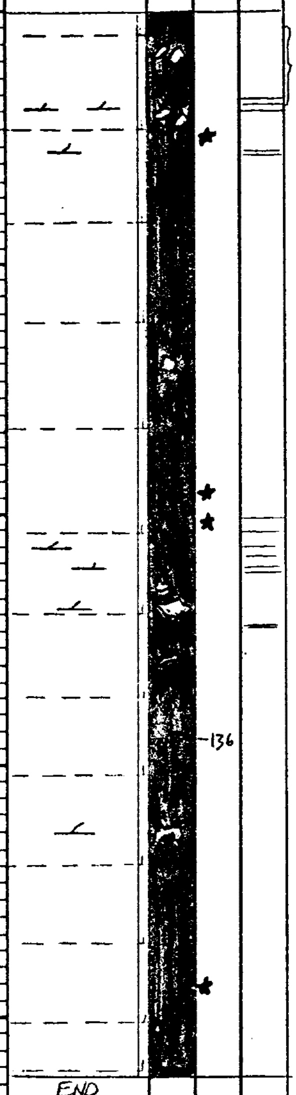


Site 398 Hole D Core 78 Cored Interval: 1173.5 - 1183 m

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
probably Aptian	prob. Aptian			0					
				1	0.5				Same units as in previous cores, same symbols, except: as noted earlier, the grayish black claystone often shows very, very faint laminae and mottles; the laminae here are becoming more significant and are noted in the "sedimentary structures" column; they in fact show no appreciable difference from the parallel olive gray to greenish gray laminae previously identified in the unit marked ▤ and are assumed to be laminations of dolomite
					1.0				SHEAR 2.80 [.30.70] dom.
				2			80		CLAYSTONE: 74% Clay, 8 Quartz, 5 Feld. unspec., 3 mica, Calc. nanno, Pyrite, 2 H. min., 1 foram.-zeolite, tr Radiol.
									SHEAR 3.100 [.35 65] dom.
				3			100		apparent slump structures; truncated, inclined bedding
									NANNO CLAYSTONE: 54% Clay, 15 Calc. Nannos, 8 Quartz, 5 pyrite, Carb. unspec., 4 Mica · dolom., 2. H. min, 3 org. mat.
									SHEAR .4.71 [-] minor
				4			71		Dolostone (microcrystalline)
									← irregular, vuggy dolomite
				5					
									SHEAR 6.35 minor
									dolostone
				6					Dolomite inclusion, irregular, light gray (N7) - apparently dolomite has two colors, N7 and the more common 5Y6/1
Aptian-Albian	Barren	Rg	Rg	Core Catcher		END			$CaCO_3$ BOMB Section 2: 94-95cm = 5%

Site 398 Hole D Core 79 Cored Interval: 1183 – 1192.5

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno		SECTION	METERS	LITHOLOGY		LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
probable Albian	prob. Aptian	xRf			0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0			-136		
	Aptian-Albian Barren	xRg	0-								



Units, symbols as in previous cores

folded; with light olive gray dolomite clasts, some with apparent inclusions; composite aggregates?

several well-preserved shells, apparently with original shell-peacock play of colors; corrugated in cross-section; Inoceramus?

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SHEAR 3. [.25.75] dom black.

CLAYSTONE
- 71% Clay
- 5 Quartz
- Carb. unspecified
- 4 Dolomite
- Mica
- 3 H. Min.
- 2 Calc. Nannos
- L/M Pyrite. Zeolite.

$CaCO_3$ BOMB Section 1: 45cm: 7%

Explanatory notes in Chapter 1

Site 398 Hole D Core 80 Cored Interval: 1192.5 – 1202.0

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	? barren	x	o	0					Units, symbols as in previous cores:
				1	0.5 – 1.0		★		washed, brecciated; cave-in?
				2		OG			
				3					
				4		ENP	★		irregular, vuggy dolomite; aggregates?
				5					
				6					
				Core Catcher					

$CaCO_3$ BOMB

Section 2: 20-21 cm = 3%

Site 398 Hole D Core 81 Cored Interval: 1202 – 1211.5 m

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Aptian	Apt-Alb. barren	xbf	c	0						Units, symbols as in previous cores
				1	0.5					drilling cuttings infilled between biscuits
					1.0					
				2				39		← flame structures, load casts on surfaces of dolomite lenses
						OG				
				3						← dolomite layer, slightly folded
				4				103		← wellwash grey (5Y 8/1) dolomite-rich layer, firmly cemented, silty in texture, composed of numerous lens-shaped fragments, with some "matrix" of block claystone
						END				
				5						
				6						
				Core Catcher						

SHEAR 2.39 [15.85] dom.
CLAYSTONE: 86% Clay; 5 Mica; 2 pyrite; 1 Quartz, H. min., Zeolite, Dolom., Carb. unspec., Radiol., Sp. Spic.; 3 Organic material

SHEAR 4: 103 [15.25.60] min
SANDY MUDSTONE: 53% Clay; 20 Dolomite; 10 Quartz; 5 Foram's, Calc. unspec.; 3 Mica, Pyrite; 2 Zeolite, Calc. Nanno; 1 gypsum, Heavy Min.; 3 organic. Mat.

$CaCO_3$ BOMB Section 3: 125-127cm - 3%

Explanatory notes in Chapter 1

Site 398 Hole D Core 82 Cored Interval: 1211.5 – 1221.0 m (5111.5 – 5121.0)

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Aptian	Aptian-Albian boundary interval	xRg	O-	0						Units, symbols as in previous cores:
				1	0.5 – 1.0			50, 92		← numerous gray to olive gray specks, medium sand size; laminated concentrations of dolomite? nannofossils?
				2						SHEAR. 1.50 [5.30.65] MUDSTONE: 61% Clay; 10 Calc. unspec. Calc. Nannos; 3 Quartz. Dolomite Foraams; 2 Feldspar. Mica.; 1 H.Min. Pyrite Radiol. Spons. Spic.; 2 Organic. Mat.
										SHEAR 1.92 [.20.80] dom. CLAYSTONE: 85% Clay; 3 Mica. Pyrite; 2 Calc. Nannos; 1 Quartz, Calc. unspec. dolomite. forams. Radiolarians Sponge. Spic.; 3 Organic mat.
				3						
				4				129		← fine black mottling within dolomite lens – Chondrites mottling?
										SHEAR. 4.125 [.15.85.] dom. CLAYSTONE: 90% Clay; 2 Mica. Pyrite; 1 Quartz. Dolomite Carb. unspec. radiolarians; tr H.Min; 2 Organic material
				5						
				6		END				
				Core Catcher						

$CaCO_3$ (BOMB) – Section 3: 103-105cm = < 2%

Site 398 Hole D Core 83 Cored Interval: 1221 – 1230.5 m.

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
Aptian	Apt-Alb Barren	x Rg	G	1	0.5 1.0	END				10 cm recovered dark gray claystone (N3)
				2						
				3						
				Core Catcher						

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Site 398 Hole D Core 84 Cored Interval: 1230.5 – 1240.0

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Aptian	Aptian-Albian Barren	xCf	O	0						
				1	0.5 – 1.0		24	★		Same units, symbols as in previous cores, except that colors are more greenish.: CLAYSTONE to MARLY CHALK grayish olive green (5GY 3/2); CLAYSTONE grayish black (N2) to dark gray (N3); CLAYSTONE, wavy laminations dark gray (N3) with gray (5Y6/1) laminae; CLAYSTONE, parallel laminations dark gray (N3) with greenish gray (5GY6/1)
				2			25			note that the laminated claystone units have a background "matrix" identical to the more homogeneous claystone unit; the division between these units is a matter of small degree
				3			58 75	★		← dolomite within a pelecypod shell
				4		OG				
				5			33			
				6			96			
				Core Catcher						

SHEAR 1.24 [2.15.83] min — GYPSUM CLAYSTONE: 85% Clay; 10 Gypsum; 2 Pyrite; Carb. unspec.; 1 Mica

SHEAR 2.25 [ ] min — DOLOSTONE: 90 Dolomite; 9 Clay; 1 Pyrite

SHEAR 3.58 [. 15.85] min — GYPSUM CLAYSTONE: 90% Clay; 5 Gypsum; 2 Pyrite; Carb. unspec.; 1 Mica

SHEAR 3.75 [. 40.60] dom — CLAYSTONE: 82% Clay; 3 pyrite. mica; 2. Zeolite radiolarians; 1 dolomite Quartz Heavy Min. 5 organic. mat

SHEAR 5.33 [3.10.87] min — GYPSUM CLAYSTONE: 90% Clay.; 10% Gypsum

SHEAR. 6.46. [2.18.80] dom — CLAYSTONE: 88% Clay; 2 Volc. glass. organic mat. pyrite mica; 1 Quartz Zeolite Dolomite Radiolarians; tr Heavy min

CaCl2 (BOMB?) Section 5: 118-121cm - <2%

END

Site 398 Hole D Core 85 Cored Interval: 1240. – 1249.5

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Aptian	Apt-Alb Barren	xRg	0-	0						
				1	0.5 1.0			33	mud turbidite?	Same units, symbols as previous cores: SHEAR 1.33 min Clayey DOLOMITE: 25% Clay; 60% Dolomite; 10 Calc. Namos; 2 Calc. unspec; 1 Quartz. Mica Pyrite; tr Heavy Mineral.
				2				26 87		SHEAR 2.26 [.40.60] dom. CLAYSTONE: 76% Clay; 8 Pyrite; 2 Mica. Calc. namo; 1 Quartz. Radiolarien; 10% Organic mat.
				3				133	mud turbidite?	SHEAR 2.87 [.30.70] min dolomitic bearing CLAYSTONE: 48% Clay; 35% dolomite; 5 Calc. Namos; 2 Carb. Unsp. mica; 1 Q. Feldsp. Pyrite Zeolite. forams; 2 organic material
				4					mud turbidite?	SHEAR 2.133 [.20.80] dom. CLAYSTONE: 74% Clay; 18% Calc. Namo + (Nannoconus); 2 Carb. unsp. Quartz; 1 mica. pyrite dolomite. forams; tr Heavy min.
						END				
				5						
				6						
				Core Catcher						

$CaCO_3$ (BOMB) Section 2: 79-81cm • 5%

Site 398 Hole D Core 86 Cored Interval: 1249.5 – 1259.0

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannofossil	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	? R. angustus ? ?	xRp	R1-	0						Same units symbols as in previous cores:
				1	0.5		-23			SHEAR 1.23 [.100] min PYRITISED DOLOSTONE: 70 Dolomite, 20 Pyrite, 10 Clay
					1.0					SHEAR 2-5 [.30.70] dom. CLAYSTONE: 70% Clay, 18 Calc. Namos, 2 mica pyrite carb. unspec., 1 Quartz. dolomite foram radiolarians, tr H. Mins., 2 org. mat.
				2			-5 -36 -101			upward fining? mud turbidite?
				3			-97			SHEAR 2.36 [.50.50] dom Dolomite bearing claystone: 43% Clay, 40 Dolomite, 12 Calc. Namos, 2 Calc. Unspec, 1 foram. Quartz mica, tr H. Mins.
										SHEAR 2.101 [.20.80] dom. CLAYSTONE: 75% clay, 10 Calc. namos, 3 mica. pyrite zeolite, 2 radiolarians, 1 Q. Dolomite Calc. unspec., 3 org. mat.
				4						SHEAR 3.97. [.50.50] min CLAYEY DOLOSTONE: 70% Dolomite, 22 Clay, 4 Pyrite, 2 Mica, 1 Quartz, 1 Zeolite, 3 organic mat.
				5			END			
				6						
				Core Catcher						$CaCO_3$ (BOMB) Section 2, 35-37cm: <2%

Explanatory notes in Chapter 1

Site 398 Hole D Core 87 Cored Interval: 1259 – 1268.5

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	? Barren	xRf	c-	0						Same units, symbols as in previous cores
				1	0.5 1.0				← mud turbidite?	
				2						
				3						
				4						
				5					← mud turbidite?	
				6		END				
				Core Catcher						

$CaCO_3$ (BOMB) Section 1, 28-30cm · <2%

Site 398 Hole D Core 88 Cored Interval: 1268.5 – 1278.0

AGE	ZONE	FOSSIL CHARACTER: foram	FOSSIL CHARACTER: nannno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	?			0						Same units, symbols as previous cores
				1	0.5 – 1.0					← Dolomite & chert (?)
										{ dolomite lenses here are not the typical color of light olive gray (5Y 6/1) but are light gray (N7)
				2				-86 -116		SMEAR 2. 86 [2.15.85] dom CLAYSTONE: 78% clay, 7% Calc. Nannos, 4 Quartz, 4 Mica, 3 Heavy min, 3 Pyrite, 1 Zeolite. SMEAR 2. 116 [5.20.75] min CLAYSTONE: 79% clay, 06 Quartz, 5 Carb. Unsp., 3 mica, pyrite, 1 Calc. Nanno, Gypsum, Heav. Min.
										{ olive gray (5Y 4/1) very fine grained well lithified with soft claystone at base
				3						SMEAR 6. 58. 98 Dolomite 2 Quartz DOLOSTONE
				4						
				5						
				6				-58		
?	?	xRF	CI	Core Catcher		END				$CaCO_3$ (BOMB) Section 3: 87-89cm = 6%

Explanatory notes in Chapter 1

Site 398 Hole D Core 89 Cored Interval: 1278 – 1287.5

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
				0						Same units, symbols as in previous cores:
				1	0.5			★		
					1.0					
				2				★		← dolomite layer with Chondrites burrows; bore-holes?
				3				★		
				4				★		← medium gray (N5) laminated with light gray (N7) claystone
				5						
				6		END				
				Core Catcher						

$CaCO_3$ BOMB Section 4 : 91-93cm · <2%

Explanatory notes in Chapter 1

Site 398 Hole D Core 90 Cored Interval: 1287.5 - 1297.

AGE	ZONE	FOSSIL CHARACTER: foram	FOSSIL CHARACTER: diatom	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	? barren	×Rp		0						Units, symbols as in previous cores
				1	0.5					
					1.0					SHEAR 2-143[100] DOLOSTONE. SHEAR 2-145[100] DOLOSTONE.
				2				-H3 -H5 ★		
				3						
				4						← medium gray claystone with dolomite laminations
										← dolomite layer, burrowed (Chondrites) and laminated
				5		OG				
				6		END				
				Core Catcher						

$CaCO_3$ BOMB Section 2: 103-105cm: <2%

Site 398 Hole D Core 91 Cored Interval: 1297 – 1306.5

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannofl.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	Lower Eocene	x	C-	0						Units, symbols as in previous cores
				1	0.5 1.0					SMEAR 2.16 [ ] DOLOSTONE
				2				16		medium gray (N5) claystone
				3				91		SMEAR 3.91 [10.5] mud: 73% Clay, 5 Carb. unsp., 4 dolomite, quartz, 3 Calc. nannos, 2 mica, 1 Heavy min, Zeolite, fibers, 3 organic mat. CLAYSTONE medium gray (N5) claystone
				4				130		SMEAR 4.130 [10.50] dom: 78 Clay, 10 Quartz, 4 Mica, 3 Heavy Min., 2 pyrite, 1 Radiolarians, 2 organic mat. CLAYSTONE olive black (5Y2/1) w. Th laminations of light olive gray (5Y6/1) as in the grayish black interval, but much more indurated; does not expand like the other claystones dark gray (N4) claystone
				5		END				
				6						
				Core Catcher						

$CaCO_3$ BOMB Section 4: 101-102: <2%

Site 398 Hole D Core 92 Cored Interval: 1306.5 – 1316.0

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	?	xRf		0						Units and symbols as in previous cores:
				1	0.5			53 58		well indurated non-expanding CLAYSTONE, olive black (5Y 2/1) with very fine laminae of grayish black (N2) inclined at 5°
					1.0					several medium gray (N5) claystone intervals, with a sharp basal contact grading upwards to olive black (5Y2/1), usually ~3cm thick, noted by ▨
				2				83		unusual occurrence of dolomite within burrowed unit
								130 138		faint tint of olive gray at center of this burrowed interval as well, with abundant dolomite in smear slide
				3						
				4						
				5		OG				
				6						
Barren		xRf	C–	Core Catcher		END				

SHEAR 1. 53 [2. 20. 78] dom

CLAYSTONE: 74% Clay; 8 Calc. Nannos; 3 Mica, pyrite, Zeolite; 1 Q. dolomite radiolaris Calc. unspec.; 5 organic material

SHEAR 1. 58 [. 20. 80] dom.

