CORE LOG, PHOTOGRAPHS AND GRAIN SIZE ANALYSES FROM THE CIROS-1 DRILLHOLE, WESTERN MCMURDO SOUND, ANTARCTICA

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

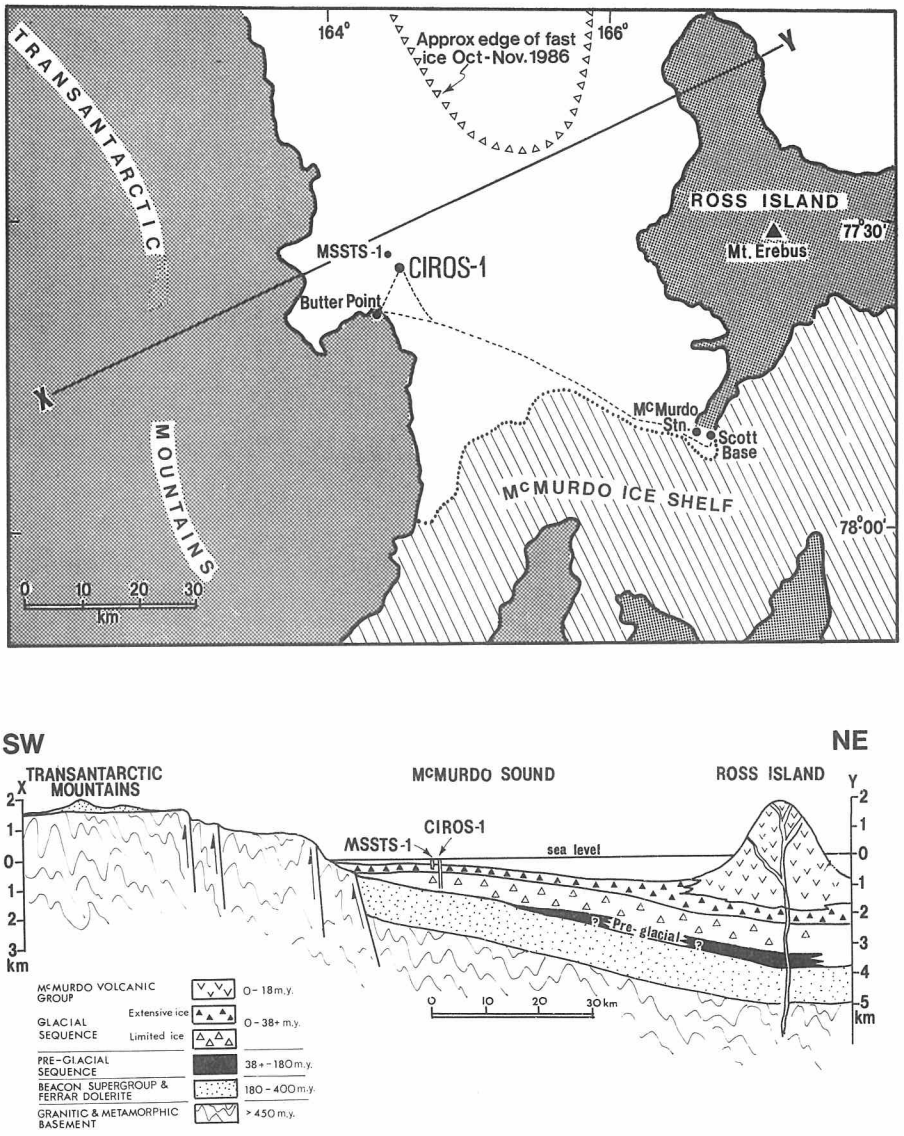


Figure 1. Map of McMurdo Sound, western Ross Sea, and geological cross-section, showing the location of MSSTS-1 and CIROS-1.

Table 1:

Site data for CIROS-1.

Position:	12 km northeast of Butter Point, McMurdo Sound. (77°34' 54.7397"S; 164°29' 55.8950"E)
Water depth:	197.5 m. Sea ice thickness: 2 m.
First core taken:	15 October 1986. Last core taken 14 November 1986.
Depth drilled:	702.14 m sub seafloor.
Depth cored:	26.69 to 702.14 m (98% recovered).
Lithology:	Diamictite, mudstone, sandstone and mixed conglomerate.
Age of oldest sediment:	Early Oligocene (foraminifera and diatoms)

ABSTRACT

CIROS-1 is one of several holes drilled in the southwestern corner of the Ross Sea to investigate the glacial and tectonic history of the region. It was sited 12 km offshore on the western edge of the Victoria Land Basin and continuously cored from 26 to 702 m below the sea floor, with a core recovery of 98%. The strata range from Early Miocene back to Early Oligocene in age, and consist largely of shallow marine mudstone, sandstone and diamictite. This publication presents a lithologic log of the entire core at a scale of 1:20, a 1:4000 summary log, core photographs and grain size analyses from core samples.

KEYWORDS

CIROS-1, core description, core photographs, grain size analysis, Oligocene, Miocene, McMurdo Sound, Antarctica.

INTRODUCTION

The aim of the CIROS project was to obtain a record of the Cenozoic history of the southwest corner of the Ross Sea by coring the sedimentary strata offshore (Barrett 1982). Early Cenozoic strata are of particular interest because there are no strata of this age exposed on the Antarctic continent, and because this period saw the beginnings of Antarctic glaciation (Kennett 1977) and the rise of the Transantarctic Mountains (Fitzgerald et al. 1986).

Previous drilling in the Ross Sea at DSDP-270 (Hayes, Frakes et al. 1975) and MSSTS-1 (Barrett 1986) had shown that Antarctic glaciation went back at least 25 and 30 million years respectively. The CIROS-1 drillhole was designed to core even older strata beneath the floor of McMurdo Sound (Fig. 1) to record the major glacial advances and retreats and to find out when they began. The core was also expected to show evidence of the uplift history of the Transantarctic Mountains, which began to rise 50 Ma ago, according to fission track ages (Fitzgerald et al. 1986).

The CIROS-1 drillhole penetrated 702.14 m below the seafloor, 12 km northeast of Butter Point in western McMurdo Sound (Fig. 1, Table 1). Good core recovery has permitted a detailed lithological log, which is presented here. The drilling programme itself is described elsewhere (Antarctic Division 1986).

The drilled sequence (Fig. 2) is readily separable into an upper interval (sea floor to 366 m sub-bottom) of predominantly diamictite and mudstone with lonestones, and a lower interval (366 m to 702.14 m total depth) which is composed of mudstone, sandstone with minor amounts of diamictite and conglomerate. The upper interval is composed of 17 units with an interval of well-cemented sandstone and conglomerate marking the lower boundary at 365.85 m. The lower interval is finer-grained, and is characterised by thick massive mudstone. A conglomerate with mudstone intraclasts and dolerite boulders was the lowest unit cored.

The detailed lithological description presented (Core log sheets 1 - 170) is based principally on procedures used for previous drillholes in the area, notably MSSTS-1 (Barrett, 1986) and CIROS-2 (Pyne et al. 1985), and is explained, along with the core processing procedure in the following sections.

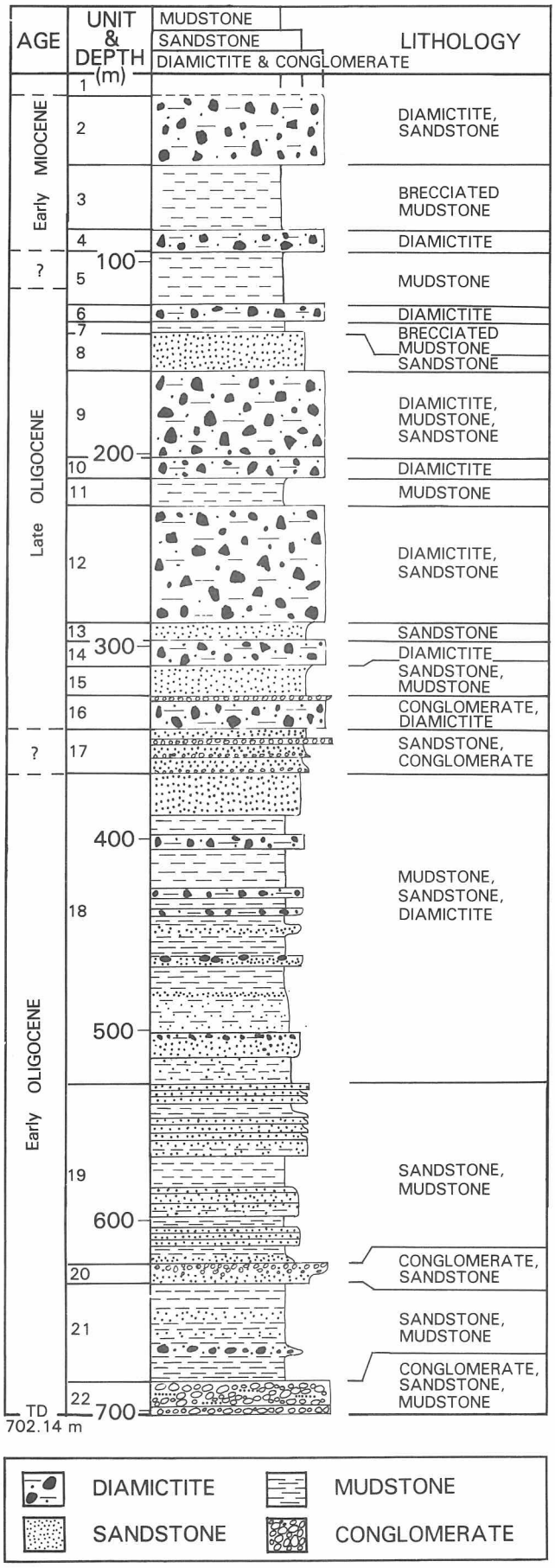


Figure 2. Summary lithologic log for CIROS-1. Ages are provisional. Those below 200 m are from diatoms (D. Harwood, pers. comm. May 1987) and those above 200 m are by lithologic correlation with MSSTS-1 from Barrett (1986).

DRILL SITE OPERATIONS

The core was processed as drilling proceeded in a 24 hour operation. A.R. Pyne supervised operations with J.N. Ashby, E.F. Hardy, C. Mills and B.D. Morris processing and readying the core for lithological description.

Core Depth

All core depths are recorded as metres beneath the sea floor after correction for a water depth of 197.5 m and tide which ranged up to 0.8 m.

The assigning of depths for the core within a core run were determined from a variety of features, such as percent recovery, continuity with the previous core run, core spin and catcher marks and known no recovery zones. Drilled depths were determined from the tensioned sea casing anchored to the seafloor and are therefore independent of tidal movement, which affected the sea ice and drilling platform.

Core Splitting

The CIROS-1 core was split lengthwise in 1 m lengths using either a specially constructed diamond saw splitting table for hard core, or a knife for those few intervals of very soft core. Core splits were boxed separately. One split was cleaned ready for core photography, description, sampling and eventual shipment to New Zealand. The other split was packaged for shipment to the United States.

Core storage facilities:

New Zealand Geological Survey
P O Box 30-368
Lower Hutt
New Zealand.

Sample requests to: Dr. P.J. Barrett, Victoria University of Wellington

Antarctic Research Facility
Department of Geology
Florida State University
Tallahasse, Florida
United States of America

Sample requests to: Mr. Dennis S. Cassidy

Core Photography

The New Zealand boxed core split was photographed on-site with Ilford 220 black and white and Ektachrome 120 colour films. Bounced colour corrected flash light was used to illuminate core boxes and for closeup core photography. Black and white photographs of the core boxes are presented in Appendix 1.

PROCEDURE AND NOMENCLATURE USED IN CORE LOGGING

Detailed core logging was performed on-site by P.J. Barrett, K.J. Hall, M.J. Hambrey and P.H. Robinson. The log format is a standard graphical and descriptive presentation using nomenclature and symbols (Fig. 3) modified for core from Andrews (1982) and Shell Standard Legend (1976).

Core Features

The CORE column is a sketch depicting as near as possible the nature of the cut core face. Features described during core processing, such as core breaks, fractures, joints and large clasts were combined with more detailed and additional features recognised in core logging including veins, faults, strength and style of bedding, and their attitude (in degrees) relative to horizontal.

Core breaks are represented as a bold line; fault, fracture, vein and clast outlines are represented as fine lines, and bedding is depicted as dashes of varying length depending upon continuity.

Grain Size Estimation

Average grain size (Wentworth scale) has been visually estimated through the entire core and is depicted as a vertical line in the MEDIAN GRAIN SIZE column. Those lithologies with wide grain size distribution were given an average grain size for the matrix only (that is, for sediment 4 mm and finer). The coarser fraction (gravel) was visually estimated from the cut core face using comparison cards, and plotted as GRAVEL %. The percentage of intraclasts is shown in the gravel column in brackets. Grain size estimates have not been adjusted to conform with the results of the grain size analyses.

Lithology and Sedimentary Features

The LITHOLOGY column is divided in two. The left side graphically illustrates gross lithology, modified where appropriate for lithologic qualifiers (muddy, sandy, pebbly, etc). Also shown are the degree of induration and cementation, the presence of assessory minerals (pyrite, mica, etc), and the various clast types and shapes. The nature, thickness and strength of bedding, bedding features, fossil types and miscellaneous sediment features are graphically portrayed using standard sedimentary symbols plotted in the right column.

Clast Composition and Shape

Clast composition, size roundness, surface texture (striae) and percentage were determined for most units and subunits. These data will be presented elsewhere (Hall, in Barrett, in prep), but some data on clast composition and striae are recorded in the LITHOLOGY column, as well as in the description of each subunit, which summarises clast size and roundness data.

Lithological Description

The core was divided into subunits at the time of logging, each "subunit" representing a distinct lithofacies or facies association. Major unit boundaries were also designated on-site where marked changes in lithofacies occurred.

Each subunit description is set to a standard format:

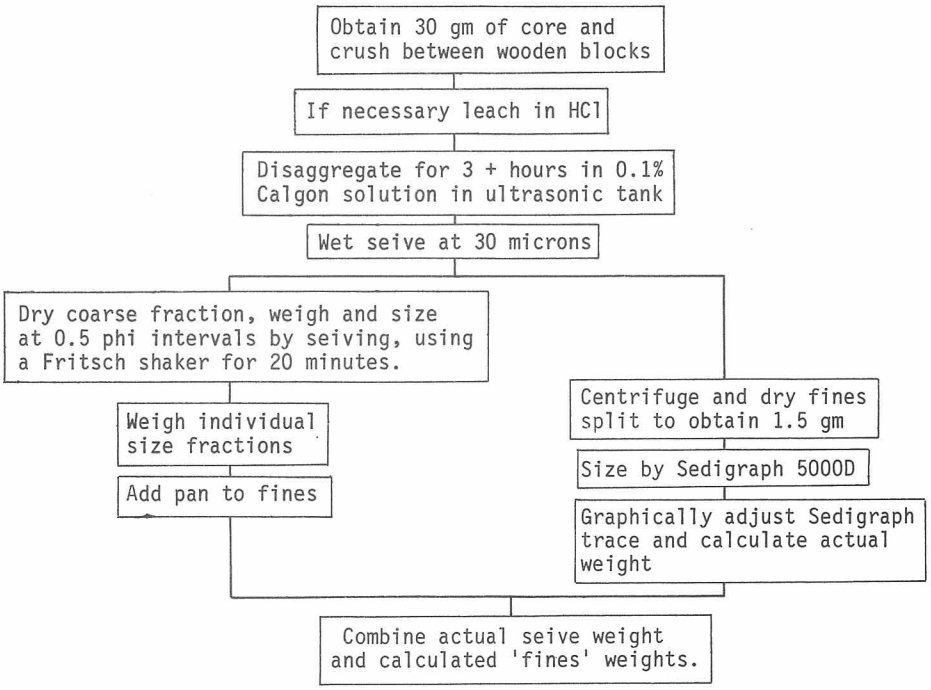
Nature of upper contact
Unit and subunit number
Subunit interval (depth)
Gross lithology(ies)
General description and colour
Stratification
Clasts
Other features

The subunit description begins with the degree of induration, cementation and stratification, a full textural name following the modified Folk textural classification (Andrews 1982), and colour (based on the Munsell Colour Chart). Other information presented for fresh wet core includes the nature of stratification, clast percentage, size, roundness and composition, sedimentary structures, (including soft sediment deformation features), biogenic material and tectonic features.

GRAIN SIZE ANALYSIS

Fifty-one samples were selected both to represent the range of facies and to cover the entire core. About 20 g was crushed between wooden blocks to pass through a 2 mm sieve. Calcareous samples were leached in hydrochloric acid. Others were stirred in 0.1% Calgon solution in an ultrasonic tank for 3 hours to aid disaggregation. Samples were checked for aggregates and some required up to 12 hours ultrasonic treatment for full disaggregation. The remainder of the analytical procedure is outlined in figure 3. The coarse (coarser than 5 phi) fraction was sized at ½ phi intervals by sieves and a Fritsch automatic shaker for 20 minutes on "intermittent". The fine fraction from the pan was added to the fines from wet sieving, all of which was split to provide a 1.2 - 1.6 g sample for settling analysis using the Sedigraph 5000D (Stein 1985). Macpherson (1986) discusses both the sieve calibration and correction of Sedigraph curves. The results of the grain size analyses are summarized in figure 4, and presented in detail in Appendix 2.

Figure 3. Flow chart for grain size analysis of CIROS-1.



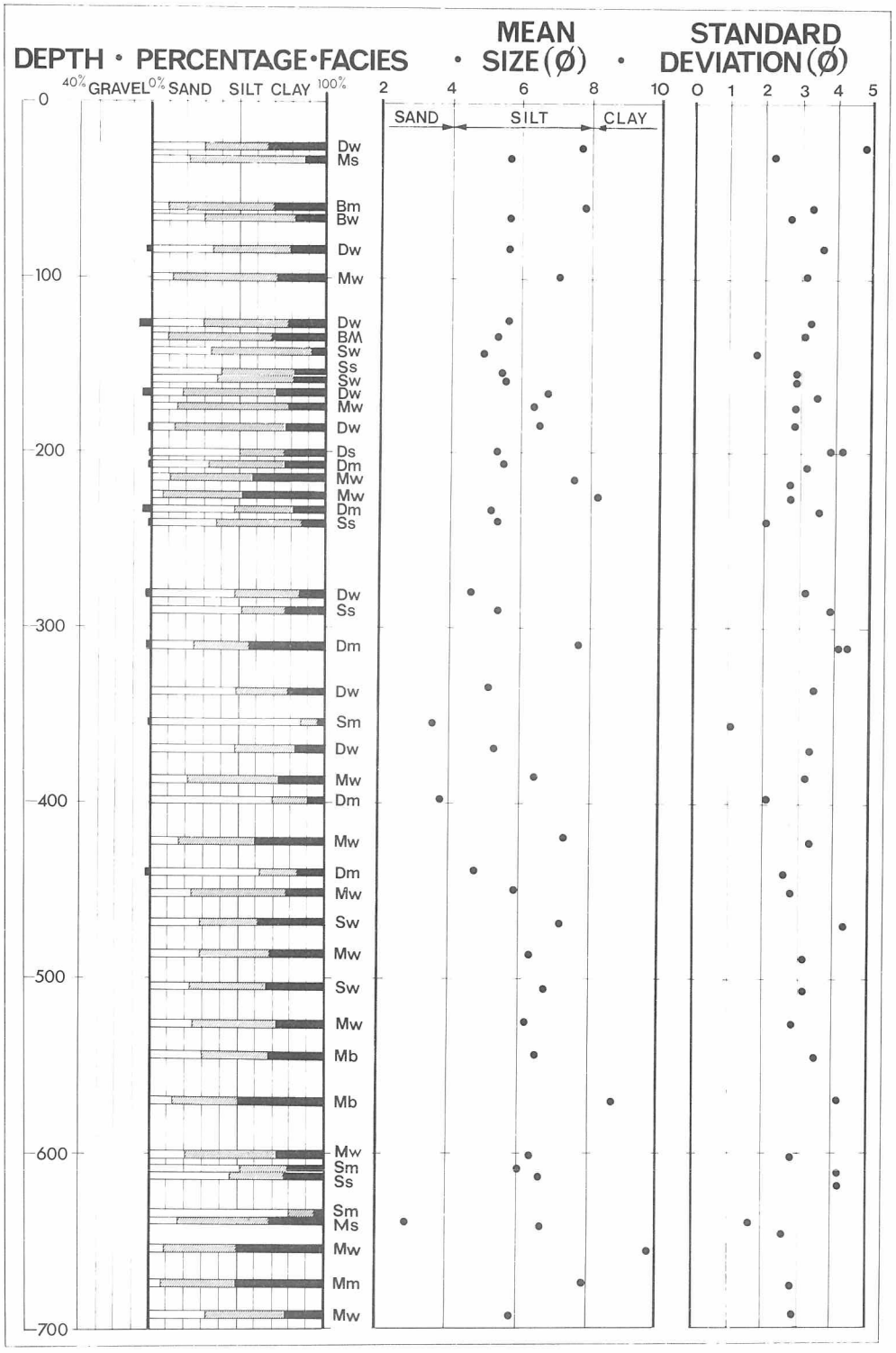


Figure 4. Grain size data for CIROS-1. Percent gravel was taken from the core log; percent sand, silt and clay were determined by analysis (see text for method and Appendix 2 for complete analyses).