CLAYSTONE.: 82% Clay; 3 Mica, Radiolarians; 2 Pyrite, Zeolite; 1 Quartz. Carb Unsp. Calc. Nanno; tr Heavy Mins; 5 organic mat.

SHEAR 2. 83 [. 30. 70] dom.

Nannos bearing CLAYSTONE.: 63% Clay; 27 Calc. nannos; 3 Mica; 1 Quartz, Pyrite Zeolite Dolomite Carb. unspec. forams sponge spic; 2 Radiolarians

SHEAR 2. 130 [2. 30. 68]

Nannos bearing CLAYSTONE.: 61% Clay; 25% Calc. Nannos; 2 Mica, vlc-glass, Zeolite, Radiolarians; 1 Q. Pyrite, dolomite Carb. Unspec.; tr. Heavy min; 2 organic material

SHEAR 2. 138 [5. 60. 35] dom.

CLAYEY DOLOSTONE: 65 Dolomite; 21 Clay; 10 Calc. Nannos; 2 Carb Unspec.; 1 Quartz, Mica.

$CaCO_3$ (BOMB) Section 3: 82-83cm: < 2%

Core 93 Cored Interval: 1316 - 1325,5 m

FORAM ZONE	FOSSIL CHARACTER: Abund.	FOSSIL CHARACTER: Preserv.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
			0						Units, symbols as in previous cores
			1	0.5			68		SHEAR 1.68 [2.25.73] dom. CLAYSTONE: 83 Clay; 3 Pyrite; 2 Quartz, Mica, Radiolarians; 1 Volc. glass, Zeolite dolomite; 5 Org. mat.
				1.0			94		SHEAR 1.94 [.20.80] min. DOLOSTONE: 94 Dolomite; 5 Clay; 1 Pyrite
			2						
			3				77		SHEAR 3.77 [50.30.20] min. COARSE-grained clayey DOLOSTONE: 70% Dolomite; 22 Clay; 1 Q. Mica. Volc. glass. Pyrite, Zeolite; tr Radiolarian (pyritized); 3 organic mat.
									here and below: sand-sized grains of dolomite
			4				16		SHEAR 4.16. [2.40.58] min. CLAYSTONE: 60% Clay; 8 Dolomite, Pyrite, Carb. unspec.; 5 Zeolite; 3 Calc. Nannos; 2 Mica; 1 Quartz; 5. Org. mat.
									← mudflow?
									← mudflow? current winnowing?
			5						SHEAR 6.82. [25.50.25] min CLAYEY DOLOSTONE: 70 Dolomite; 25 Clay; 3 organic mat; 1 Volc. Glass, Pyrite
									← bottom current winnowing?
									← burrowed dolomite
			6				82		← winnowing?
					END				breccia (drilling) $CaCO_3$ (BOMB)
			Core Catcher						Section 2: 47-49 cm: 3%

...atory notes in Chapter 1

Site 398 Hole D Core 94 Cored Interval: 1325.5 – 1327-5

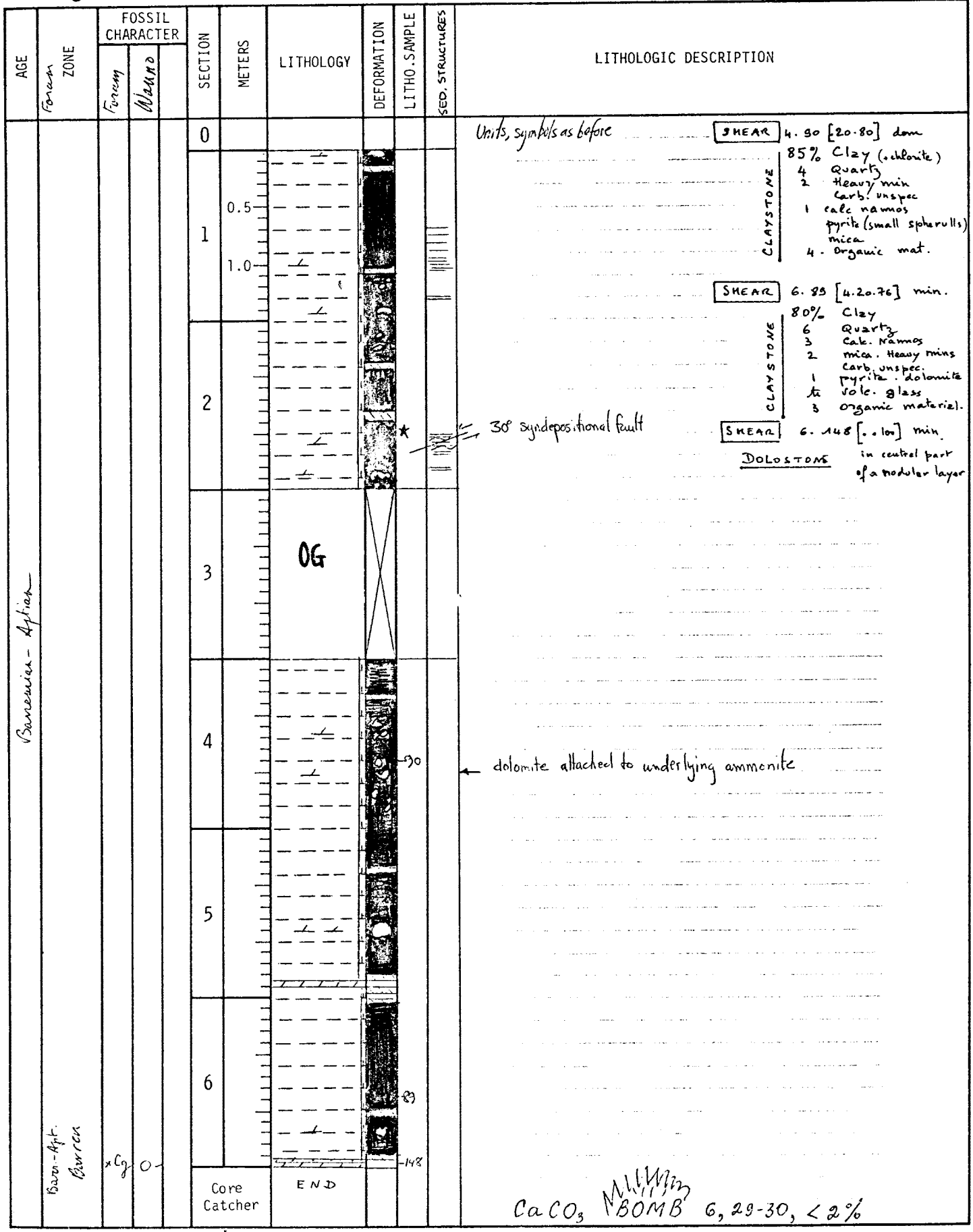
AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
Barremian – Aptian	Barr.-Apt. Barren	xRg	1	0.5, 1.0	END		42		Units, symbols as in previous cores
			2				42		
			3						
			Core Catcher						

SHEAR 1.42 [.15-85]
CLAYSTONE: 85% Clay, 6 Quartz, 2 Mica, 2 Calc. Namos, 1 Heavy Mins, 1 Dolomite, 2 organic material

SHEAR 2.42.[.100]
DOLOSTONE: 99% dolomite, 1% Namos (recrystallisation of namos?)

$CaCO_3$ BOMB 1, 39-41, 9%

Site 398 Hole D Core 95 Cored Interval: 1327.5 – 1335 m.

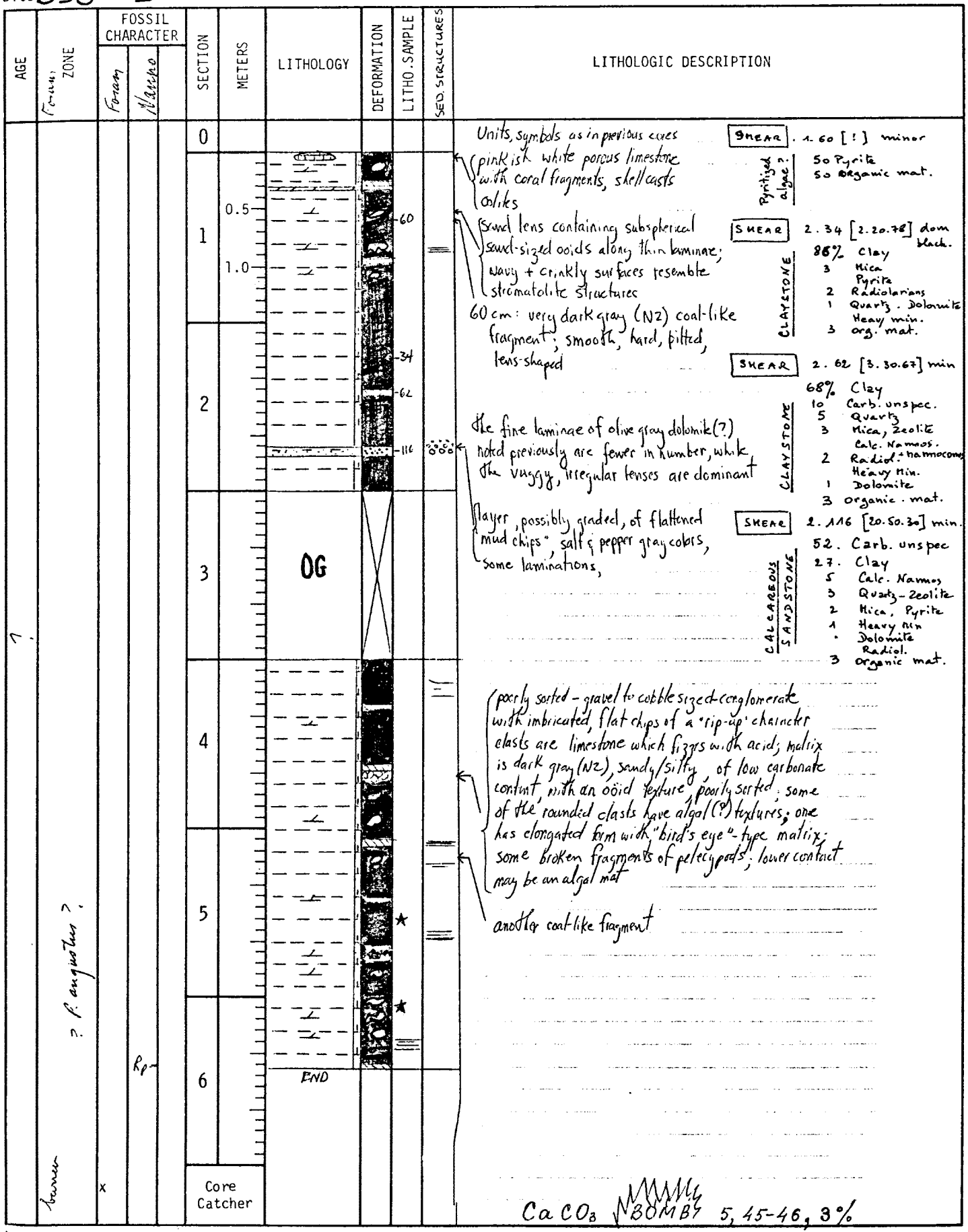


Site 398 Hole D Core 96 Cored Interval: 1335.0 – 1344.5

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Barremian – Aptian	Barren			0						Units, symbols as in previous cores
				1	0.5 – 1.0			★ 63–73 ★		SHEAR 1.68 [60 40] min (clast) DOLOMITE bearing LIMESTONE: 55% Carb unspec.; 20 Dolomite; 20 clay; 5 Pyrite SHEAR 1.73 [40 60] dom. CLAYSTONE: 67% Clay; 10 Carb. unspec.; 3 Calc. Nannos; Pyrite; 2 Quartz, Mica, Vole. glass, Zeolite; 1 Heavy Mins. Dolomite forams. Radiol.; 5 organic mat.
				2						← dolomite nodule with very smooth, straight hole through center – bore hole? weathered?
				3				★ ★ 104 ★		SHEAR 3.104 [80 20] min (Pebble) LIMESTONE: 78 Carb. unspec.; 20 clay; 2 Vole. glass. Zeolite Dolomite ← {hard rounded clasts of dark olive gray in a soft matrix of very dark gray; ammonite shell fragments, dolomite breccia in calcite cement?
				4						
				5						
				6		END				
Barr.–Apt.		xRf		Core Catcher						

$CaCO_3$ BOMB 1, 6-7, 9%

Site 398 Hole D Core 97 Cored Interval: 1344.5 – 1354 m.



Explanatory notes in Chapter 1

Site 398 Hole D Core 98 Cored Interval: 1354 - 1363,5 m

AGE	ZONE	FOSSIL CHARACTER: foram	FOSSIL CHARACTER: nannofl.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	? ?	x Cf 6		0						Units, symbols as in previous cores
				1	0.5			41		Washed, brecciated
					1.0			98 104		Similar to previous cores, but light olive gray laminae are virtually absent; dolomite is very rarely in thick homogeneous beds; irregular, vuggy fragments generally ¼ to 2 cm in greatest dimension are common; ammonite shells are absent
				2		END		36		dolomite breccia; no matrix
				3						
				4						
				5						
				6						
				Core Catcher						

SHEAR 1.41 [1.00] min
DOLOSTONE: 98 Dolomite, 1 pyrite, 1 zeolite

SHEAR 1.98 [8.42.50] min
mudstone: 62. Clay, 10. Carb. unspec., 5. Quartz, Radiolarians, 3 Mica. Pyrite, 2 Heavy Min. Calc. Nannos, 1 Feldspar. Sponge spic. Vole. Glass?, 5 organic. mat.

SHEAR 1.104 [5.95] dom.
CLAYSTONE: 79 % Clay, 3 Mica. Radiol. Pyrite, 2 Vole. glass Zeolite, 1 Q. Dolomite Heavy. Min., 5 organic. mat.

SHEAR 2.36 min
DOLOSTONE

$CaCO_3$ BOMB 1,80-82, < 2 %

Site 398 Hole D Core 99 Cored Interval: 1363.5 - 1373 m.