Lithofacies coding: B - breccia, D - diamictite, M - mudstone and S - sandstone, with suffixes, m - massive, w - weakly stratified, s - moderately to well stratified and b - bioturbated.

ACKNOWLEDGEMENTS

The CIROS project was a joint venture between Victoria University of Wellington, who coordinated the science programme, Geophysics Division DSIR who supervised the drilling, and Antarctic Division DSIR, who provided the logistic support. The drilling rig was provided by the US National Science Foundation. Special thanks to Peter Gallagher and Terry Best (NZ Geological Survey) for their considerable effort in drafting the core logs. Figures 1 - 4 were drafted by Ted Hardy (VUW). Frank Williams (VUW) carried out the grain size analyses. John Casey (VUW photographic facility) helped develop the photographic system for the core and processed the core photographs.

Finally we thank the drillers, planners and those in the support system for the project. Without their efforts such an abundance and quality of core would not have been possible.

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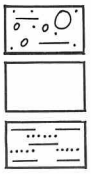
LEGEND

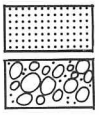
LITHOLOGY



Diamictite

Mudstone

Rhythmite



Sandstone

Conglomerate

LITHOLOGY QUALIFIERS

muddy

sandy

pebbly

carbonaceous

calcareous

LITHOLOGY ACCESSORIES

Py Pyrite

C Chlorite

M Mica

FOSSIL TYPES

Fossils in general

(broken)

Mollusc (articulated)

Scaphopod

Mollusc (single valve)

Gastropod

Echinoid

Sponge spicule

Leaf

Wood fragments

Indeterminate plant debris

Foraminifera in general

CLAST TYPES

Basement Complex

Ferrar Dolerite

Beacon Supergroup

McMurdo Volcanic

Indurated sediment

Quartz

Limestone

Mudstone clast

Sandstone clast

Diamictite

CONTACTS

Sharp

Gradational

Erosional (irregular)

SEDIMENTARY STRUCTURES

Weakly bedded

Well bedded


Inclined bedding

Graded bedding (normal)


Wavy bedding


Flaser bedding


Asymmetrical ripples


Bioturbation structures


Mottling


Contorted bedding

Load structures

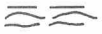

Flame structures

Bedded


Horizontal bedding


Cross bedding

Graded bedding (reverse)


Discontinuous bedding


Lenticular bedding


Symmetrical ripples


Burrows

Convolute bedding


Contorted and disrupted bedding


Sand dykes


Water escape structures

MISCELLANEOUS SYMBOLS

-o- Lonestones


Concretions/Nodules

frac Fractures


Slickensides

Ca Calcite vein


No core recovery

Dropstones

Mouldic and vugular porosity

F Faults

Indurated

Cl Clay vein


Striations


Clast rind / Weathering rind

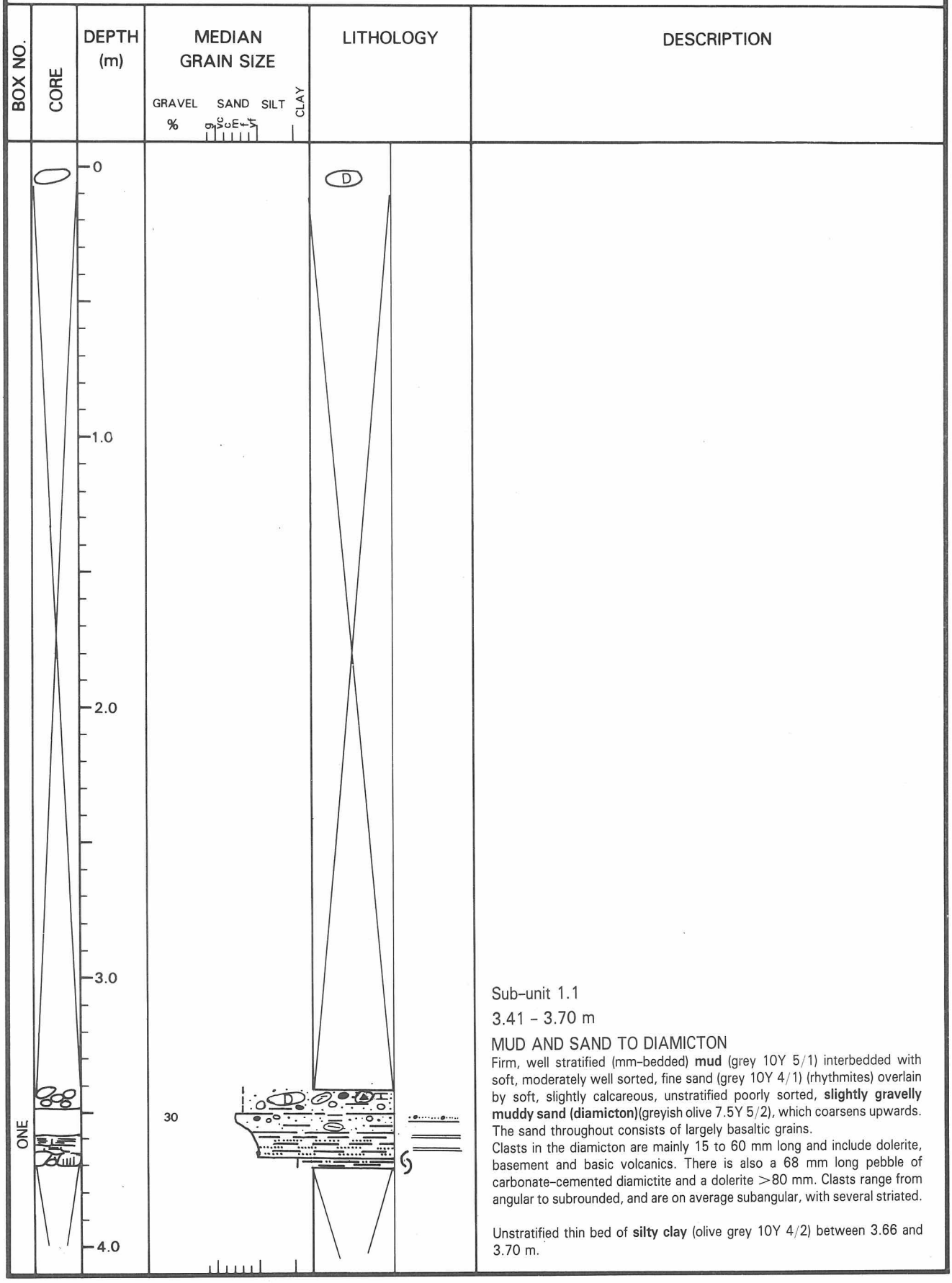
jts Joints

cmt Cemented

PROJECT : CIROS -1

SHEET NO. : 1

SCALE : 1:20



Sub-unit 1.1

3.41 - 3.70 m

MUD AND SAND TO DIAMICTON

Firm, well stratified (mm-bedded) **mud** (grey 10Y 5/1) interbedded with soft, moderately well sorted, fine sand (grey 10Y 4/1) (rhythmites) overlain by soft, slightly calcareous, unstratified poorly sorted, **slightly gravelly muddy sand (diamicton)**(greyish olive 7.5Y 5/2), which coarsens upwards. The sand throughout consists of largely basaltic grains.

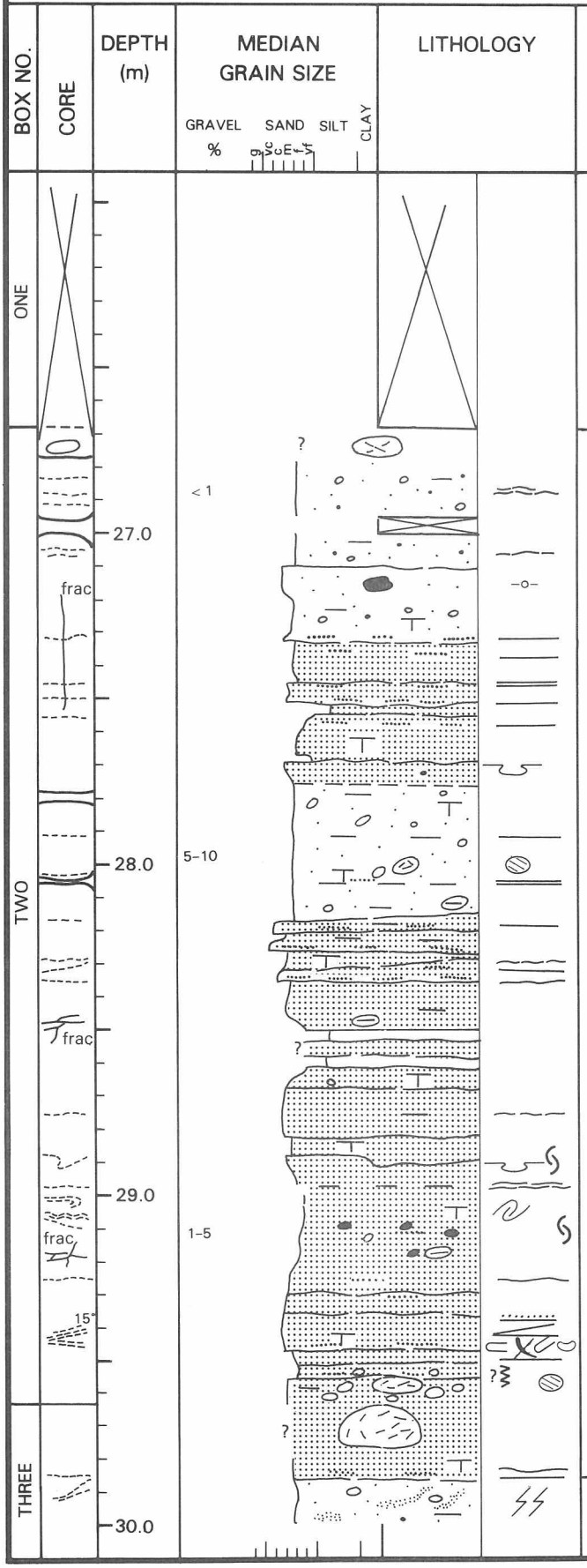
Clasts in the diamicton are mainly 15 to 60 mm long and include dolerite, basement and basic volcanics. There is also a 68 mm long pebble of carbonate-cemented diamictite and a dolerite >80 mm. Clasts range from angular to subrounded, and are on average subangular, with several striated.

Unstratified thin bed of **silty clay** (olive grey 10Y 4/2) between 3.66 and 3.70 m.

PROJECT : CIROS -1

SHEET NO. : 2

SCALE : 1:20



DESCRIPTION

— contact in non-cored interval –

Sub-unit 2.1

26.69 - 29.85 m

SANDSTONE AND DIAMICTITE

Hard, moderately well stratified (cm- and mm-bedded), moderately well-sorted to poorly sorted, **coarse to medium sandstone** (grey 10Y 4/1) with minor interbeds of weakly stratified (mm-bedded), moderately well sorted, **muddy fine sandstone** and **sandy mudstone** (greenish grey 10G 5/1).
Clasts are on average subrounded and two are striated. Clasts form 1 to 10% of the core. They range in size mainly from 5 to 30 mm, but 3 are >50 mm. Lithologies include basement, dolerite and basic volcanic rocks.

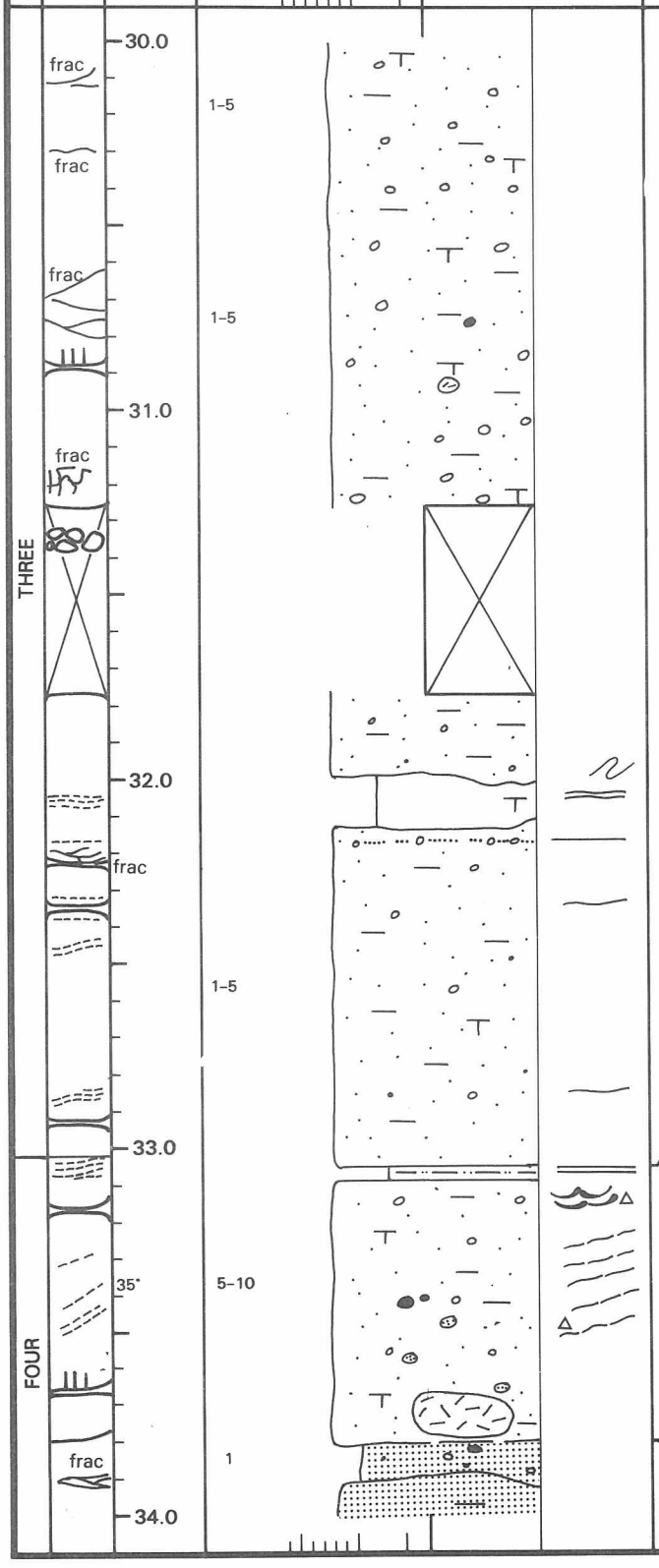
Beds of hard, weakly stratified (mm- and cm-bedded), **slightly conglomeratic muddy medium to fine sandstone (diamictite)** (dark greenish grey 7.5GY 4/1) from 26.79 to 27.32 and from 27.75 to 28.15 m.
Between 29.05 and 29.30 m bedding is contorted and disrupted with deformation on a scale of 1 to 3 cm.
?Zeolite-lined cavities and surfaces with the form of burrows and bivalve shells in coarse sandstone bed from 29.45 to 29.48 m. Horizontal slickenside-like lineations in mudstone above clast at 29.57 m.

— contact gradational –

PROJECT : CIROS -1

SHEET NO. : 3

SCALE : 1:20



Sub-unit 2.2

29.85 - 33.06 m

DIAMICTITE

Hard, **slightly conglomeratic muddy medium to fine sandstone (diamictite)** (dark greenish grey 10GY 4/1).

Unstratified above 31.98 m; weakly and diffusely stratified below.

Clasts up to 15 mm form 1 to 5% of rock. Clasts range from angular to rounded but on average are subangular. Lithologies include basement and basic volcanic rocks.

Clast-free, stratified (cm-bedded), moderately well sorted, **sandy mudstone** (dark greenish grey 10G 4/1) with gradational contacts from 31.98 to 32.33 m.

Stringer of coarse sandstone to fine conglomerate at 32.33 m.

contact sharp -

Sub-unit 2.3

33.06 - 33.80 m

DIAMICTITE

Hard, weakly stratified (mm- to cm-bedded), **conglomeratic muddy medium sandstone (diamictite)** (dark greenish grey 10GY 4/1).

Bedding dips steeply (up to 35°) and is emphasised by dissolution.

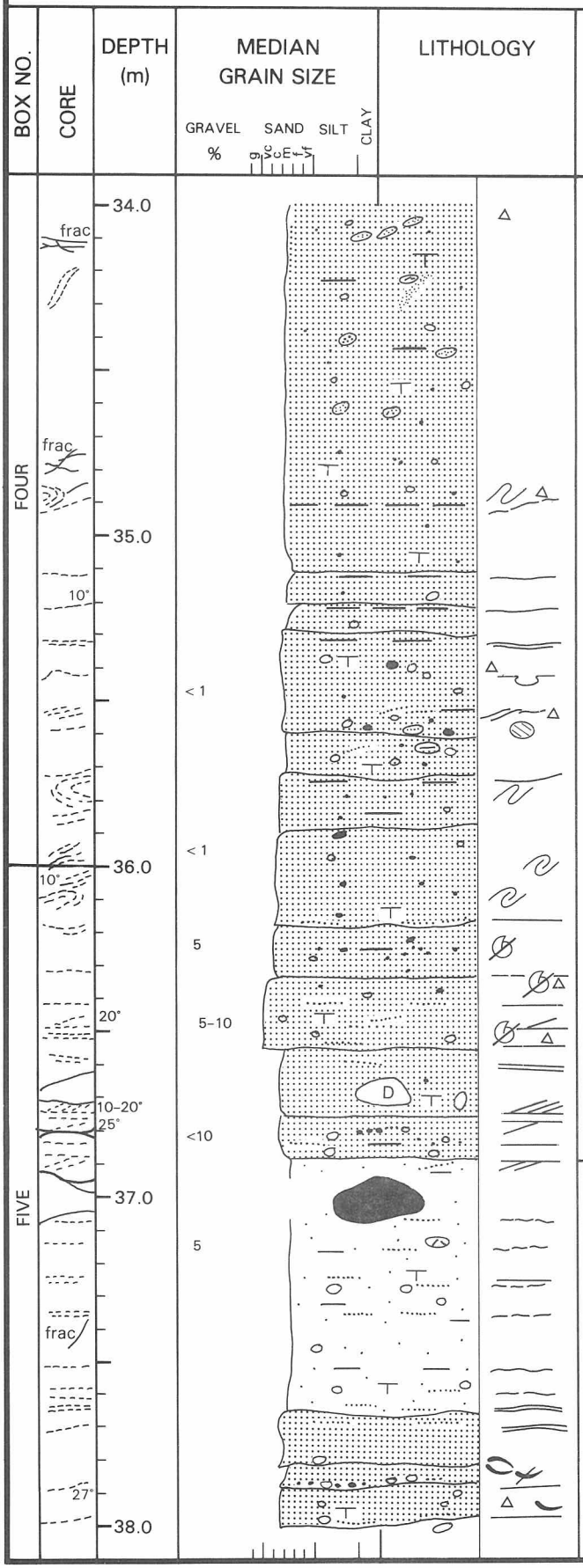
Clasts average 2 to 8% of core and are mostly between 5 and 18 mm long, though one large granite clast is >140 mm. Bedrock clasts are largely basic volcanic. Intraclasts of sandstone and grit are also common. All are on average subrounded.

contact at base of large clast -

PROJECT : CIROS -1

SHEET NO. : 4

SCALE : 1:20



Sub-unit 2.4

33.80 — 36.88 m

SANDSTONE

Interbeds of hard, unstratified, moderately well sorted, **very fine sandstone** (dark greenish grey 10GY 3 1) and weakly stratified (cm-bedded), very poorly sorted, **coarse sandstone** (dark greyish yellow 2.5Y 4 2).

Stratification is irregular, discontinuous and cross-bedded with dips up to 25 . Common contorted and disrupted bedding.

Clasts form <1% in upper part of sub-unit to around 10% near base. Bedrock clasts are subangular to subrounded and from 5 to 10 mm long. One is striated and several are faceted. Lithologies include basic volcanics, basement and dolerite. Slightly larger (up to 22 mm) subrounded coarse sandstone and mudstone intraclasts also occur.

Vugular and shell mouldic porosity widespread.

— contact sharp -

Sub-unit 2.5

36.88 — 38.82 m

DIAMICTITE AND SANDSTONE

Hard, weakly stratified (cm-bedded), **conglomeratic muddy medium to fine sandstone (diamictite)** (dark greenish grey 10Y 4 1), separated by hard, weakly stratified to well stratified (cm-bedded), moderately poorly sorted, **coarse to fine sandstone** (dark greenish grey 7.5GY 4 1 to 10GY 3 1).

Discontinuous and irregular stratification marked by coarse sandstone partings.