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	? P. augustus ? ?	xCf	Rp	0						Units, symbols as before
				1	0.5			★		the medium gray (N5) to medium dark gray (N4) claystone is massive to finely laminated, perhaps with graded bedding in the thickest beds
				1	1.0					
				2				37		
				2				67		
				3				85		
				4		OG				
				5				14 ★		
				6						
				Core Catcher		END				

SMEAR 2.37 [3.30.67] min
CLAYSTONE: 64% Clay; 8 Carb. unspec. Calc. Nannos; 3 mica, pyrite, Zeolite; 2 Quartz, radiol; 1 Heavy min, dolomite; 5 organic. mat.

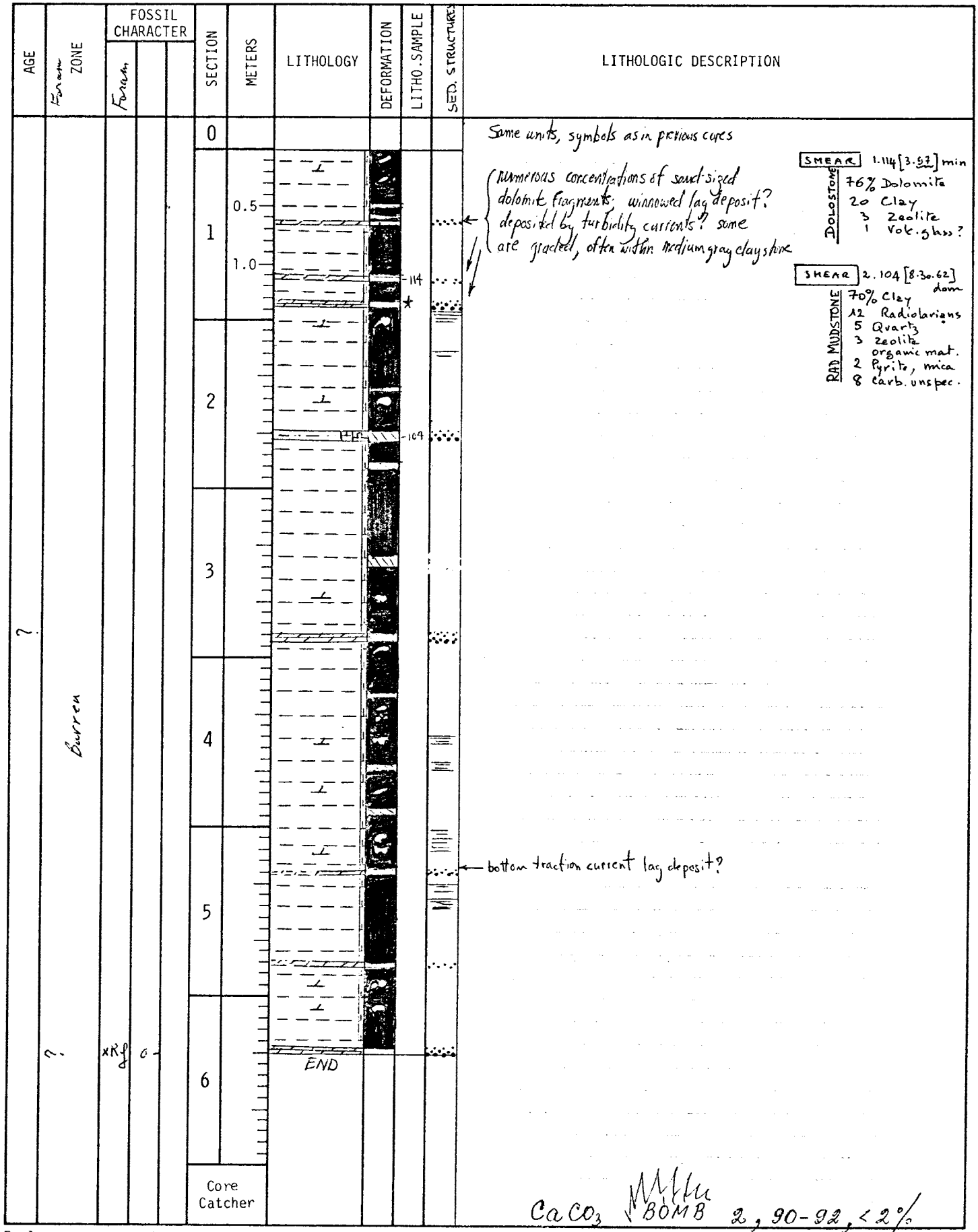
SMEAR 2.67 [3.30.67] (black) dom.
CLAYSTONE: 74% Clay; 3 Quartz - Mica; 4 Pyrite; 2 Gypsum, Zeolite; 1 Dolomite, Heavy min; 5 Radiolarians; 5 Organic mat.

SMEAR 3.85 [5.40.55] min
CLAYSTONE: 66% Clay; 5 Quartz, Carb unspec, Calc Nannos; 3 mica, radiol; 2 Pyrite, Zeolite; 1 Dolomite, Forams, Gypsum, H. mins; 5 Organic mat.

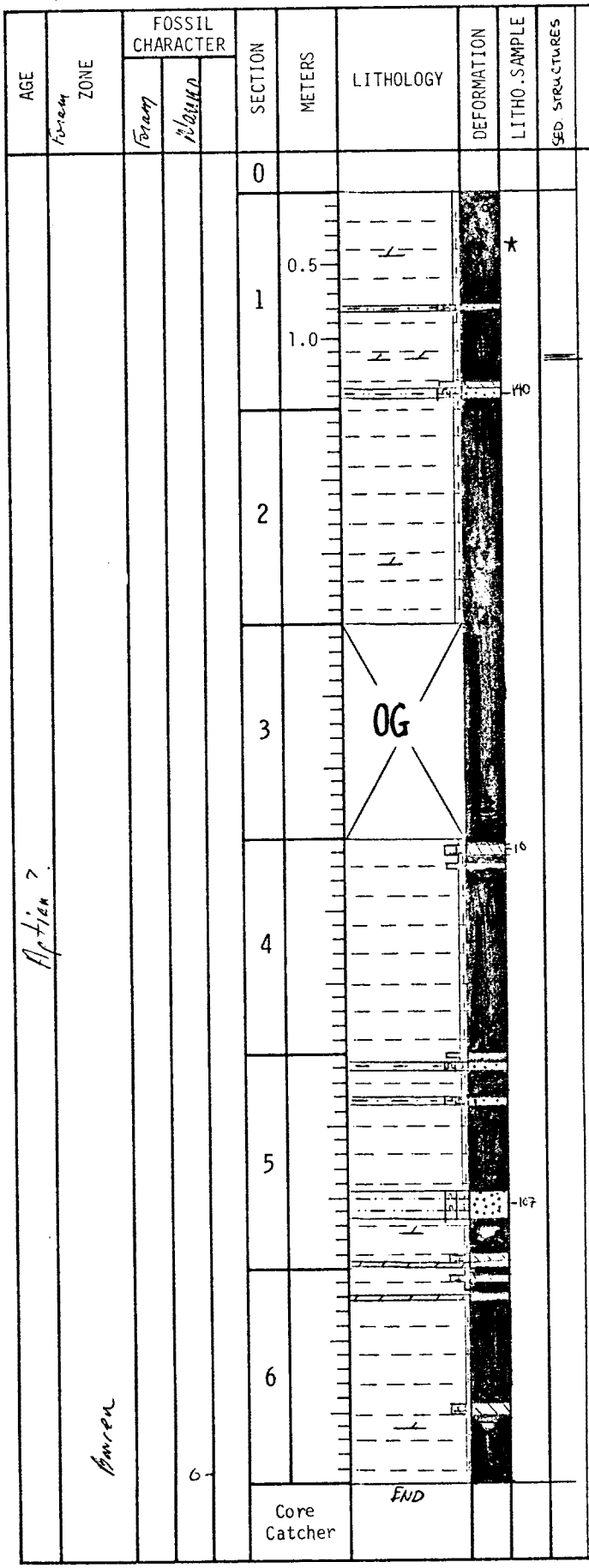
SMEAR 5.14 [ ] min
Gypsum bearing CLAYSTONE: 91% Clay; 1 Volc. glass?; 8 Gypsum

$CaCO_3$ BOMB 2, 64-65, < 2%

Site 398 Hole D Core 100 Cored Interval: 1373 – 1382.5 m



Site 398 Hole D Core 101 Cored Interval: 1382.5 - 1392 m.



LITHOLOGIC DESCRIPTION

Symbols, units as in previous cores, with additions:

Layers of medium gray (N5) CLAYSTONE with a significant nannofossil component; sharp contacts; distinctly different from dark carbonate-poor claystone in that it does not expand and show a 'splintered' texture

"Mud-chip" siltstone, sandstone variously colored grains – perhaps graded – of grayish black (N2) to dark gray (N3) to medium dark gray (N4)

SHEAR 1. 140 [25. 30. 45] min

Radiolarian SANDY MUDSTONE
- 54% Clay
- 12 Radiol. (recrist.)
- 10 Carb. unspec.
- 8 Quartz
- 3 mica
- 4 organic mat
- 2 gypsum ?
- tr. min. forams
- Calc. nannos
- 1 diatoms.

SHEAR 4. 10 [. 12. 88] min

nannos bearing CLAYSTONE
- 63% Clay
- 10 Calc. Nannos
- 5 Quartz
- 8 Carb. unspec
- 4 Organic mat
- 3 Mica. Radiol.
- 2 Heavy Min.
- 1 dolomite forams

SHEAR 5. 107 [7. 20. 73] dom

nannos bearing CLAYSTONE
- 60% Clay
- 12 Calc Nannos
- 10 Carb. Unsp.
- 8 Quartz
- 3 mica
- organic mat.
- 2 zeolite
- Heavy Mins
- 1 gypsum, Radiol. fibers

$CaCO_3$ BOMB 6, 76-78, < 2%

Site 398 Hole D Core 102 Cored Interval: 1392 – 1401.5 m.

AGE	Foram. ZONE	FOSSIL CHARACTER: Foram.	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	Barren			0						Units, symbols as in previous cores:
				1	0.5 – 1.0					
				2				50		
				3				117		
				4				33		← hard, irregular lens of slightly vuggy, burrowed (Chondrites) of yellowish olive; looks exactly like all other dolomite lenses, but smear slide shows micritic calcite
				5						brown, granular, vuggy, burrowed dolomite
				6		END		61		← parallel laminated fine sand; well indurated
?		xRB		Core Catcher						

SMEAR 2.50 [1.15.84] dom
Vamos bearing CLAYSTONE
63% Clay
18 Calc. Nannos
6 Org. mat
5 Quartz
3 mica
1 Heavy mins
radiolarians (pyritized)
tr dolomite

SMEAR 3.117 [0.20.80] min black
Namos bearing CLAYSTONE
68% Clay
10 Calc. Nannos
7 Org. mat.
5 Quartz
Carb. unspec.
3 Mica
1 Heavy min div.
1 apatite
tr dolomite

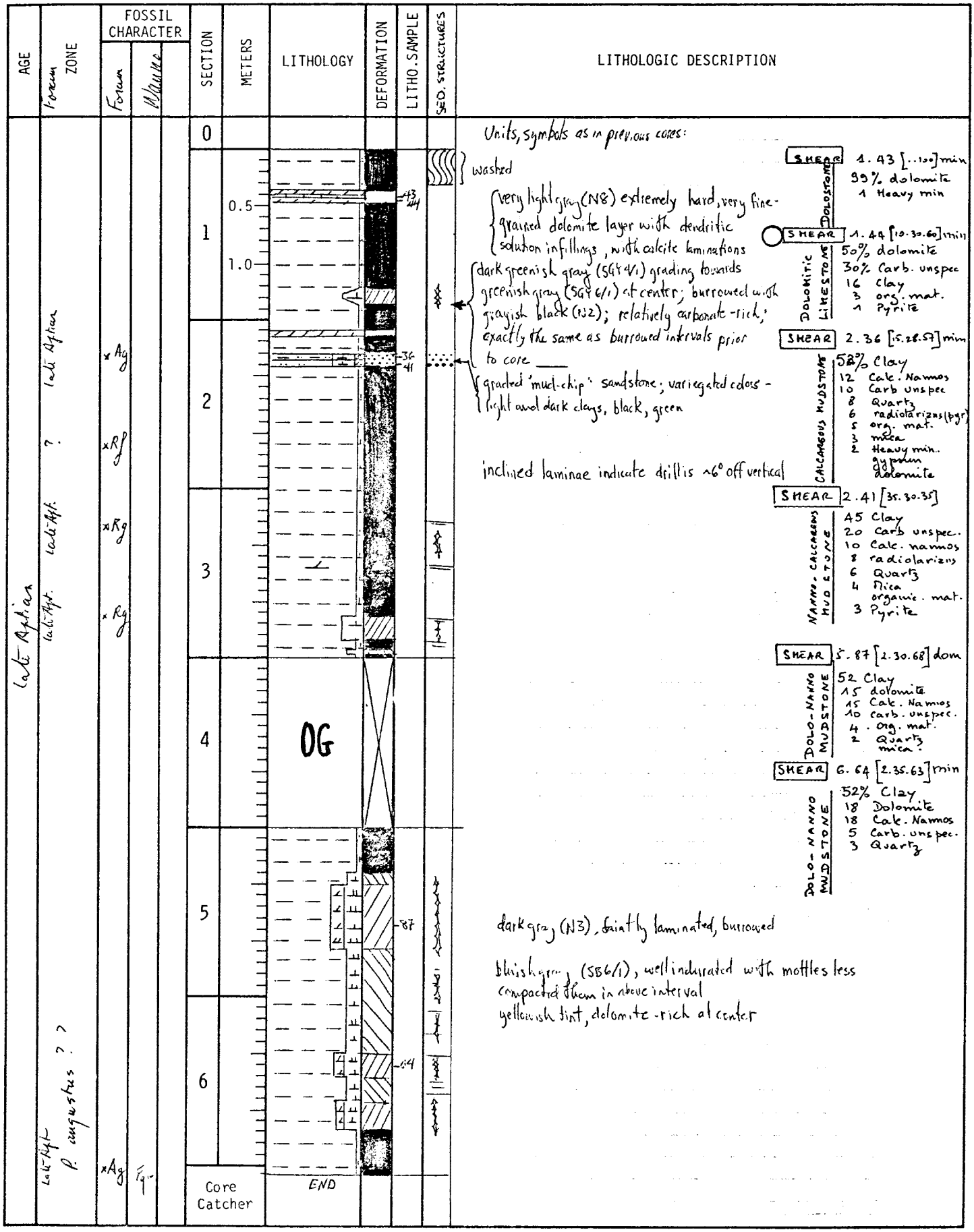
SMEAR 3.118 [ ] min
DOLOSTONE
98% dolomite
2% chlorite
Some grains of dolomite appear as coccoliths dolomitized (62%)