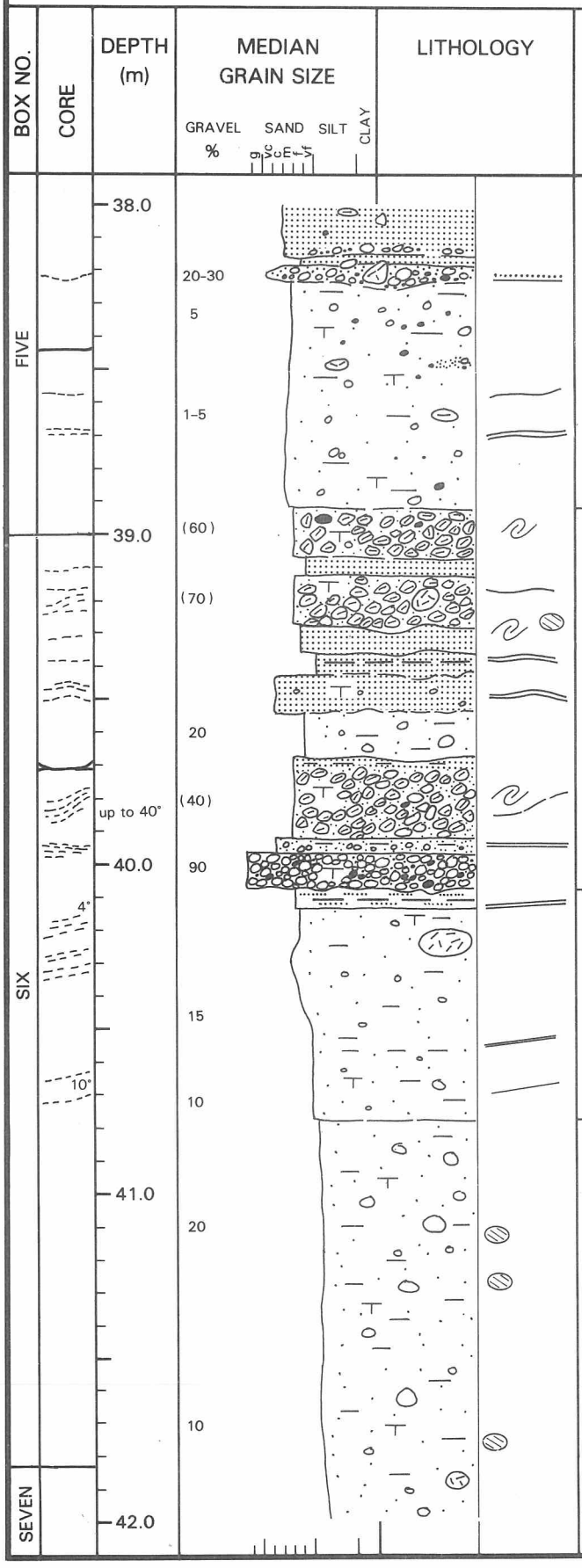
Clasts in the diamictite form 5% of the core. They range in size mainly from 5 to 25 mm, but several are >50 mm and a volcanic clast at 37.00 m is >160 mm. Clasts on average are subangular and several are faceted. Lithologies include basement(40%), basic volcanics(30%), dolerite(10%) and chert.

Cavities in coarse sandstone from 37.82 to 37.95 m have the form of bivalve shells (one articulated).

PROJECT : CIROS -1

SHEET NO. : 5

SCALE : 1:20



contact sharp –

Sub-unit 2.6

38.82 – 40.08 m

MUDSTONE BRECCIA AND DIAMICTITE

Three beds of moderately hard, poorly sorted **brecciated mudstone** (dark bluish grey 5BG 4/1) (38.8 to 39.07 m, 39.14 to 39.28 m, 39.68–39.92 m).

Bedding on mm- to cm-scale, moderately well developed but contorted with dips up to 40 .

From 40 to 80% of the rock is formed of clasts up to 20 mm long. Between 70 and 90% are intraformational mudstone, the remainder being of basement and a few basic volcanic (mainly subangular to subrounded).

Bed of soft, unstratified, **conglomeratic muddy fine to very fine sandstone (diamictite)** (greenish grey 10Y 6/1) from 39.55 to 39.68 m.

Clasts form 20% of core, and include basement and minor volcanics as well as intraformational mudstone. They are mainly subangular to subrounded. There is one striated clast.

Basal bed of unstratified, moderately well sorted, **pebble conglomerate** with 10% matrix. Pebbles range up to 10 mm and are rounded to subangular. Lithologies include basement (80%) and basic volcanic (20%).

contact erosional –

Sub-unit 2.7

40.08 - 40.78 m

DIAMICTITE

Hard, weakly to well stratified (mm- to cm-bedded),**conglomeratic muddy fine to very fine sandstone (diamictite)** (greenish grey 10G 5/1).

Stratification is subhorizontal to inclined (4–10°); weakly bedded at the base to well bedded in the upper 6 cm which is interlaminated sandstone and mudstone (rhythmite).

Clasts form 10% of core and range in size from 5 to 10 mm, though one basement clast is >60 mm. Basement is the predominant clast type.

Possible shell fragments. Thin bed of fine volcanic sandstone and quartz, feldspar, brown amphibole and minor glass at 40.35 m.

contact sharp –

Sub-unit 2.8

40.78 - 42.84 m

DIAMICTITE

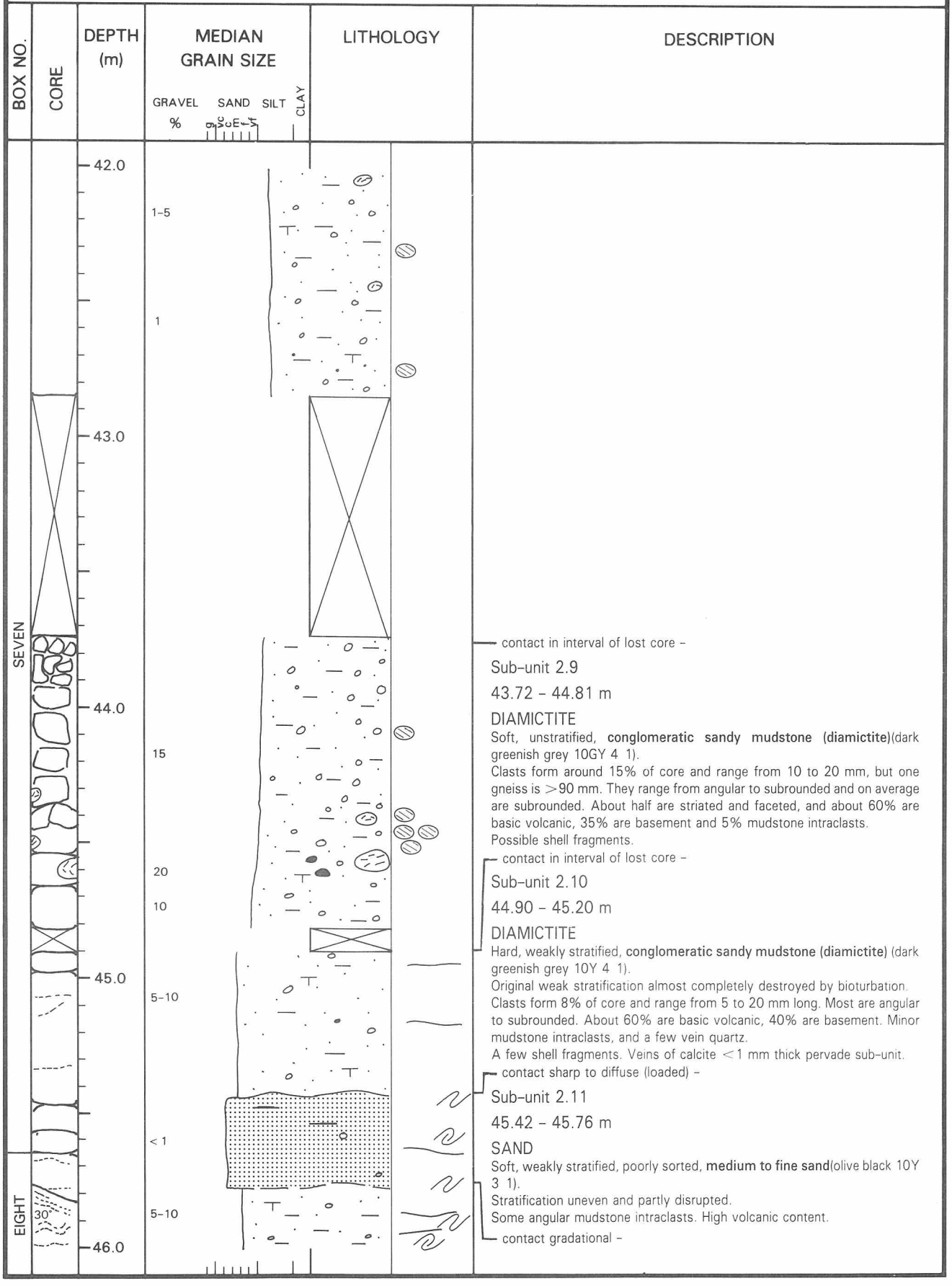
Variably hard to soft, unstratified, conglomeratic sandy mudstone (diamictite) (greenish grey 10G 5/1).

Clasts form 20% of core in upper part of sub-unit but proportion declines to 1% near base. They range from 5 to more than 30 mm long; they are angular to subrounded and on average are subrounded. Almost half are striated. About 70% are of basement and 30% are basic volcanic lithology.