SMEAR 4.33 [.100] minor
100% Carb. unspec microcrystalline
LIMESTONE

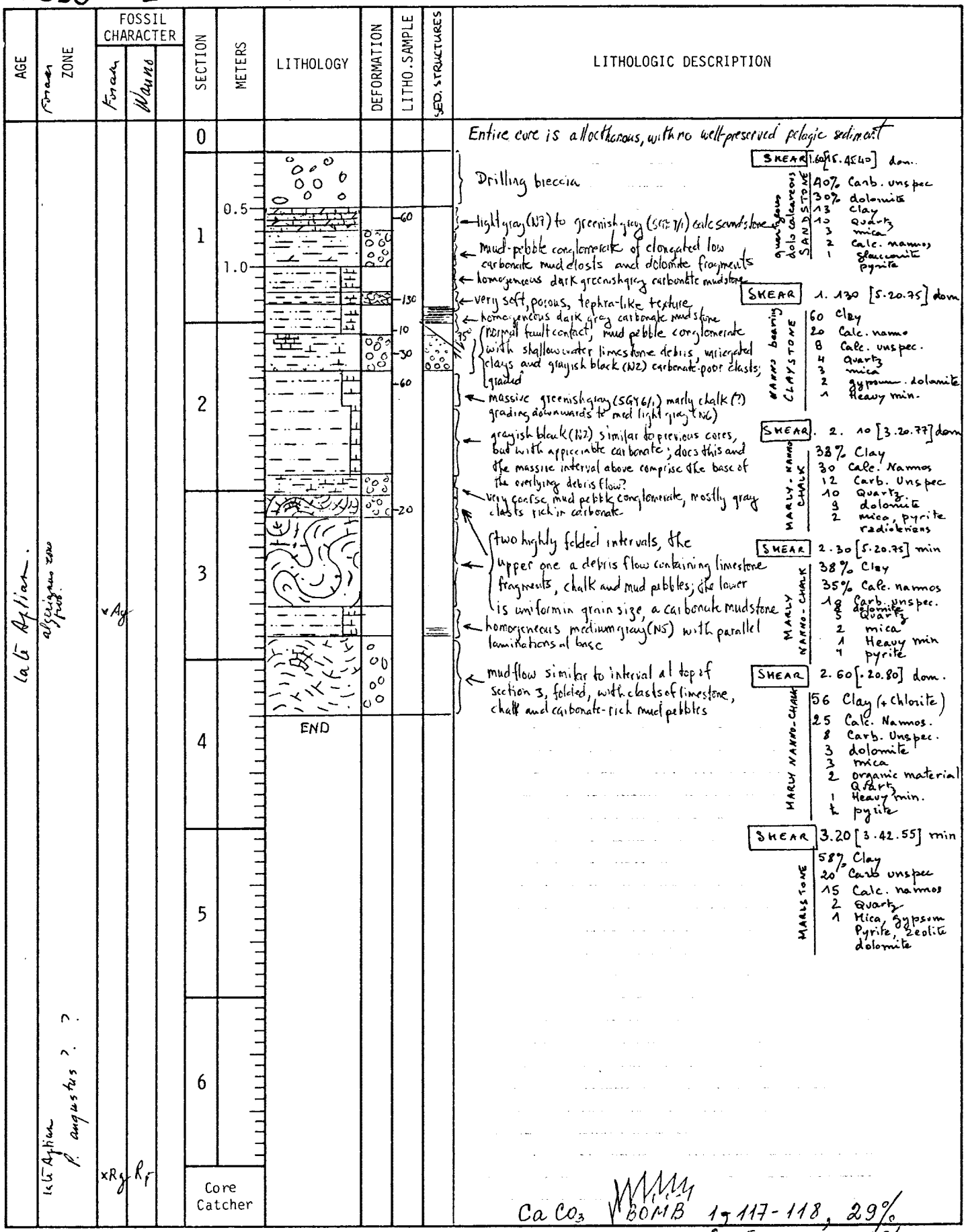
SMEAR 6.61 [5.15.80] min (grey dark finely laminated)
MUDSTONE
56% Clay
15 Quartz
7 Calc. Nannos
Org. mat.
6 Carb unspec
5 mica
2 radiolarians
1 zeolite
gypsum?

$CaCO_3$ BOMB 1, 95-96, < 2%

Site 398 Hole D Core 103 Cored Interval: 1401.5- 1411

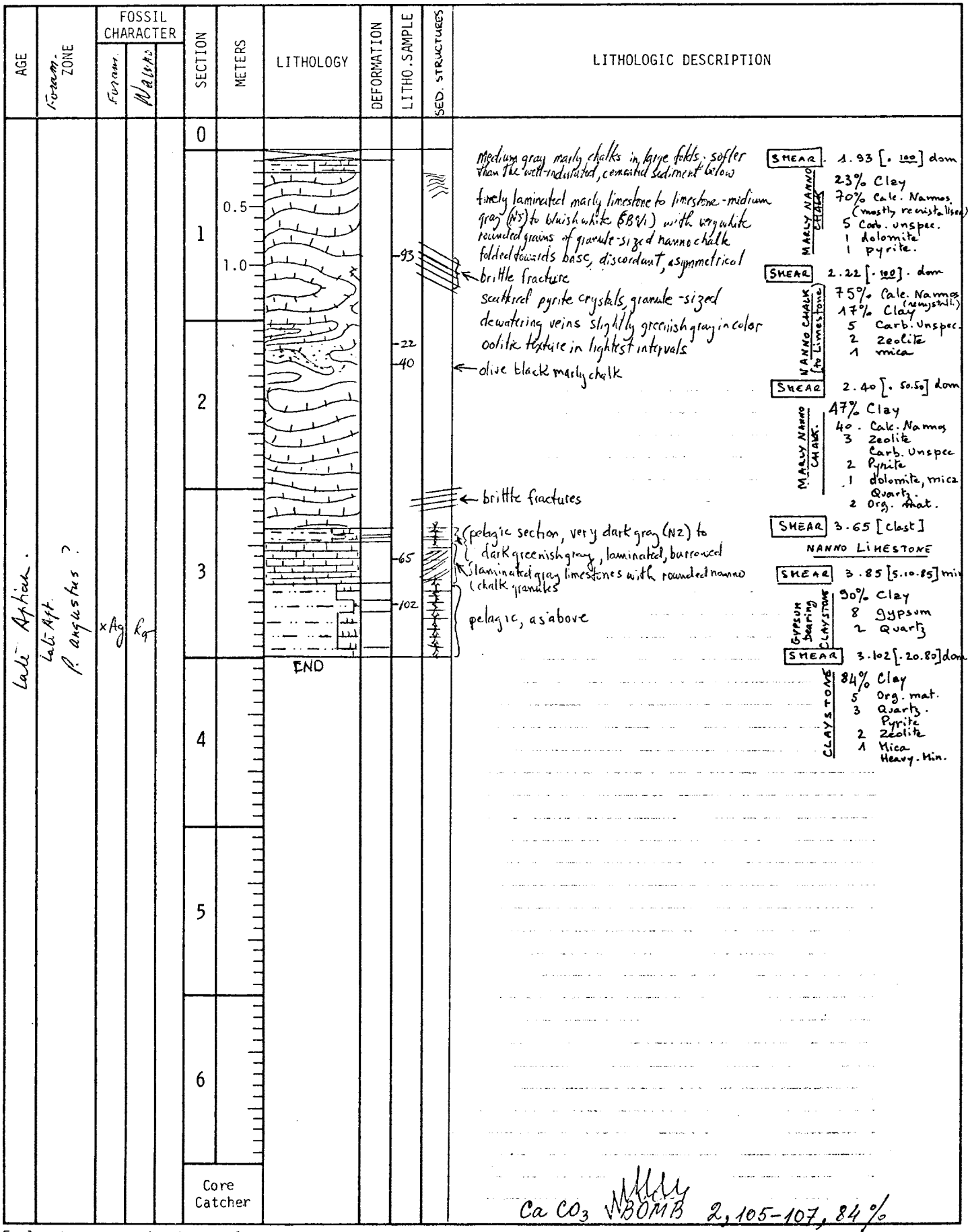


Site 398 Hole D Core 104 Cored Interval: 1411 – 1420.5 m



$CaCO_3$ BOMB 1, 117-118, 29%
2, 50-52, 28%

Site 398 Hole D Core 105 Cored Interval: 1420.5 – 1430 m.



$CaCO_3$ WBOMB 2, 105-107, 84%

Site 398 Hole D Core 106 Cored Interval: 1430 - 1439,5 m.

AGE	FOSSIL CHARACTER: Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannofo	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	Barren			0						Several debris flows at top of core with intervening homogeneous marly chalk, burrowed pelagic sediment towards bottom of core
				1	0.5		5 15 34 65			SHEAR 1.5 [0.50.50] min (Pebble)
										NANNO LIMESTONE: 55 Cale. nannos, 25 Clay, 20 Carb. unspec
										homogeneous v dark gray claystone (N3)
										SHEAR 1.15 [.20.80] dom
					1.0					folded debris flow
							124			very dark gray claystone, faintly laminated, not burrowed
										MARLY NANNO CHALK: 60 Cale. Nannos, 35 Clay, 8 Carb unspec, 2 Zeolite, 1 Dolomite, tr Heavy mins.
										SHEAR 1.34 [.40.60] min
				2						two main sediment units below here: (1) greenish black mudstone (5GY?/1) homogeneous, (2) greenish gray marly nannochalk (5GY 6/1) burrowed and occasionally laminated at the base and as before: grayish black to very dark gray (N2, N3) claystone
							75			MARLY NANNO CHALK: 46 Clay, 35 Calc Nannos, 5 zeolite, Carb. unspec, 3 org. mat., 2 mica, pyrite, 1 Quartz, Heavy Min.
										SHEAR 1.65 dom.
										folded mud flow of dark gray claystone and greenish gray marlstone
										NANNO CHALK: 90 Cale. Nannos recrystallised, 10 Clay
										White (N9) lamination of quartz (?) in claystone
										SHEAR 1.124 [.15,85] dom
				3						bedding planes show dip of 10-15°
										CLAYSTONE: 83 Clay, 5 Organic mat, 3 pyrite, 2 Q. mica. zeolite, 1 Heavy. Mins. - Dolomite, - Radiolarians
										SHEAR 2.75 [8.42.50]
				4			47			← quartz-rich sand at base
										CARBONATE BEARING MUDSTONE: 37 Clay, 20 Dolomite, 20 Cale. Nannos, 5 Quartz mica?, 3 Carb. unspec., 1 Heavy mins. Pyrite
										← laminations
										SHEAR 4.47 [25.55.20] min
				5						CALCAREOUS QUARTZ SANDSTONE: 30 Quartz, 21 Carb. unspeci., 20 Clay, 5 Mica, forams Cale. Nannos, 3 Feldspar. Radiolarian, 2 glauconite Pyrite, 1 Heavy Min., 1 Sponge Spicule Dolomite
						OG				
				6						⇐ 2mm muddy sandstone laminae
			0-			END				
				Core Catcher						

$CaCO_3$ BOMB 2, 94-96, 31%

Site 398 Hole D Core 107 Cored Interval: 1439.5 – 1449 m

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	? Barren	Nannos	0						
			1	0.5 1.0					Three main sediment types: greenish black (5GY 2/1) mudstone massive or slightly laminated, rarely burrowed greenish gray (5GY 6/1) marly nanno chalk, intensely burrowed, laminated in parts grayish olive (10Y 4/2) muddy and silty sandstone ripple laminations dolomite appears as rare fragments and as a significant component of the muddy matrix
			2				6 71		dolomite very fine sand, rippled, laminated
			3				139		
			4				16		
			5		END				
			6						
			Core Catcher						

SMEAR 2.6. [5.45.5] dom.
Dolomite bearing MARLY NANNO CHALK
45 Clay
25 Calc. Nannos
18 Dolomite
5 Carb unspec.
3 mica
1 Quartz, Pyrite
Heavy mins
Zeolite

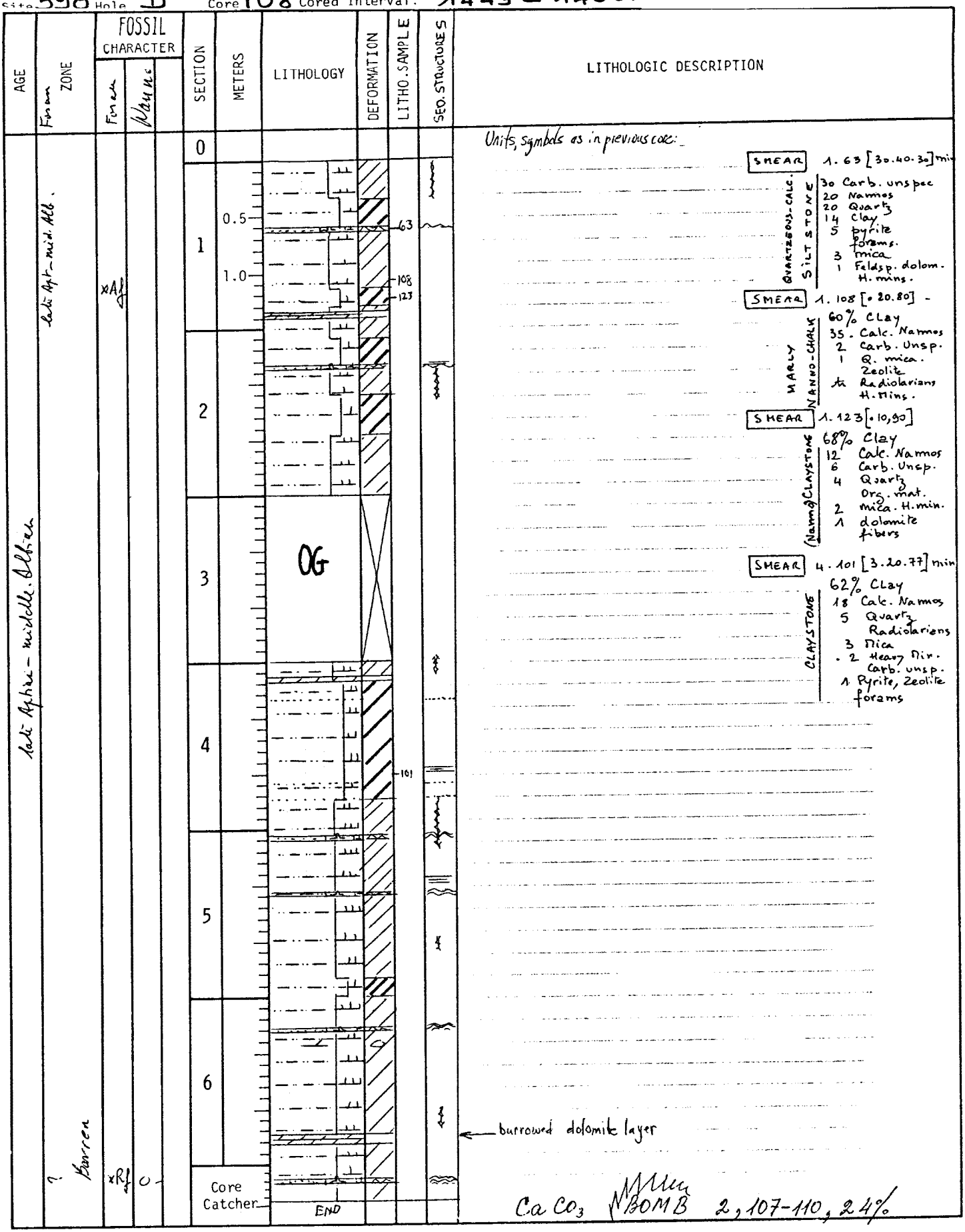
SMEAR 2.71 [. 50.50] dom
Dolomite bearing MARLSTONE
35 Clay
28 Dolomite
25 Calc Nannos
5 Calc unspec
2 Zeolite
Organic. mat.
1 mica. Quartz
pyrite

SMEAR 2.189 [25.45.30] min
QUARTZOSE SANDSTONE
30 Quartz
19 Clay
10 Radiolarians
8 Zeolite
Calc. Nannos
Carb. Unspec
5 mica
3 Feldspar
Forams
2 Heavy min
Glauconite
1 Pyrite. dolomite

SMEAR 4.16 [. 50.50] dom
CLAYSTONE
67% Clay
23 Calc. Nannos
2 Carb. unsp.
org. mat.
Q. mica
1 Pyrite, dolomite

$CaCO_3$ Milly BOMB 1, 119-121, 29%

Site 398 Hole D Core 108 Cored Interval: 1449 – 1458.5 m.



Site 398 Hole D Core 109 Cored Interval: 1458.5 – 1468 m

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	P. angustus ? ?		R_p	0						Units, symbols as in previous cores
				1	0.5					
					1.0					
				2				52 63		SMEAR 2-52 [10, 50, 40]
										34% clay
										20% quartz
										15% nannos
										5% mica
										5% zeolites
										5% carb unspec
										5% rads
										3% organic matter
										2% heavy mins
										2% pyrite
										2% dolomite
				3		END				SMEAR 2-63 [0, 30, 70]
										44% clay
										30% nannos
										10% dolomite
										5% org mat
										3% mica
										2% quartz
										2% pyrite
										2% carb unspec
										1% rads
										1% heavy mins
				4						
				5						
				6						
?		kRg		Core Catcher						

MARLY NANNO CHALK

calc. nanno mudstone

Site 398 Hole D Core 110 Cored Interval: 1468–1477.5 m

AGE	Foram ZONE	FOSSIL CHARACTER: Foram FOSSIL	FOSSIL CHARACTER: NANNO. FOSSIL	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
?	? *P. augustus* ??	xR	R		1	0.5 1.0	END			Breccia only, variegated mudstones medium gray to light gray, N3-N6
					Core Catcher					

Explanatory notes in Chapter 1

Site 398 Hole D Core 111 Cored Interval: 1477.5 - 1487.0

AGE	Foram ZONE	FOSSIL CHARACTER: Foram			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES
Aptian	Apt. P. augustus ? ? ?	xCg	R_1		0					
					1	0.5			100	
						1.0				
					2				3	
					3				105	
					4				116	
					5		END			
					6					
					Core Catcher					

LITHOLOGIC DESCRIPTION

The same 3 units as in previous cores:

- by far the most dominant; greenish black (5GY 2/1), moderately mottled with grayish black (N2); these are most likely burrows, but they are highly irregular in shape, generally 5mm x 2mm; numerous erosional surfaces (?) noted by sharp but subtle color changes, are found at a frequency of about 1 every 15cm; slightly laminated
- medium light gray (N6) unmottled mudstone, always with a gradational contact with the overlying dominant unit
- very fine sand/silt, laminated, no apparent grading; olive gray (5Y 4/1); with sharp upper + lower contacts

dolomite

Section 2: 2-5cm; greenish gray 5GY 4/1
74-76cm; soft, porous claystone with texture like tephra

↓ lighter from here down: dark greenish gray 5GY 4/1

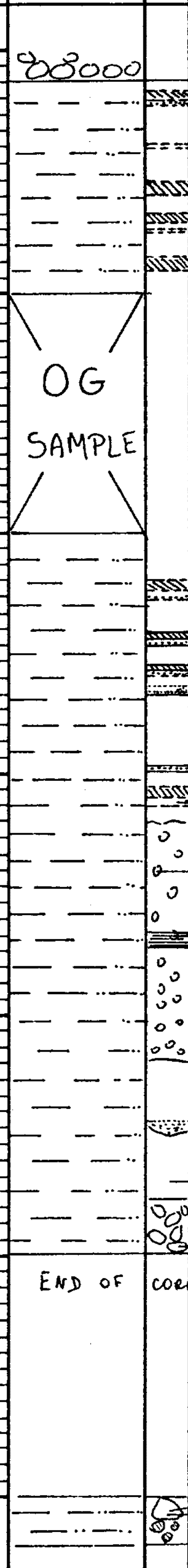
QUARTZ-RAD. SILTSTONE	Smear	1-100 [30, 30, 40]	
	20 %		nannos
	17		clay
	15		quartz
	16		radiol.
	15		carb. unspec.
	4		organic mat.
	3		mica
	3		pyrite
	3		foram
	2		heavy mins
	1		zeolite
	1		sponge spicules
CLAY-STONE	Smear	2-3 [0, 10, 90]	
	87 %		clay
	5		quartz
	3		organic mat.
	2		carb. unspec.
	2		nannos
	1		mica
CLAY-STONE	Smear	3-102 [0, 5, 95]	
	90 %		clay
	3		organic mat
	2		quartz
	2		Heavy mins
	2		carb unspec.
	1		mica
CLAY-STONE	Smear	3-105 [0, 10, 90]	
	90%		clay
	3		quartz
	3		organic mat.
	2		carb. unspec.
	1		mica
	1		heavy mins
MUD-STONE	Smear	4-116 [25, 30, 45]	
	79 %		clay
	15		quartz
	2		mica
	2		nannos
	1		heavy mins
	1		carb unspec.

$CaCO_3$ MBOMB 2, 14-16, < 2%
3, 134-136, < 2%

Explanatory notes in Chapter 1

Site 398 Hole D Core 112 Cored Interval: 1487.0 - 1496.5

AGE	ZONE	FOSSIL CHARACTER (Nanno)	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Early Aptian	prob. Fed… ; ? C. litterarius ? ?	×Rf ; ×Rf Rp	0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0			17, 62, 102, 145, S.51		see below



Legend: 1; 2; 3; 4

facies = same as core 111 at Top

gradual transition — 1) 5GY 2/1 to N3 irregular N2 mottles (burrows) with laminations and erosional features, subtle color changes, all uniformly clay sized
2. uniforme gray (N6)
3. silty basal lamination, olive gray 5Y4/1
4. + tephra like texture in clay sized greenish gray 6/1

gradual transition

graded. white, gray coarse sand to fine sand
white is probably calcite fragments burrow passes down thin layer + infilled with granule sized calcite fragments

gradual transition. multicolored mud grain graded sandstone, poorly cemented

numerous coarse grained debris flows

most clasts are deformed by compaction

} current sheared black pelagic interval.

dolomite, gradational upper contact

more debris flows as before, with larger clasts.

white limestone, micritic, with chlorite underlain breccia

Smear 4-62 [5, 20, 75] — MUDSTONE
42 % clay
20 nannos
15 quartz
6 pyrite
5 organic mat.
5 carb. unspec.
3 heavy mins
4 mica

Smear 4-17 [20, 30, 50] — MUDSTONE
36 % clay
25 nannos
8 quartz
8 radiol.
4 pyrite
2 mica
1 heavy mins
1 dolomite
15 carb. unspec.

Smear 5-102 [3, 15, 82] — CLAYSTONE
72 % clay
8 nannos
7 quartz
3 mica
3 pyrite
3 carb. unspec.
2 radiol.
1 heavy mins.
1 zeolite

Smear 5-145 [15, 25, 60] — RAD. MUD-STONE
65 % clay
15 quartz
15 radiol.
3 mica
1 heavy mins.
1 carb. unspec.

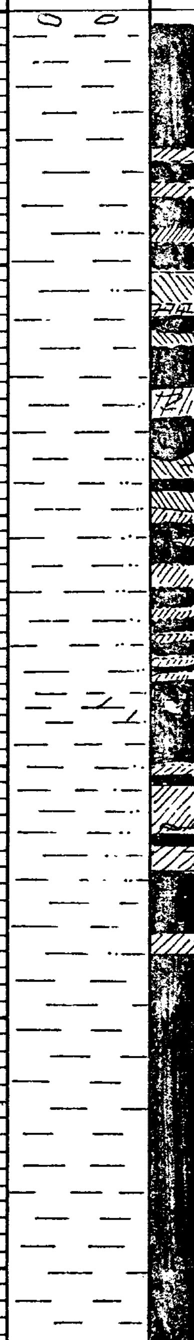
Smear CC [0, 100]
98 % recrystal. nannos
2 clay
LIMESTONE

$CaCO_3$ BOMB 1, 98-100, < 2 %

Explanatory notes in Chapter 1

Site 398 Hole D Core 113 Cored Interval: 1496.5 - 1506.0

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Early Aptian				0–6	0.5, 1.0			105, 122, 41, 50		see below
	Lower Late Apt. or Early Apt. C. litterarius	x Cf	Rp	Core Catcher						$CaCO_3$ BOMB 2, 85-87, 2%



Legend: 1, 2, 3, 4

① dark gray N3
olive black 5Y2/1, greenish black 5GY 2/1, with grayish black mottles N2
mottling is intense
uniformly claystone, carbonate poor.

②. olive gray 5Y 4/1, usally unmottled silt sized, more carbonaterich than ①.
often this unit rests on a sharp erosional contact over ① with a gradational upper contact.

with rippled sand lamination

laminated unit 2 slumped?

③ thin silty layer

④ in a few limited intervals the dominantly dark color unit ① lifts and the greens become the major, giving the interval and overall dark greenish gray color (5G 4/1) still with grayish black mottles.

dolomite

extremely brecciated claystone with colors as noted up., with intense mottling + chondrites burrows, N2

Smear 1-103 [0, 30, 70] — CLAYSTONE

%	Component
66 %	clay
18	nannos
5	organic mat.
3	mica
3	pyrite
3	carb. unspec.
1	quartz
1	dolomite

Smear 2-122 [5, 20, 75] — CLAYSTONE

%	Component
73 %	clay
7	quartz
4	mica
4	carb. unspec.
3	pyrite
3	nannos
2	radiol.
2	sponge spic.
1	Heavy mins.
1	organic mat.

Smear 4-41 [30, 40, 30] — RAD. SILT-STONE

%	Component
29 %	clay
20	radiol.
15	quartz
15	carb. unspec.
12	nannos
4	mica
3	forams
2	heavy mins

Smear 4-50 [0, 25, 75] — CALCAREOUS CLAYSTONE

%	Component
60 %	clay
25 %	nannos
3	quartz
3	mica
2	pyrite
2	zeolite
2	carb. unspec.
1	dolomite
1	foram
1	radiol.

Explanatory notes in Chapter 1

Site 398 Hole D Core 114 Cored Interval: 1506.0 - 1515.5

AGE	ZONE	FOSSIL CHARACTER: foram	FOSSIL CHARACTER: nannno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	?	xRp		0						Same facies as C.113
				1	0.5					laminated sand at base
					1.0					light bluish gray 5B/7/1 gradual silt to clay.
										sandy, laminated
				2				53		2 generations of unit ②, lower is sandy, laminated, contorted, lying on an irregular erosional surface. The upper one is fine silt and cuts down into the lower, with an upper gradational contact with ①
										dolostone laminated 2
				3		OG SAMPLE				
				4						contorted rippled, sandy.
										cross bedded sand
										gray claystone lams.
				5						
	? C. litterarius >. >			6						
			Rp	Core Catcher						

Smear 1-97 [10, 60, 30]
QUARTZ-CALCAREOUS SILTSTONE
28 % clay
18 carb. unspec.
20 quartz
10 radiol.
5 mica
5 zeolite
5 nannos
2 heavy mins
2 forams
2 sponge spic.
2 organic mat.
1 pyrite

Smear 2-53 [10, 50, 40]
RAD. MUDSTONE
59 % clay
12 radiol.
5 quartz
5 mica
5 carb. unspec.
3 nannos
3 organic mat.
2 heavy mins
2 pyrite
2 zeolite
1 glauconite
1 dolomite

Smear 2-95 [5, 5, 90]
GYPSUM bearing CLAYSTONE
92 % clay
5 gypsum
2 quartz
1 mica

Smear 4-5 [5, 45, 50]
RAD. MUDSTONE
58 % clay
12 radiol.
.8 quartz
5 carb. unspec.
3 mica
3 zeolite
3 nannos
3 organic mat.
2 heavy mins
2 pyrite
1 forams

Smear 4-27 [0, 20, 80]
CLAYSTONE
78 % clay
5 organic matt
5 quartz
3 mica
2 pyrite
2 zeolite
2 carb. unspec.
2 radiol
1 dolomite

$CaCO_3$ BOMB 4, 102-103, <2%

Explanatory notes in Chapter 1

Site 398 Hole D Core 115 Cored Interval: 1515.5-1525.0

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
				0						same facies see key in core 113
				1	0.5					
					1.0					
				2						? slump or folded ② interbedded with ① + a pebble (1cm) of gray limestone - dolomite laminated sand/silt.
				3						dolomite, gradational contacts - crossed bedding
D -										graded multicolored (green, grey white, black) mud clast sandstone;
				4						End of Core
				5						
				6						
	barren	X	O	Core Catcher			• breccing unit ②			

Smear 1-2 [15, 35, 50]
Rad. MUDSTONE
53% clay
15 radiol.
8 quartz
3 zeolite
3 carb. unspec.
3 mica
3 gypsum
3 nannos
2 dolomite
1 heavy mins
1 forams
1 pyrite

Smear 1-5 [0, 100] - pebble
70% recrystal. nannos
20 dolomite
10 clay
Dolomite bearing LIMESTONE

Smear 1-5 [0, 100] - cement
50% carb. unspec.
20 dolomite
30 clay
Dolomite bearing MARLSTONE

Smear 2-138 [0, 100]
70% dolomite
20 carb. unspec.
10 clay
MARLY DOLOSTONE

Smear 3-60 [3, 27, 70]
Calcareous CLAYSTONE
58% clay
12 nannos
5 radiol.
3 quartz
3 zeolite
3 carb. unspec.
2 mica
2 pyrite
1 heavy mins
1 dolomite
1 forams
3 organic mat.

Smear 3-77 [15, 25, 60]
RAD. MUDSTONE
52% clay
11 radiol.
10 nannos
8 quartz
5 carb. unspec.
3 mica
3 organic mat
2 feldspar
2 zeolite
1 heavy mins
1 pyrite
1 dolomite
1 forams

Smear 3-83 [10, 30, 60]
RAD. MUDSTONE
65% clay
15 radiol.
5 quartz
3 mica
3 zeolite
3 carb. unspec.
3 organic mat.
1 dolomite
1 sponge spic.
1 heavy mins

Smear 3-84 [0, 100] - pebble
100% - recryst. nannos
LIMESTONE

$CaCO_3$ BOMB 2, 83-85, <2%

Site 398 Hole D Core 116 Cored Interval: 1525.0 - 1534.5

AGE	FOSSIL CHARACTER: Foram ZONE	FOSSIL CHARACTER: Nannofossils	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	lower Barren	X	0						
			1	0.5					
				1.0					
			2						
			3						
			4						
			5						
			6						
			Core Catcher						

1
2

Smear 1-113 [20, 20, 60]

RAD. MUDSTONE

55 %	clay
20	radiol.
20	nannos
8	zeolite
5	organic mat.
3	quartz
3	carb. unspec.
2	mica
2	pyrite
1	dolomite
1	heavy mins.