PROJECT : CIROS -1

SHEET NO. : 6

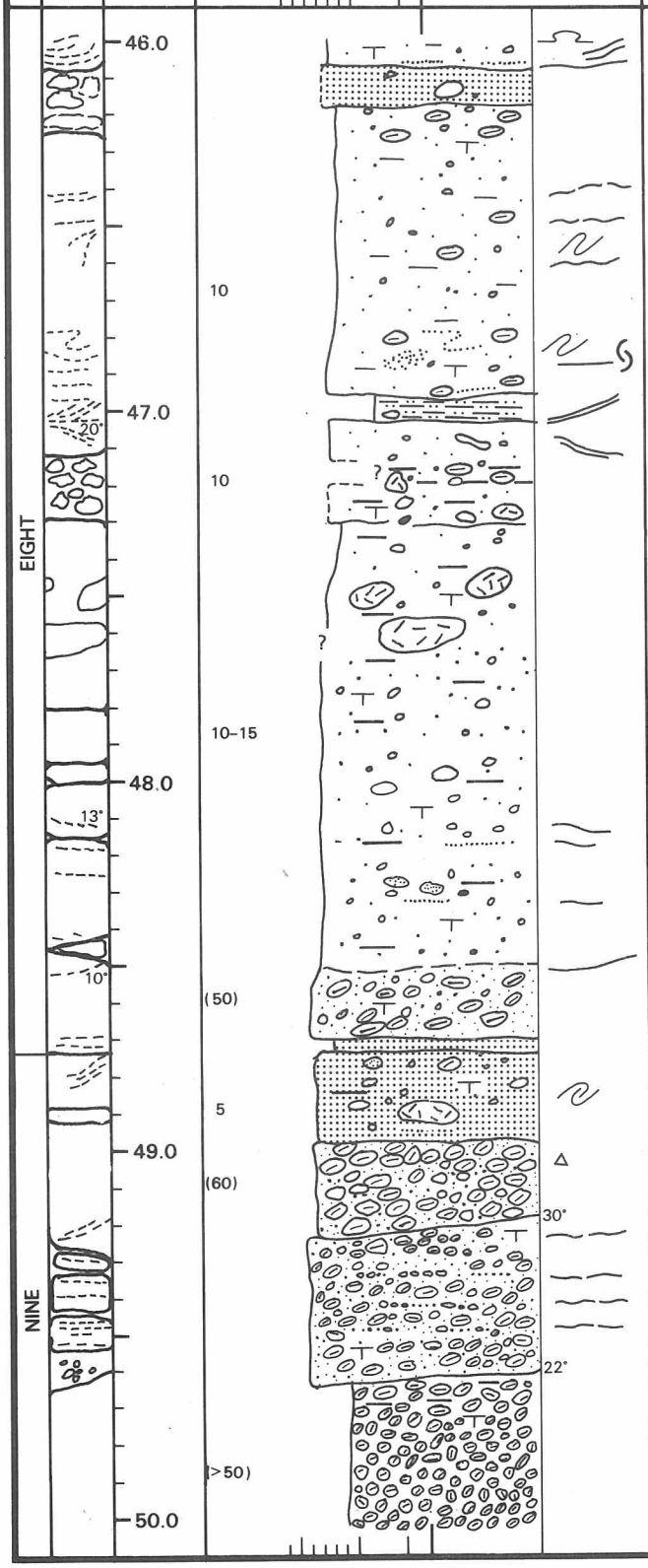
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 7

SCALE : 1:20



Sub-unit 2.12

45.76 - 48.50 m

DIAMICTITE

Hard, weakly stratified (cm-bedded), **conglomeratic muddy fine sandstone (diamictite)** (greenish grey 5BG 5/1).

Original stratification partly disrupted, producing diamictite clast breccias, and in places contorted, dipping up to 30°.

Bedrock clasts form 5 to 15% of core and range from 4 to 20 mm long. About 60% are volcanic (including red porphyritic felsite) and 40% are basement.

Thin beds of unstratified, moderately well-sorted, **medium sandstone** (greenish grey 10GY 6/1) from 46.08 to 46.18 m and of weakly stratified, **mudstone** (dark bluish grey 5BG 4/1) from 46.96 to 47.04 m.

— contact sharp and loaded –

Sub-unit 3.1

48.50 - 62.13 m

MUDSTONE BRECCIA

Hard, unstratified to weakly stratified, very poorly sorted, breccia of intraformational **mudstone** clasts in a **sandy mudstone** matrix (greenish grey 5BG 5/1 to dark greenish grey 7.5GY 4/1).

Stratification is locally contorted and disrupted, showing dips up to 30° and at 51.40 m the hinge of an isoclinal fold.

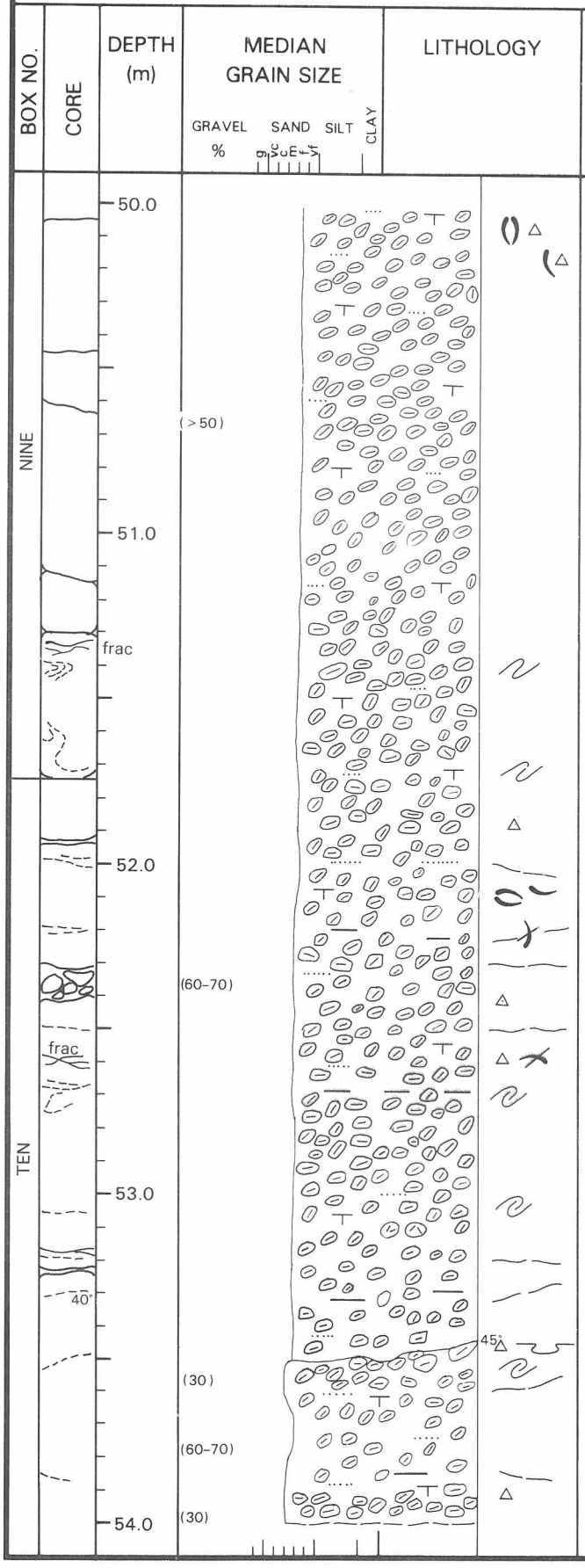
Matrix- and clast-supported with 80 to 90% mudstone clasts and the remainder bedrock derived. Mudstone clasts are on average 10 to 15 mm long and range up to 25 mm.

Thin bed of well-stratified, pebbly coarse to fine sandstone (dark greenish grey 7.5GY 4/1) from 48.73 to 48.98 m.

PROJECT : CIROS -1

SHEET NO. : 8

SCALE : 1:20



DESCRIPTION

Sub-unit 3.1

48.50 - 62.13 m

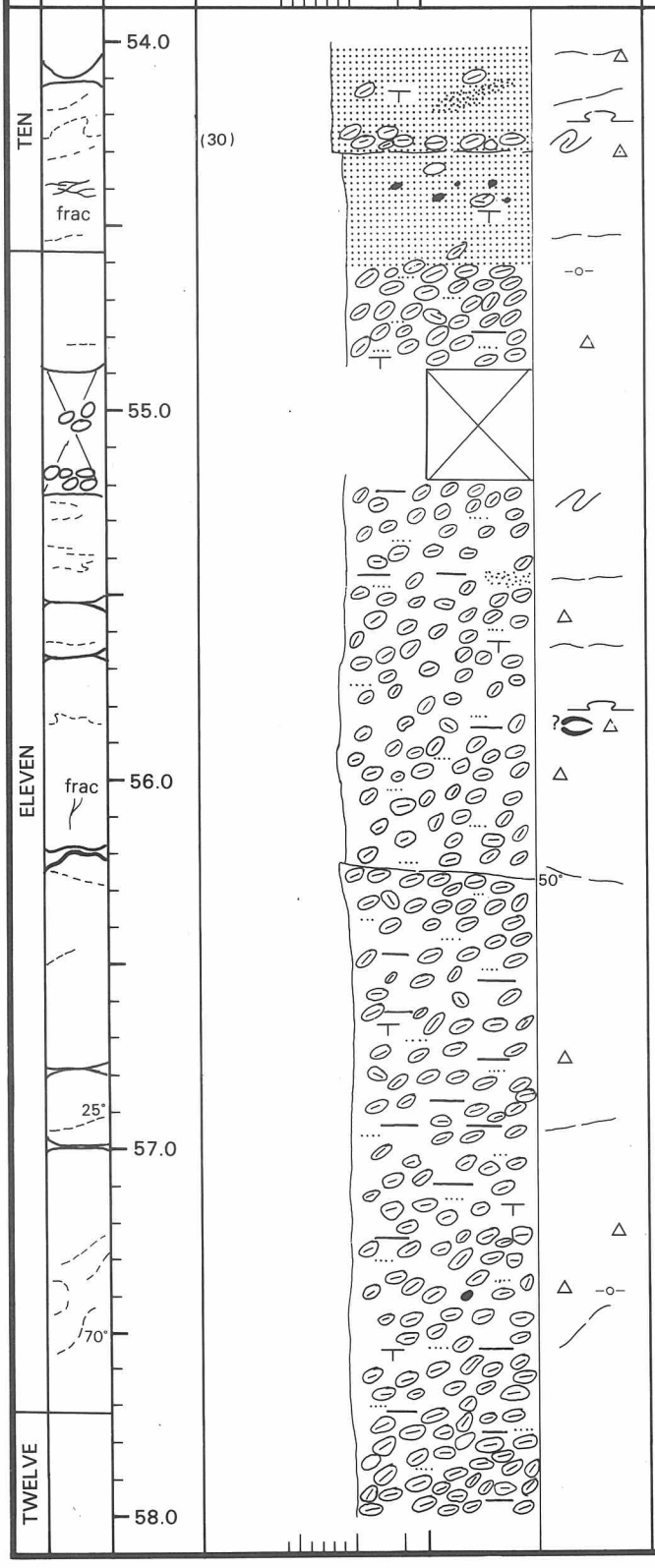
MUDSTONE BRECCIA

Hard, unstratified to weakly stratified, very poorly sorted, breccia of intraformational **mudstone** clasts in a **sandy mudstone matrix** (greenish grey 5BG 5/1 to dark greenish grey 7.5GY 4/1). Stratification is locally contorted and disrupted, showing dips up to 30° and at 51.40 m the hinge of an isoclinal fold. Matrix-and clast-supported with 80 to 90% mudstone clasts and the remainder bedrock derived. Mudstone clasts are on average 10 to 15 mm long and range up to 25 mm. Thin bed of well-stratified, pebbly coarse to fine sandstone (dark greenish grey 7.5GY 4/1) from 48.73 to 48.98 m.