Smear 2-61 [30, 30, 40]

SANDY MUDSTONE

37 %	clay
15	quartz
15	dolomite
10	carb. unspec
5	mica
3	zeolite
3	nannos
3	organic mat
2	feldspar
2	gypsum
2	forams
2	heavy mins
1	pyrite

Three main facies:

(1) N3 dark gray homogeneous or faintly laminated Claystone

(2) 7.5YR 3/0 very dark gray matrix radiolarian mudstone with pelagic white and green limestone clasts (debris flow, mud flow, slump.)

(3) 5Y 1/2 - 5Y 5/2 Yellowish grey, light grey Sandy mudstone

slump

mudflow

debris flow

mud flow

dolostone laminae

dolostone lense

muddy siltstone (mica) dark fine ripple laminated.

113

61

VOID

dolostone laminae

dolostone lense
2cm muddy siltstone (mica) dark no bioturbated
layer of fine sand to silt, ripple laminated

END OF CORE

Core Catcher

CaCO3 BOMB 1, 68-70, <2%

Explanatory notes in Chapter 1

Site 398 Hole D Core 717 Cored Interval: 1534.5 - 1544.0

AGE	FORAM ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	? Barren	xR	D	0						
				1	0.5					
					1.0					
				2				69, 77, 81, 15		
				3						
				4						
				5						
				6						
				Core Catcher		7				

1 2 3

The main facies groups:
(1) 3GY 3/2 grayish olive green marly nanno chalk pelagic or hemipelagic, intensively bioturbated
(2) 3GY 3/2 grayish olive green matrix with white limestone clasts. Mud flow to debris flow deposit.
(3) N7 light gray sandstone grading upward into N3 (dark gray) silty mudstone and N3 (grayish black) claystone

Smear 2-69 [3, 20, 77]
CLAYSTONE: 76% clay; 5 pyrite; 5 radiol.; 5 organic mat.; 3 mica; 3 zeolite; 2 quartz; 1 heavy mins

Smear 2-77 [0, 30, 70]
MARLY NANNO CHALK: 49% clay; 30 nannos; 5 carb. unspec; 5 organic mat; 2 mica; 2 pyrite; 2 dolomite; 1 heavy mins; 1 zeolite; 3 quartz

All along this core it is a similar succession of units. only the base of each unit is put.

mud flow to debris flow

2cm fine sand

Smear 2-81 [0, 100]
DOLOSTONE: 80% dolomite; 16 clay; 10 carb. unspec

Smear 2-87 [10, 50, 40]
MUDSTONE: 41% clay; 15 quartz; 10 dolomite; 10 carb. unspec; 8 radiol.; 3 mica; 3 zeolite; 3 organic mat; 2 heavy mins; 1 feldspar; 1 pyrite; 1 forams; 1 nannos; 1 sponge spic

debris flow to grain flow.

Requested for X Radiography.

Smear 5-22 [10, 30, 60]
RAD. MUDSTONE: 66% clay; 12 radiol.; 5 nannos; 3 quartz; 3 carb. unspec; 3 organic mat.; 2 mica; 2 pyrite; 2 zeolite; 1 sponge spic; 1 heavy mins

Smear 5-121 [0, 30, 70]
MARLY NANNO CHALK: 48% clay; 40 nannos; 5 carb. unspec; 3 dolomite; 2 forams; 1 mica; 1 pyrite; tr. radiol.

6cm fine Sand

$CaCO_3$ BOMB 3, 101-103, < 2%

c.c.

Site 398 Hole D Core 118 Cored Interval: 1544.0 - 1553.5

AGE	ZONE	FOSSIL CHARACTER: Radiol.	FOSSIL CHARACTER: Diatom	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	Fr. an			0						
				1	0.5 – 1.0					same succession of facies as described in core 117.
				2			slumped sediment?			
				3						
				4						
				5		OG SAMPLE				
				6						slumped bed irregulary silt to mud turbidit
	?	xRf								END OF CORE
	? Barren	xTf	0	Core Catcher						

Smear 1-80 [2, 15, 83] — CLAYSTONE
84% clay; 3 quartz; 3 mica; 3 pyrite; 2 organic mat; 2 dolomite; 2 nannos; 1 carb. unspec.

Smear 1-86 [30, 35, 35] — RAD. SILTSTONE
41% clay; 15 radiol.; 15 quartz; 15 forams; 5 dolomite; 4 pyrite; 3 mica; 2 heavy mins

Smear 1-96 [20, 35, 45] — Quartzose - calcareous MUDSTONE
34% clay; 18 carb. unspec; 15 quartz; 15 dolomite; 7 nannos; 4 mica; 4 pyrite; 3 organic mat.

Smear 1-100 [2, 65, 33] — Quartzose-Calcareous MUDSTONE
35% carb. unspec.; 30 quartz; 8 clay; 8 dolomite; 4 chaecedony; 3 pyrite; 2 organic mat

Smear 1-102 [30, 35, 35] — SANDY MUDSTONE
30% carb. unspec; 15 quartz; 32 clay; 1 nannos; 2 pyrite; 2 dolomite; 2 organic mat

Smear 1-115 [0, 30, 70] — CLAYSTONE
68% clay; 10 carb unspec.; 8 quartz; 5 radiol.; 5 organic mat.; 2 mica; 1 pyrite; 1 heavy mins

Smear 1-136 [2, 20, 78] — MARLY NANNO CHALK
35% nannos; 27 clay; 25 carb. unspec; 5 dolomite; 3 organic mat; 2 quartz; 2 pyrite; 1 heavy mins

Smear 2-105 [2, 35, 45] — Quartzose-Calcareous MUDSTONE
32% clay; 30 carb. unspec.; 25 quartz; 5 mica; 3 organic mat; 3 pyrite; 1 heavy mins; 1 dolomite

$CaCO_3$ BOMB 2, 85-87, 6

Site 398 Hole D Core 119 Cored Interval: 1553.5 - 1563.0

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannofo	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	Barren	x	o	0	0					
				1	0.5					Also similar to 117 and 118 Amalgamated silt to sand turbidite sequences Base cut off Bouma sequences Td, Tet No bioturbation Some Tep (pelagic mud) units overbank deposit Predominantly parallel laminated with fine to medium beds (1-5 cm thick)
					1.0					
				2						Only are report the base of sequences. Sect 2 Requested for X Ray.
				3						fine sand ... silty mud ...
				4						coarse quartz sandstone
				5						Coarse clean sand
				6						END OF CORE
				Core Catcher						

CLAYSTONE: Smear 2-68 [2, 30, 68]
72% clay, 18 quartz, 3 pyrite, 2 mica, 2 carb. unspec, 2 organic mat, 1 heavy mins

Smear 2-71 [30, 30, 40]
Rad.-calcareous SILTSTONE: 30% carb. unspec, 18 clay, 18 raddol., 15 quartz, 5 pyrite, 5 dolomite, 3 mica, 3 organic mat, 2 nannos, 1 heavy mins.

Smear 3-122 [5, 30, 65]
LIME-STONE: 60% carb. unspec, 27% clay, 5 quartz, 8 dolomite

Smear 5-138 [2, 25, 73]
NANNO CHALK: 30% carb. unspec, 30 nannos, 15 dolomite, 18 clay, 5 quartz, 2 zeolite

$CaCO_3$ BOMB 2, 45-47, < 2%

Site 398 Hole D Core 120 Cored Interval: 1563.0 - 1512.5

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Early Late Barremian	Late Barr. Barren	x		0						
				1	0.5					
					1.0					
				2						
				3						
				4						
				5				OG SAMPLE		
		rCg	O	6						
				Core Catcher						

Almost the entire core is unburrowed laminated, graded intervals 1mm → 10 cm largely silt to fine sand sized med. light to med. dark gray colors predominate.

it seems that all these turbidits have similar shallow water sources?

some intervals are fine grained distal turbidites; others are cross laminated and some are coarse grained massive sequences. due to truncation, erosion of one turbidite by the next.

(1) finest grained, massive, silty topmost sequence, graded, med to med. dark gray N4 to N3. carbonate rich. (nanno)

(2) parallel to cross laminated coarse silt to very fine sand, gray N7 to N3 exactely like (1) + light gray

(3) massive to faintly laminated fine to coarse sand, multicolored, apparently composed of white micritic calcite or nanno limestone.

4) one other minor unit that does not fit into above sequence; perhaps this indicate a different source pinkish gray (5YR 8/1) very fine silt → clay massive or // laminated

pyrite cristals.

pyrite cristals

numerous pelagic intervals overlying ↓

pelagic

Smear 1-77 [0, 20, 80]

MARLY NANNO CHALK
- 49% clay
- 25 nannos
- 10 carb. unspec
- 7 quartz
- 3 mica
- 3 pyrite
- 2 dolomite
- 1 heavy mins

Smear 1-106 [30, 30, 40]

Rad.-Calca-reous SILTSTONE
- 43% carb. unspec
- 14 clay
- 10 quartz
- 10 radiol.
- 7 organic mat
- 5 pyrite
- 3 mica
- 3 dolomite
- 5 nannos

Smear 2-96 [15, 35, 50]

Quartzose SILTSTONE
- 42% clay
- 28 quartz
- 15 carb. unspec
- 4 mica
- 4 dolomite
- 3 pyrite
- 3 organic mat
- 2 forams
- 2 heavy mins

Smear 2-102 [2, 25, 73]

CLAYSTONE
- 76% clay
- 5 quartz
- 5 carb. unspec
- 4 mica
- 3 heavy mins
- 3 pyrite
- 2 dolomite
- 2 organic mat

Smear 6-81 [10, 15, 75]

NANNO CHALK
- 60% nannos
- 10 clay
- 5 carb. unspec
- 4 quartz
- 4 organic mat
- 2 pyrite
- 2 dolomite
- 1 heavy mins
- 3 mica

$CaCO_3$ Bomb 3, 114-116, 5%

Site 398 Hole D Core 121 Cored Interval: 1572.5 - 1582.0

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannofossil	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
? Barremian	Barremian? M. Hoterivian Zone	xRf	Cf-	0						
				1	0.5			1 2		Like core 120 ie. largely gray silty, graded chalky distal turbidite (a) with laminated, crossbedded calcareous quartzrich siltstone (b) and sand sized massive, rarely laminated graded calcite-rich basal sequences.
					1.0			1 2 1 2		pyrite predominantly c grading up to a 1 no pelagic intervals. 5 cycles +7 intervals. + a slumped debris flow.
				2						predominantly (c) grading up to (a) about 15 cycles
				3						mostly b grading up to a approximately 25 such cycles + another 10 intervals of a above — olive brown soft claystone
				4						bed # to 1 at 2 to 1
										mud matrix supported mud flow of white nanno chalks, brown chalks, green chlorite claystones The latter most likely clasts of in situ sediment — laminated carb. rich. dark gray claystone
				5						as before
				6						— soft olive brown clay.
				Core Catcher						olive black greenish gray, mottled

Smear 1-22 [0, 30, 70]
CLAYSTONE: 65% clay, 15 carb. unspec., 10 nannos, 3 quartz, 3 mica, 1 pyrite, 1 dolomite, 1 organic mat, 1 heavy mins

Smear 1-32 [10, 40, 50]
MUDSTONE: 37% clay, 15 carb. unspec., 13 quartz, 12 nannos, 7 organic mat, 5 mica, 3 pyrite, 2 heavy mins, 1 dolomite, 1 forams

Smear 1-34 [0, 10, 90]
MARLY NANNO CHALK: 60% nannos, 33 clay, 2 quartz, 2 mica, 2 organic mat, 1 heavy mins

Smear 1-37 [0, 10, 90]
MARLY NANNO CHALK: 65% nannos, 28 clay, 2 quartz, 2 pyrite, 2 organic mat, 1 heavy mins

Smear 1-42 [0, 100]
MARLY LIMESTONE: 35% carb. unspec., 25 nannos, 31 clay, 3 organic mat, 2 mica, 2 pyrite, 2 quartz

Smear 5-133 [20, 30, 50]
LIMESTONE: 50% carb. unspec., 22 nannos, 22 clay, 3 quartz, 2 organic mat, 1 mica

$CaCO_3$ BOMB 1, 17-18, 7%
2, 30-32, 16%

Explanatory notes in Chapter 1

Site 398 Hole D Core 122 Cored Interval: 1582.0 - 1591.5

AGE	ZONE (Foram)	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?Barremian					0						
					1	0.5, 1.0				numerous sequences(?) few graded. gray soft claystone	same turbidite sequences as in last 120-121 Cores. units (2) and (3) continue to appear separately (2) is sand/silt rounded grains, while (3) is largely mud clasts
					2						
					3				3-60		
					4				-100		dark gray. Contorted, grading down to almost massive convoluted
					5		OG SAMPLE				
Barren ?Barremian	M. hoschulzi Zone	× Rf			6						massive
		×	Rf		7 Core Catcher						

Smear 1-15 [0, 10, 90] CLAYSTONE
82 % clay
5 quartz
5 organic mat.
2 pyrite
2 dolomite
2 carb. unspec.
1 mica
1 heavy mins

Smear 1-88 [0, 25, 75] MARLY NANNO CHALK
68 % clay
25 nannos
5 carb. unspec
1 quartz
1 pyrite

Smear 3-43 [3, 27, 70] CLAYSTONE
70 % clay
10 nannos
5 organic mat
3 carb. unspec
3 pyrite
3 mica
2 quartz
2 zeolite
1 feldspar
1 dolomite
tr heavy mins

Smear 3-50 [0, 40, 60] MARLY NANNO CHALK
47 % clay
35 nannos
10 carb. unspec
2 mica
2 organic mat
2 forams
1 quartz
1 pyrite
tr zeolite
tr dolomite

Smear 3-60 [3, 37, 60] MARLY NANNO CHALK
41 % clay
35 nannos
10 carb. unspec.
2 mica
2 glauconite
2 pyrite
2 forams
2 organic mat
1 quartz
1 gypsum
1 zeolite
1 dolomite

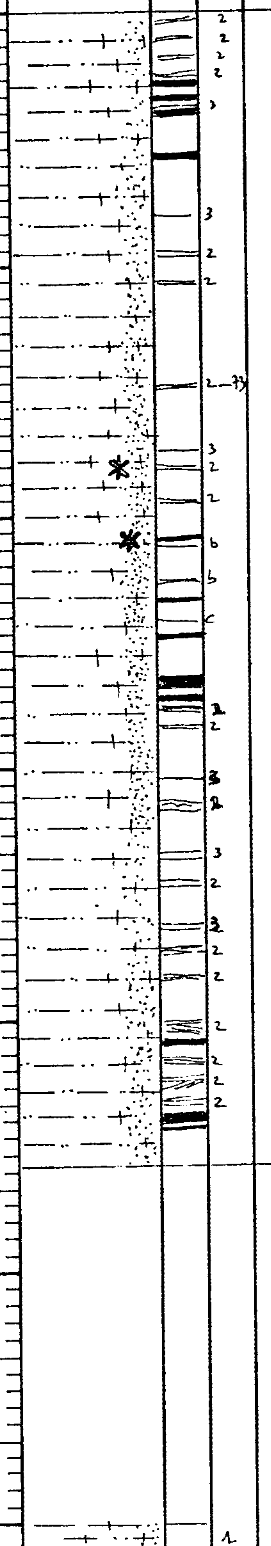
Smear 4-100 [0, 30, 70] MARLY NANNO CHALK
40 % clay
40 nannos
12 carb. unspec
3 dolomite
2 zeolite
2 forams
1 organic mat.

$CaCO_3$ Bomb
4, 25-26, 28
4, 27-28, 33
4, 82-84, 25

Explanatory notes in Chapter 1 — Core Catcher 1

Site 398 Hole D Core 123 Cored Interval: 1591.5 - 1601.0

AGE	Foram ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nanno	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
?	Foram: M. hoelzli(?)	×	R_f	0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0					



Same turbidite séquences as in cores 122, 121, 120.

largely gray to med gray to mid dark gray (1) units as always, with 2 + 3 as noted

about 20 additional (1) intervals, some graded.

pelagic intervals again greenish at center of intervals darker towards upper + lower contacts.

~ 20 intervals of (1) + the (2)'s + (3)'s as noted.

idem.

two black (N$_1$) intervals, carbonate poor, within burrowed greenish black to grayish green.

Bottom of Core

Smear 2-73 [20,40,40] MUDSTONE
41% clay
15 quartz
15 nannos
5 zeolite
5 carb. unspec
3 mica
3 dolomite
3 radiol.
3 organic mat
2 feldspar
2 pyrite
2 heavy mins
1 forams

Smear 3-98 [3,27,70] MARLY NANNO CHALK
58% clay
30 nanno
5 carb. unspec
3 radiol.
2 zeolite
1 quartz
1 mica

Smear 4-2 [0,40,60] MARLY NANNO CHALK
57% clay
26 nanno
5 zeolite
5 carb. unspec
3 organic mat
1 quartz
1 mica
1 pyrite
1 dolomite

Smear 4-10 [3,30,67] MARLY NANNO CHALK
50% clay
28 nanno
15 carb. unspec
2 organic mat.
1 quartz
1 mica
1 pyrite
1 zeolite
1 dolomite

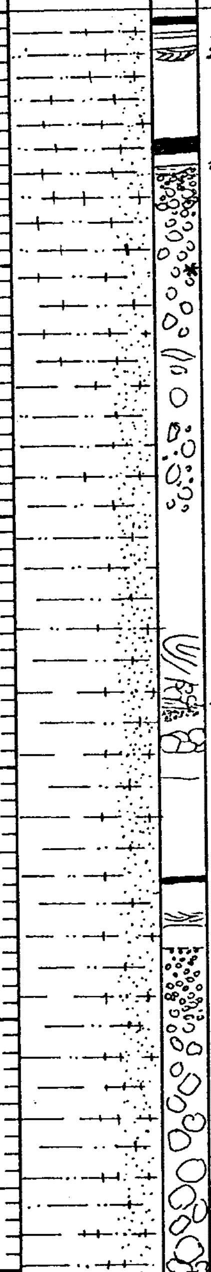
Smear 4-11 [3,31,66] MARLY NANNO CHALK
47% clay
28 nannos
5 pyrite
5 radiol.
5 organic mat
3 zeolite
3 carb. unspec
1 quartz
1 mica
1 dolomite
1 heavy mins

$CaCO_3$ BOMB 3, 85-86, 52%

Explanatory notes in Chapter 1

Site 398 Hole D Core 124 Cored Interval: 1601.5-1610.5

AGE	Foram ZONE	FOSSIL CHARACTER: Foram			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Neocomian or Barremian	Neoc. or Barrem. H. kochsolzi	×Tp			0						
					1	0.5 1.0			3 2 2		predominantly silty/clay units about 7 separate disposition, graded with coarser units (3) or (2) as noted at base. dark gray } pelagic grain supported debris flow, grossly graded. with sub angular to rounded white limestone granules
					2						matrix supported mud flow beginning here 1) subround oolitic limestone, white 2) deformed chalks, limestones, white, gray, brown 3 deformed graded (1), clasts, gray. 4 non carb. claystones, black 5 rare chlorite claystones, green 6 burrowed marly limestones, gray. 7 native pyrite crystals.
					3				2 c		matrix's medium gray (N5) marly nanno chalk. folded dark gray Smear 3-66 [0,40,60] MARLY NANNO CHALK: 60% nannos, 30 clay, 5 carb. unspec., 2 organic mat, 1 quartz, 1 mica, 1 pyrite Smear 4-67 [0,35,65] CLAYSTONE: 66% clay, 12 nannos, 5 organic mat., 3 quartz, 3 zeolite, 3 carb. unspec., 2 mica, 2 radiol., 4 pyrite
					4				2 3		black claystone; pelagic facies debris flow to mud flow The mud flow begins with units as has been throughout the last several cores. Smear 4-145 [0,50,50] NANNO CHALK / LIMESTONE: 70% nannos, 27 clay, 2 carb. unspec., 1 zeolite
					5						Smear 5-35 [0,100] - pebble MARLY NANNO CHALK: 65% clay, 32 nannos, 3 carb. unspec.
			lp		6						
					Core Catcher						CORE CATCHER $CaCO_3$ BOMB 4, 30-32, 35%



Site 398 Hole D Core 125 Cored Interval: 1610.5-1620.0

AGE	Foram ZONE	FOSSIL CHARACTER: Foram			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Neocomian - Barremian	Neoc. Barr. M. hoeckschulzi	xRf	Rc		0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0	 THE END	a_1, a_3, c, a_3, c, a_3, c, a_2, a_1, a_2, a_1, a_2, a_1, c, a_1, a_2, a_1, b, a_1, c, b_3/b_4, b_2, b_1, b_3, b_4/c, b_4/b_5, b_4/b_5, b_4/b_5, b_4/c, b_4/b_5	50, 57, 60	c belemnites; belemnites; armored ball; mud-chip coarse sand turbidite; mud chip fine sand turbidite; mud-chip coarse sand turbidite; pelecypod; very fine sand siliceous; pelecypod; (↑) 7 cm mud-chip fine silt; (↑) 4 cm mud-chip/biogenic	see below

LITHOLOGIC DESCRIPTION

Three main facies groups:

(a) Matrix suported mud flow and debris flow deposit. Intraclast polygenic pebbles of limited age ranges. Locally slumping deposits are also present. Medium gray (N5) mudstone matrix

- a_1: debris flow
- a_2: mud flow
- a_3: slumping

(b) Fine sand to silt turbiditic sequences. Some coarse sand turbidite sequences. Light gray (N7) sandstone to siltstone grading upward into medium dark gray (N4) MUDSTONE

Sequence:
- c = b_5: mudstone
- b_4: marly nanno chalk
- b_3: calcareous mudstone
- b_2: siltstone } (1) mud chip
- b_1: sandstone } (2) siliceous

(c) Greenish black (5GY 2/1) MUDSTONE Pelagic sediments.

Sections 1 throughout 4 are predominantly formed by mass movement deposits. Sections 5 and 6 are formed by turbidite sequences and some pelagic sediments.

Smear 5-50 [0,50,50] — MARLY NANNO CHALK

%	Component
45%	clay
45	nannos
5	carb. unspec.
2	pyrite
1	quartz
1	mica
1	zeolite

Smear 5-57 [30,30,40] — CALCAREOUS MUDSTONE

%	Component
35%	nannos
30	carb. unspec.
21	clay
5	organic mat.
4	pyrite
2	glauconite
1	quartz
1	mica
1	zeolite

Smear 5-60 [10,50,40] — MUDSTONE

%	Component
51%	clay
15	organic mat.
10	nannos
5	quartz
5	carb. unspec.
4	pyrite
3	zeolite
3	heavy mins
2	dolomite
2	mica

Explanatory notes in Chapter 1

Site 398 Hole D Core 126 Cored Interval: 1620.5 - 1629.5

AGE | Forams ZONE | FOSSIL CHARACTER: Forams | | | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | SED. STRUCTURES | LITHOLOGIC DESCRIPTION

Three main facies associations:

(1) mud-chip sand to silt size mudstone turbidites, with two main members (a) basal mud-chip sand and silt size light gray (N7) mudstone, which grades upward into (b) light olive gray MUDSTONE (5Y 6/2)

(2) clastic-terrigenous quartzose sandstone to siltstone turbidites and channel sands. Well structured, ripples, lamination, graded bedding, etc.. Three terms (a) coarse quartzose-micaceous sandstone (b) carbonate bearing quartzose fine grain sandstone to siltstone (c) medium dark gray (N4) MUDSTONE

(3) dark-gray (N-3) homogeneous or slighly burrowed MUDSTONE

Only the main turbidite sequences are marked in the core log. The spaces not specified correspond to subalgorithmic of mud turbidites and facies (3).

Smear 5-137 [15, 55, 30]
CARBONATE BEARING QUARTZOSE SILTSTONE
38% clay
15 carb. unspec.
15 quartz
10 dolomite
5 mica
5 nannos
5 organic mat.
2 zeolite
2 pyrite
2 heavy mins
1 feldspar

Smear 6-71 [0, 60, 40]
MUDSTONE
47% clay
15 organic mat.
10 quartz
10 nannos
5 carb. unspec.
3 mica
3 pyrite
2 feldspar
2 dolomite
1 zeolite
1 heavy mins

Smear 6-74 [0, 100]
MARLY NANNO CHALK
60% nannos
28 clay
3 carb. unspec.
3 organic mat.
2 zeolite
1 quartz
1 mica
1 heavy mins.
1 pyrite.

Smear 6-80 [5, 65, 30]
CALCAREOUS MUDSTONE
40% nannos
29 clay
20 carb. unspec.
3 organic mat.
2 quartz
2 mica
2 dolomite
1 pyrite
1 heavy mins

epeleypods
pelecypod
!algae
!algae
CaCO3 "BOMB" 1, 114-116 60%
THE END
Core Catcher

Explanatory notes in Chapter 1

Site 398 Hole D Core 127 Cored Interval: 1629.5 - 1639.0

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Late Barremian	Micrantholithus hoschulzi	Nannos	0						
			1	0.5					
				1.0					
			2						
			3						
			4						
			5						
			6						
			7						
			CC						

three main facies associations:

(1) mud-drip sand (★) to silt size mudstone turbidites

(2) clastic terrigenous quartzose sandstone to siltstone turbidites (▭)

(3) dark gray (N3) homogeneous or slightly burrowed MUDSTONE (□)

Lithologic description as core 126.

//// mud turbidites; also ∅

pelecypod

pelecypods

Smear 3-126 [5,25,70]
MARLY NANNO CHALK: 35% clay, 30 nannos, 10 carb. unspec., 5 dolomite, 5 quartz, 4 mica, 6 organic mat, 3 pyrite, 2 heavy mins

Smear 3-130 [2,15,83]
MARLY NANNO CHALK: 35% nannos, 30 carb. unspec., 22 clay, 3 quartz, 2 mica, 2 dolomite, 2 organic mat., 1 heavy mins., 1 pyrite

Smear 3-140 [6,20,74]
MARLY NANNO CHALK: 30% carb. unspec., 30 nannos, 16 clay, 4 quartz, 2 mica, 2 pyrite, 2 organic mat, 2 dolomite

Smear 5-57 [4,30,66]
Quartzose-calcareous MUDSTONE: 30% carb. unspec., 29 clay, 20 quartz, 4 mica, 2 pyrite, 2 dolomite, 2 organic mat, 1 heavy mins.

Smear 6-80 [0,15,85]
MUDSTONE: 68% clay, 12 quartz, 8 carb. unspec., 6 nannos, 2 mica, 2 pyrite, 2 dolomite

Smear 7-28 [25,30,45]
CALCAREOUS MUDSTONE: 60% carb. unspec., 16 clay, 10 nannos, 4 mica, 3 quartz, 3 pyrite, 3 organic mat, 1 heavy mins.

$CaCO_3$ BOMB 2, 42-44, 19%

Explanatory notes in Ch

THE END

Site 398 Hole D Core 128 Cored Interval: 1639.0 - 1648.5

AGE: Barremian - Late Hauterivian
ZONE: Lithraphidites bollii
FOSSIL CHARACTER: Nannos
SECTION: 0, 1, 2, 3, 4, 5, 6, Core Catcher
METERS: 0.5, 1.0
LITHOLOGY
DEFORMATION
LITHO. SAMPLE
SED. STRUCTURES
Cg

LITHOLOGIC DESCRIPTION

N-2 claystone
5GY 4/1 mudstone

Several intercalated lithologic types. Rhythmic, sharply defined alternations of olive-black (5Y2/1) to grayish black (N2) slightly silty mudstone with dark greenish-gray (5GY4/1) silty mudstone, slightly laminated, calcareous.

Also bluish gray (5B6/1) silty to very f.g. ss. with parallel and convolute laminations occur irregularly, usually within (N2) dk. gray intervals quartz-rich, calcareous.

dark grn. gray (5GY4/1) silty mudstone usually < 2cm, grading occasionally down to a mud-clast sandstone containing elongated grains of various colors. Bioturbation

debris found exclusively within this unit. Similar to debris flows or mudflows in clast assemblage.

Dark gray claystone often overlies mudclast sandstone with sharp contacts. Both may be turbidite

wood fragments

Debris flow, matrix-supported, containing numerous shell fragments, wood fragments at top, subrounded pebbles and granules of lt. green and gray limestone to marly limestone. No grading except at top

QUARTZOSE MUDSTONE
Smear 1-27 [0, 30, 70]
40% clay
20 quartz
13 organic mat.
10 nannos
6 carb. unspec.
4 mica
3 heavy mins
2 pyrite
2 dolomite

Smear 1-28 [0, 15, 85]
60% nannos
18 clay
4 quartz
4 carb. unspec.
4 organic mat.
3 heavy mins
2 pyrite
2 mica

NANNO CHALK
Smear 2-104 [0, 8, 92]
85% clay
5 quartz
3 mica
3 carb. unspec.
2 nannos
2 pyrite

CLAYSTONE
Smear 3-144 [2, 20, 78]
45% nannos
38 clay
8 carb. unspec.
4 quartz
2 organic mat
2 mica
1 heavy mins

MARLY NANNO CHALK
Smear 4-4 [ ]
95% organic mat
5 pyrite

ALGAE (?)

THE END

$CaCO_3$ BOMB 1, 17-19, 11 %
3, 65-66, 39 %

Site 398 Hole D Core 129 Cored Interval: 1648. -1658

AGE: Barremian - Late Hauterivian
ZONE: L. bollii
FOSSIL CHARACTER: Nannos
SECTION: 0, 1, 2, 3, 4, 5, 6, CC
METERS: 0.5, 1.0
LITHOLOGY
DEFORMATION
LITHO. SAMPLE
SED. STRUCTURES
LITHOLOGIC DESCRIPTION

Four main types of facies associations:

(1) mud-clast sand to silt size mudstone turbidites (*), with two main members (a) basal mud clast sand and silt size light gray (N7) intraclasts mudstone, which grades upward into (b) olive gray MUDSTONE (O)

(2) clastic - terrigenous quartzose sandstone to siltstone turbidites. The basal sand to silt part is usually thin (2-3 cm) well structured - ripples, cross bedding, parallel or irregular laminations, etc - and fine grain sand to silt size. It grades upward into medium dark gray (N4) mudstone

(3) dark-gray (N3) homogeneous or slightly burrowed MUDSTONE

(4) Grayish black, dark gray (N2, N3) and greenish black, dark greenish gray (5GY 3/1) claystone, mudstone, marly mudstone and marly chalks. Disturbed - normal faulting, contorted bedding - as result of the debris flow recovered in the bottom of core 128.