PROJECT : CIROS -1

SHEET NO. : 9

SCALE : 1:20



Sub-unit 3.1

48.50 - 62.13 m

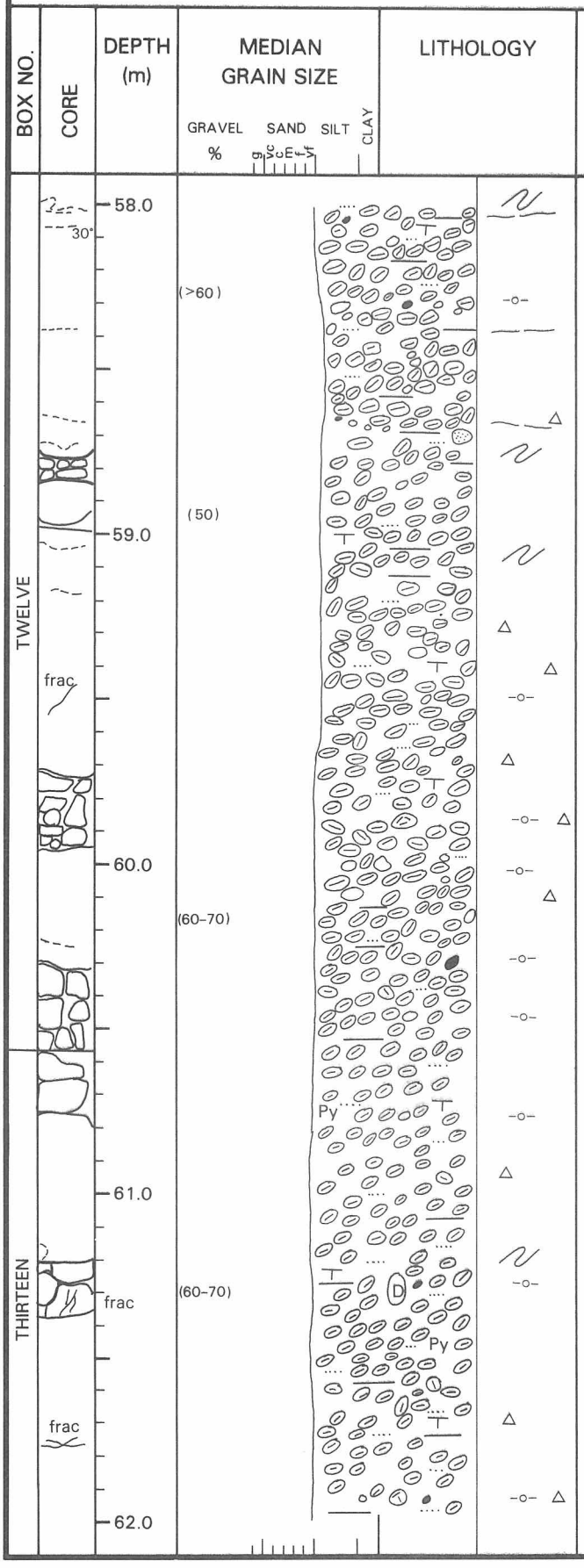
MUDSTONE BRECCIA

Hard, unstratified to weakly stratified, very poorly sorted, breccia of intraformational **mudstone** clasts in a **sandy mudstone matrix** (greenish grey 5BG 5/1 to dark greenish grey 7.5GY 4/1). Stratification is locally contorted and disrupted, showing dips up to 30° and at 51.40 m the hinge of an isoclinal fold. Matrix-and clast-supported with 80 to 90% mudstone clasts and the remainder bedrock derived. Mudstone clasts are on average 10 to 15 mm long and range up to 25 mm. Thin bed of well-stratified, pebbly coarse to fine sandstone (dark greenish grey 7.5GY 4/1) from 48.73 to 48.98 m.

PROJECT : CIROS -1

SHEET NO. : 10

SCALE : 1:20



DESCRIPTION

Sub-unit 3.1

48.50 - 62.13 m

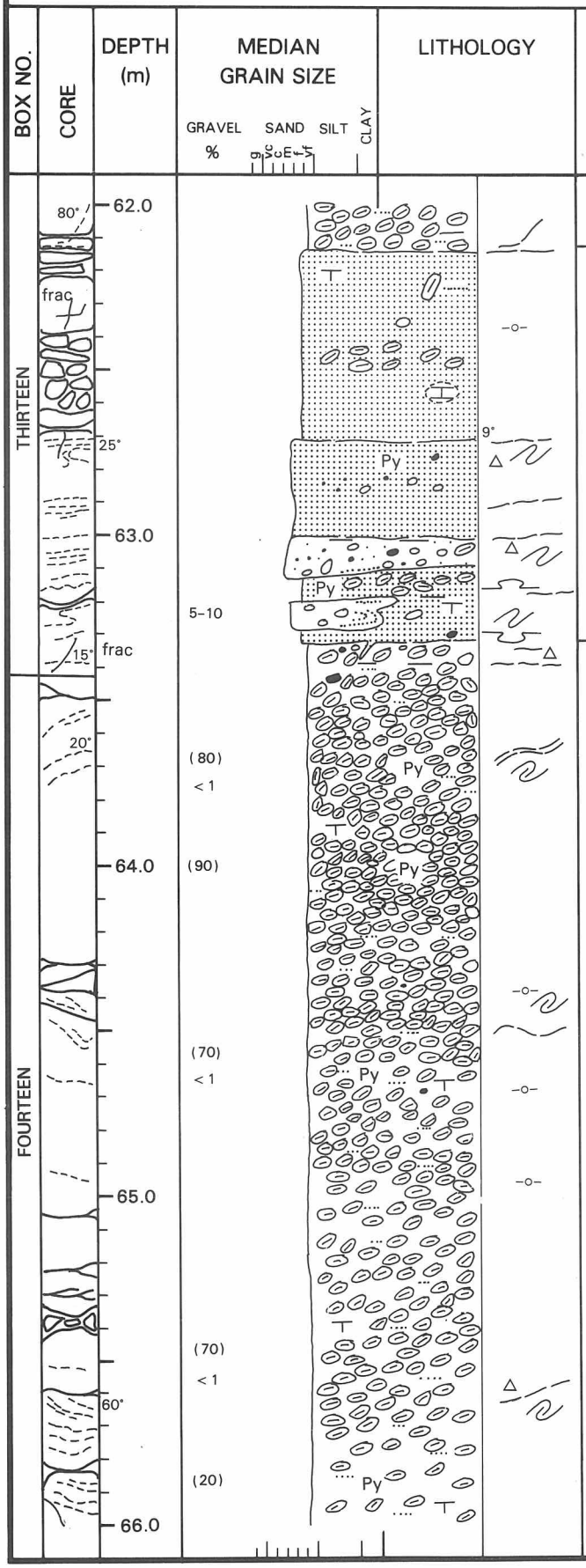
MUDSTONE BRECCIA

Hard, unstratified to weakly stratified, very poorly sorted, breccia of intraformational **mudstone** clasts in a **sandy mudstone matrix** (greenish grey 5BG 5/1 to dark greenish grey 7.5GY 4/1). Stratification is locally contorted and disrupted, showing dips up to 30° and at 51.40 m the hinge of an isoclinal fold. Matrix-and clast-supported with 80 to 90% mudstone clasts and the remainder bedrock derived. Mudstone clasts are on average 10 to 15 mm long and range up to 25 mm. Thin bed of well-stratified, pebbly coarse to fine sandstone (dark greenish grey 7.5GY 4/1) from 48.73 to 48.98 m.

PROJECT : CIROS -1

SHEET NO. : 11

SCALE : 1:20



DESCRIPTION

— contact gradational —

Sub-unit 3.2

62.13 - 63.32 m

SANDSTONE AND DIAMICTITE

Hard to firm, unstratified to weakly and diffusely stratified (mm- to cm-bedded), **muddy fine to very fine sandstone** (grey 10Y 4/1) with partial intraformational brecciation.

Contorted bed (63.00 to 63.12 m) of weakly stratified **diamictite**(grey 10Y 4/1). Clasts comprise 5 to 10% of core and range up to 24 mm in length. Most are subangular to subrounded. About 70% are basement and 30% basic volcanic lithology.

Small crystals of pyrite disseminated through the core.

— contact sharp, possibly slumped —

Sub-unit 3.3

MUDSTONE BRECCIA

63.32 - 73.10 m

Hard, unstratified to weakly stratified (mm-bedded), very poorly sorted, **sandy mudstone breccia** (intraformational) (dark olive grey 5GY 4/1).

Stratification is locally distorted and disrupted into mudstone clasts up to 20 mm long that form 10 to 90% of the core (less towards base of sub-unit). Bedding dips as much as 55°.

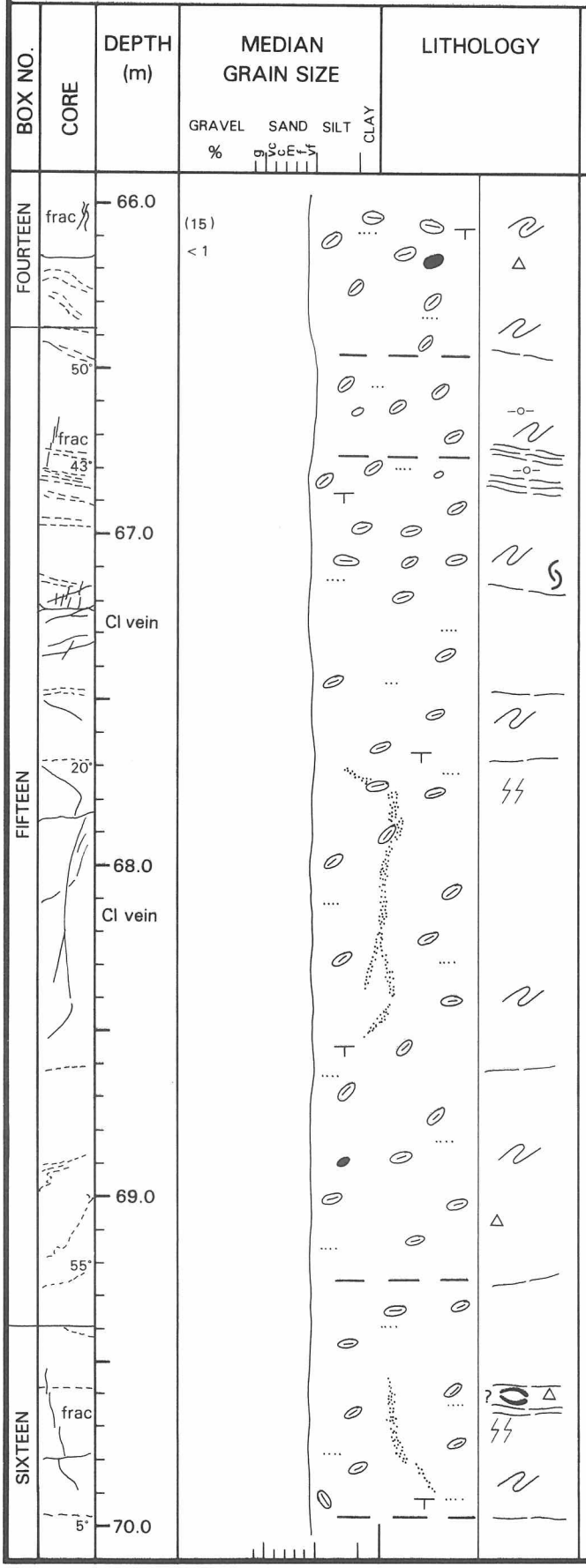
Bedrock clasts, mostly granule size but a few more than 20 mm long, form <1% of the core. Lithologies include dolerite, basement and basic volcanic rocks.