Smear 2-30 [0,30,70]
MUDSTONE: 60% clay, 10 carb. unspec, 6 nannos, 5 quartz, 5 forams, 4 pyrite, 4 organic mat, 3 mica, 1 dolomite, 1 gypsum, 1 heavy mins

Smear 2-85 [5,15,80]
CLAYSTONE: 67% clay, 12 nannos, 5 quartz, 5 pyrite, 3 mica, 2 dolomite, 2 organic mat, 1 sponge spic, 3 carb. unspec

Smear 3-109 [0,100]
DOLOSTONE: 60% dolomite, 20 clay, 13 carb. unspec, 5 nannos, 1 quartz, 1 mica

Smear 6-40 [0,40,60]
MARLY NANNO CHALK: 34% clay, 30 carb. unspec, 30 nannos, 2 quartz, 1 mica, 1 zeolite, 2 pyrite

CaCO3 BOMB 3, 68-69, 6%

Explanatory notes in

Site 398 Hole D Core 130 Cored Interval: 1658.0 - 1667.5

AGE	ZONE	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES
Barremian - Late Hauterivian	L. bolli	R	0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0	OG; END			

LITHOLOGIC DESCRIPTION

As in previous cores, sedimentary units recognized as 2 turbidite deposits of different sources:

(1) "mud-chip" conglomerate, predominantly coarse sand size, colors green, white, black, brown, generally less than 5mm in thickness
grades upwards to light gray (N7) mudstone and into greenish gray (5GY 6/1) lam, nannofossil, unburrowed, pelecypod-bearing mudstone

(2) fine-grained sand to silt-sized quartz-mica-calcite, medium light gray (N6); laminated - ripples, cross beds, convoluted, parallel - no apparent grading
set in matrix of medium dark gray (N4) mudstone/claystone which grades upwards to greenish gray (5GY 6/1) burrowed and faintly laminated marly chalk

often parts of each of the above 2 sequences are interbedded

sharp basal contacts of individual sequences are noted by "—"

occasional: pelecypods; ammonite ★; pyrite nodule Ⓟ

Smear 1-6 [0, 50, 50] — MARLY CHALK
45 % clay
30 nannos
20 carb. unspec.
1 quartz
1 feldspar
1 mica
1 pyrite
1 organic mat.

Smear 1-12 [0, 40, 60] — MARLY NANNO CHALK
55 % nannos
40 clay
5 carb. unspec.

Smear 1-18 [0, 20, 30] — MARLY NANNO CHALK
55 % nannos
30 clay
5 carb. unspec.
5 quartz
2 pyrite
1 dolomite
2 organic mat.

Smear 1-23 [0, 50, 50] — MUDSTONE
49 % clay
20 nannos
8 organic mat.
5 quartz
5 mica
3 pyrite
3 dolomite
3 carb. unspec.
2 heavy mins.
2 forams

Smear 1-36 [15, 50, 35] — MUDSTONE
40 % clay
25 carb. unspec.
10 quartz
5 mica
5 nannos
5 dolomite
3 organic mat.
1 feldspar
1 heavy mins
1 glauconite
1 forams
3 pyrite

$CaCO_3$ BOMB 3, 36-37, 10 %

Explanatory notes in Chapter 1

Site 398 Hole D Core 131 Cored Interval: 1667.5-1677.0m

AGE	ZONE	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Barremian - Late Hauterivian	L. bollii	Rp	0						bluish white 5B 7/1 marly nanno chalk light greenish gray (5G 8/1) marly nanno chalk below 23cm: numerous intervals of mudstones and marly nanno chalks as described in previous core.
			1	0.5 1.0	END				
			2						
			3						
			4						
			5						
			6						
			Core Catcher						

SMEAR 1-11 [0, 30, 70]
MARLY NANNO CHALK: 60% clay, 35% nannos, 3% carb unspec, 1% quartz, 1% mica

SMEAR : 1-27 [0, 20, 80]
MARLY NANNO CHALK: 54% clay, 35% nannos, 5% organic mat., 3% carb unspec, 1% quartz, 1% mica, 1% pyrite

ite 398 Hole D Core 132 Cored Interval: 1677.0 - 1686.5

AGE	ZONE	FOSSIL CHARACTER (Nannos)	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES
Barremian - late Hauterivian	L. bollii	R_p	0					
			1	0.5 – 1.0			78	
			2				17, 30, 35, 93	
			3					
			4		END			⇐ green diagenetic laminae within limestone
			5					
			6					
			Core Catcher					

Much like previous cores except:
(1) fine sandy/silty layers here are thinner than before
(2) occurence of new sediment type, noted first at very top of last core: NANNO LIMESTONE: bluish white 5B 8/1 to very light gray (N8); intensely burrowed, abundant pyritized worm tubes and pyrite concentrations, not laminated, but showing current scour

Smear 1-78 [2, 28, 70]
MARLY NANNO CHALK: 47% clay, 40% nannos, 5 carb unspec, 1 quartz, mica, heavy mins, dolomite, forams, org mat, 2 pyrite

Smear 2-93 [0, 40, 60]
MARLY NANNO CHALK: 46% clay, 28 nannos, 8 organic mat, 5 cull. unspec., 3 mica, 2 quartz, 4 pyrite, 1 zeolite, 1 dolomite, 1 radiol., 1 heavy mins

Smear 2-97 [20, 60, 20]
CALCAREOUS QUARTZOSE SILTSTONE: 30% quartz, 20 clay, 20 carb. unspec., 5 feldspar, 5 nannos, 5 organic mat, 4 pyrite, 3 mica, 3 dolomite, 2 heavy mins, 2 forams, 1 glauconite

Smear 2-30 [20, 50, 30]
QUARTZOSE CALCAREOUS SILTSTONE: 25% carb. unspec., 23 clay, 15 quartz, 12 nannos, 5 mica, 5 dolomite, 3 feldspar, 3 organic mat, 2 zeolite, 1 heavy mins., 1 glauconite, 1 diatoms, 3 pyrite, 1 forams

Smear 2-35 [0, 100]
NANNO LIMESTONE: 80% nannos recrystal., 10 carb. unspec., 10 clay

$CaCO_3$ BOMB 3, 90-91, 55%

Site 398 Hole D Core 133 Cored Interval: 1686.5 - 1696.0

AGE	ZONE	FOSSIL CHARACTER: Planct.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Barremian - Late Hauterivian	L. bolli	ℓ_f	0						Similar to previous core, continuing trend of decreasing significance of coarse-grained sequences and increasing significance of barrow/light-colored limestones
			1	0.5 1.0					← wood fragment
			2						⇐ wood fragment
			3				87 110		
			4				120		
			5		END				
			6						
			Core Catcher						

Smear 3-87 [0, 15, 85]
NANNO LIMESTONE
80% recrystal. nannos
16 clay
3 quartz
1 organic mat

Smear 3-110 [3, 25, 72]
CALCAREOUS MUDSTONE
70% carb. unspec
10 nannos
6 clay
6 quartz
3 organic mat.
2 pyrite
2 dolomite
1 mica

Smear 4-120 [0, 40, 60]
MARLSTONE
40% carb. unspec
33 clay
15 nannos
4 quartz
3 organic mat
2 mica
2 pyrite
1 heavy mins

$CaCO_3$ #BOMB 2, 70-74, 81%

Site 398 Hole D Core 134 Cored Interval: 1696.0 - 1705.5

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Barremian - Late Hauterivian	L. bollii	Rf	0						As in previous cores, burrowed light-colored limestones, with woody fragments and pyrite, alternate with finely bedded silty/sandy mudstones and marly chalks
			1	0.5 1.0			-112		
			2		P		-21		
			3				-54		← woody fragment
			4		END				
			5						
			6						
			Core Catcher						

Smear 1-112 [30,30,40]
CALCAREOUS SILTSTONE: 65% carb. unspec., 12 quartz, 8 nannos, 6 clay, 4 organic mat, 3 dolomite, 2 mica

Smear 2-21 [2,25,73]
MARLSTONE: 35% nannos, 20 carb. unspec., 28 clay, 5 quartz, 7 organic mat, 3 mica, 2 heavy mins, 2 pyrite

Smear 3-54 [15,35,50]
MUDSTONE: 48% carb. unspec., 21 clay, 20 nannos, 8 quartz, 2 organic mat, 1 pyrite

$CaCO_3$ BOMB 1, 77-78, 43%

Explanatc notes in Chapter 1

Site 398 Hole D Core 135 Cored Interval: 1705.5 - 1715.0

AGE	ZONE	FOSSIL CHARACTER: Foram	FOSSIL CHARACTER: Nannos	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
(Barremian - L. Hauterivian ? Neocomian	Neocomian L. bolli	xRg		0						light gray limestone gradual passage crossed bedded quartzose calc. sandstone
				1	0.5 1.0					gradual contact.
				2						with also mud chips. burrowed at base This sequence present many sub sequences finely laminated parallel. certains, like 88 to go present a graded bedding → turbiditic origine.
				3						gradual contact.
				4						
				5						END of CORE
?		Rf	Rf	6						Core catcher
				Core Catcher						

Smear 1-67 [5,20,75]
MARLY NANNO CHALK
38% clay
30 nannos
15 carb. unspec
5 quartz
4 organic mat
3 mica
2 pyrite
1 heavy mins

Smear 2-52 [0,50,50]
MARLSTONE
30% carb. unspec
27 clay
25 nannos
6 mica
5 quartz
4 organic mat.
2 pyrite
1 heavy mins

Smear 3-15 [0,100]
95% recrystal. nannos
5 quartz
LIMESTONE

Smear 4-60 [25,30,45]
QUARTZOSE CALCAREOUS
45% carb. unspec.
25 quartz
14 clay
6 mica
5 organic mat.
4 nannos
1 dolomite
SILTSTONE

$CaCO_3$ BOMB 3, 119-120, 74 %

Explanatory notes in Chapter 1

Site 398 Hole D Core 136 Cored Interval: 1715.0 - 1724.5

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Barremian - Late Hauterivian ?	L. bollii	RF / RF	0						
			1	0.5					
				1.0					
			2						
			3						
			4						
			5						
			6						
			Core Catcher						

apparently there are 3 major sediment types intermixed in this core

(1) white (N9) to bluish white (5B 9/1) Pelagic limestone, intensively burrowed

(2) med. dark. grey (N4) generally homogeneous claystone, showing "splintering" texture of expanding clay

← occasionally includes wavy, convoluted laminae of quartz rich silt

← burrowed greenish gray (5G 6/1)

multicolored mud-clast siltstone to sandstone always graded where best developed

|PPP| occasional pyrite

Smear 1-41 [0,20,80]

MARLY NANNO CHALK
55% nannos
34 clay
3 pyrite
2 carb. unspec.
2 mica
1 quartz
1 dolomite
1 radiol.

Smear 1-46 [10,50,40]

QUARTZOSE-CALCAREOUS SILTSTONE
36% clay
20 carb. unspec.
15 quartz
10 nannos
3 mica
3 feldspar
3 pyrite
2 dolomite
2 heavy mins
2 organic mat
1 radiol.

Smear 1-53 [0,30,70]

MARLSTONE
48% clay
40 nannos
5 carb. unspec.
3 dolomite
2 organic mat.
1 mica
1 pyrite

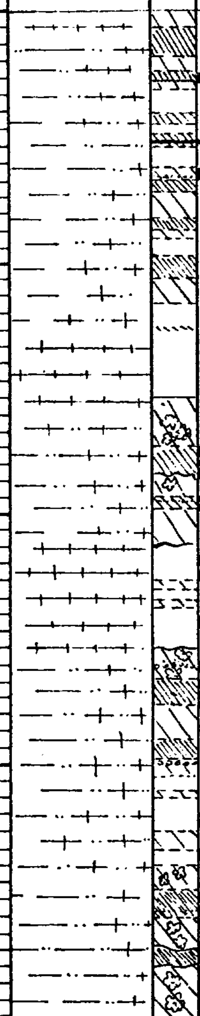
BOTTOM OF CORE

$CaCO_3$ BOMB 2, 3-4, 64%

Explanatory notes in Chapter 1

Site 398 Hole D Core 137 Cored Interval: 1724.5 - 1734.0

AGE	Foram ZONE	FOSSIL CHARACTER Foram	FOSSIL CHARACTER Nanno		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED. STRUCTURES	LITHOLOGIC DESCRIPTION
Barremian — possibly Hauterivian top	Hauterivian possibly; possib Haut.; possib Haut; L. bollii	× Rf; × Cg; × Rf	Rp–		0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0					



very similar to the previous core
again 3 unit
See last core for legend key.

only these transitional intervals (between 1 & 2) with burrows, shows the expending clay synchrone perhaps the darkest intervals, ııı, are Not our same organic rich expending clays, but are very fine grained homogeous unit 3's; but this is doubtful because of color; where coarser grained units 3 is multicolored clasts; perhaps when 3 interlaminated with 2, as it seems to do most of the time, the permeability + porosity is altered enough so that the mixture does not expand back at sealevel.

Smear 1-98 [3, 37, 60]
CALCAREOUS MUDSTONE
51% clay
25 nannos
20 carb. unspec.
1 quartz
1 mica
1 pyrite
1 dolomite

Smear 1-138 [0, 100]
LIME-STONE
50% carb. unspec.
40 nannos recrystal.
10 clay

Smear 3-106 [0, 30, 70]
MARLSTONE
50% clay
30 nannos
5 carb. unspec.
5 organic mat.
3 pyrite
3 mica
1 quartz
1 heavy mins
1 zeolite
1 dolomite

Smear 3-145 [10, 60, 30]
QUARTZOSE CALCAREOUS SILTSTONE
35% carb. unspec
25 quartz
20 clay
5 nannos
4 dolomite
3 feldspar
3 mica
2 heavy mins
2 organic mat.
1 radiol.

$CaCO_3$ BOMB 3, 112 - 114, 33%

Site 398 Hole D Core 138 Cored Interval: 1734.0 - 1742.5

AGE	ZONE	FOSSIL CHARACTER	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	SED STRUCTURES	LITHOLOGIC DESCRIPTION
Barremian - Late Hauterivian	L. Bo III	Nfauna	0						Rhythmic sedimentation as noted in previous cores this one is very similar in facies association to core 134. i.e, • terrigeneous (quartz mica) structure laminate turbidits are not well represented • mud chips turbidits are well show • pelagic greenish-white burrowed limestone. are well represented (5 B 8/1) • varve like, parallel laminated olive gray 5Y4/1 limestone are common but not abundant.
		Pf	1	0.5 – 1.0					
			2						
			3						$CaCO_3$ BOMB 2, 116-117, 45 %
			4						all cuttings -
			5						all cutting
			6						END OF CORE THE LAST CORE END OF CRUISE
			Core Catcher						