Veins of clay, some light grey and others black, occur below 65 m. Some run parallel with tectonic fractures, which are mostly steeply inclined. Thin vertical synsedimentary dykes of sandstone from 67.70 to 68.53 m and 69.55 to 69.90 m. Fault breccia at 72.10 m.

PROJECT : CIROS -1

SHEET NO. : 12

SCALE : 1:20



Sub-unit 3.3

63.32 - 73.10 m

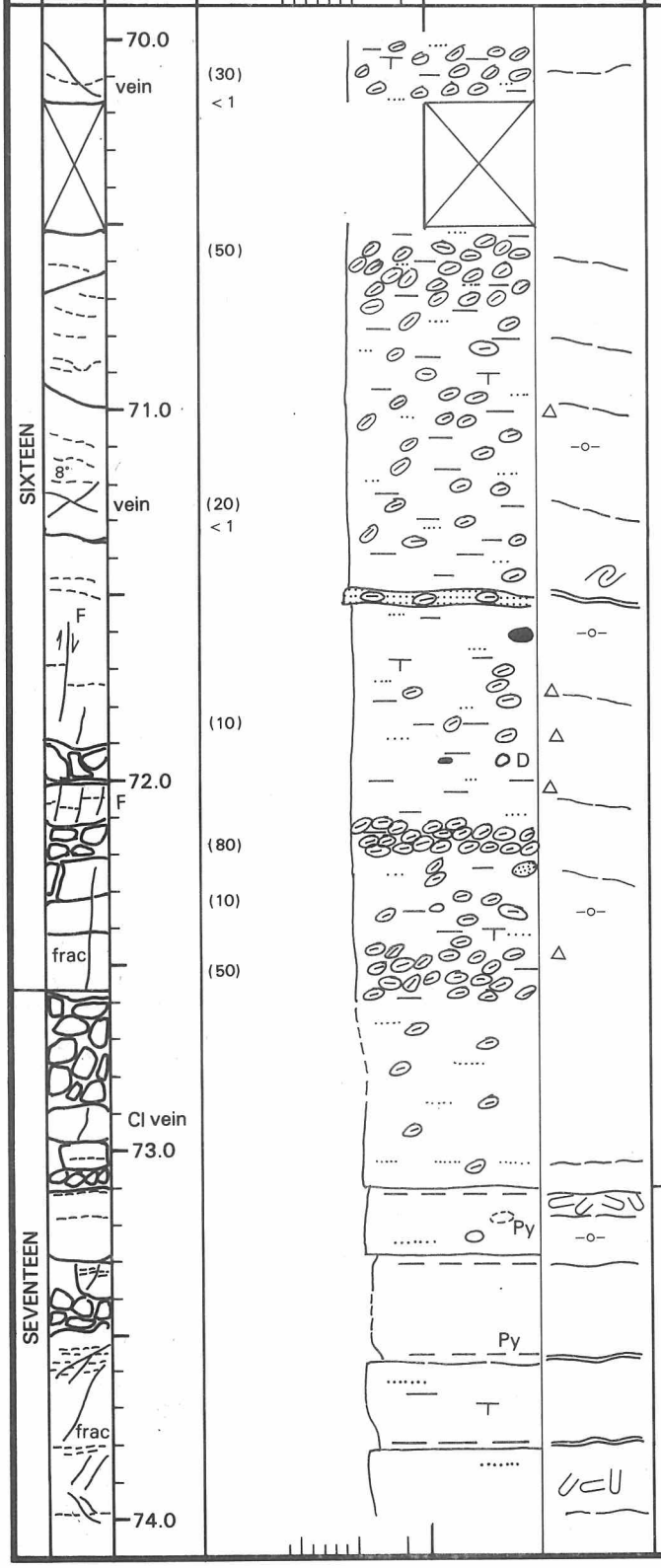
MUDSTONE BRECCIA

Hard, unstratified to weakly stratified (mm-bedded), very poorly sorted, **sandy mudstone breccia** (intraformational) (dark olive grey 5GY 4/1). Stratification is locally distorted and disrupted into mudstone clasts up to 20 mm long that form 10 to 90% of the core (less towards base of sub-unit). Bedding dips as much as 55°. Bedrock clasts, mostly granule size but a few more than 20 mm long, form < 1% of the core. Lithologies include dolerite, basement and basic volcanic rocks. Veins of clay, some light grey and others black, occur below 65 m. Some run parallel with tectonic fractures, which are mostly steeply inclined. Thin vertical synsedimentary dykes of sandstone from 67.70 to 68.53 m and 69.55 to 69.90 m. Fault breccia at 72.10 m.

PROJECT : CIROS -1

SHEET NO. : 13

SCALE : 1:20



Sub-unit 3.3

63.32 - 73.10 m

MUDSTONE BRECCIA

Hard, unstratified to weakly stratified (mm-bedded), very poorly sorted, **sandy mudstone breccia** (intraformational) (dark olive grey 5GY 4/1). Stratification is locally distorted and disrupted into mudstone clasts up to 20 mm long that form 10 to 90% of the core (less towards base of sub-unit). Bedding dips as much as 55°. Bedrock clasts, mostly granule size but a few more than 20 mm long, form < 1% of the core. Lithologies include dolerite, basement and basic volcanic rocks. Veins of clay, some light grey and others black, occur below 65 m. Some run parallel with tectonic fractures, which are mostly steeply inclined. Thin vertical synsedimentary dykes of sandstone from 67.70 to 68.53 m and 69.55 to 69.90 m. Fault breccia at 72.10 m.

— contact sharp -

Sub-unit 3.4

73.10 - 75.60 m

MUDSTONE

Moderately hard to hard, well stratified (mm- to cm-bedded), **sandy mudstone** (dark greenish grey 10GY 4/1).

Stratification is near horizontal, discontinuous and wavy.

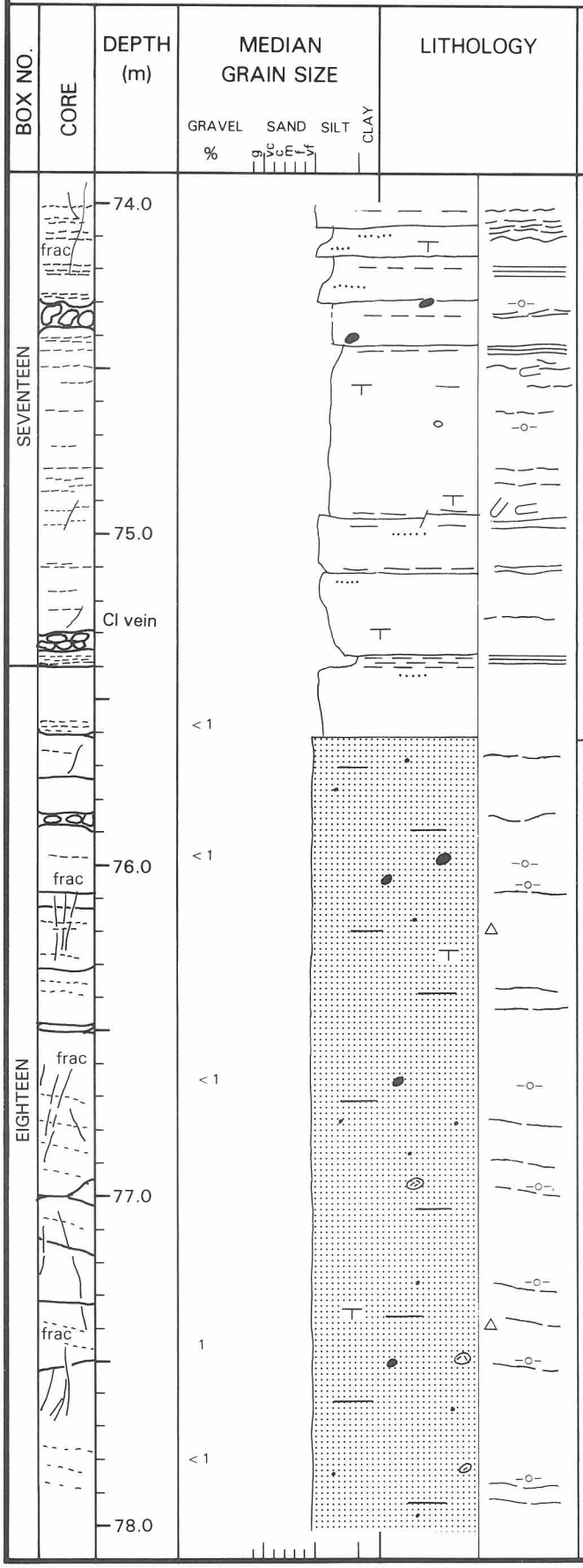
Rare lonestones up to 8 mm long of basement and basic volcanic composition.

Burrows 1 to 10 mm wide, both inclined and horizontal, associated with well stratified clayey beds (dark grey N3). Nodules of disseminated pyrite from 73.26 to 73.60 m.

PROJECT : CIROS -1

SHEET NO. : 14

SCALE : 1:20



DESCRIPTION

Sub-unit 3.4

73.10 - 75.60 m

MUDSTONE

Moderately hard to hard, well stratified (mm- to cm-bedded), **sandy mudstone** (dark greenish grey 10GY 4/1). Stratification is near horizontal, discontinuous and wavy. Rare lonestones up to 8 mm long of basement and basic volcanic composition. Burrows 1 to 10 mm wide, both inclined and horizontal, associated with well stratified clayey beds (dark grey N3). Nodules of disseminated pyrite from 73.26 to 73.60 m.

— contact sharp -

Sub-unit 3.5

75.60 - 79.14 m

SANDSTONE

Hard, unstratified to weakly stratified (cm-bedded), poorly sorted, **muddy very fine sandstone** (dark olive grey 2.5GY 4 1).

Occassional slight disruption of bedding resulting in lenticular pseudobedding. Stratification dips <10 .

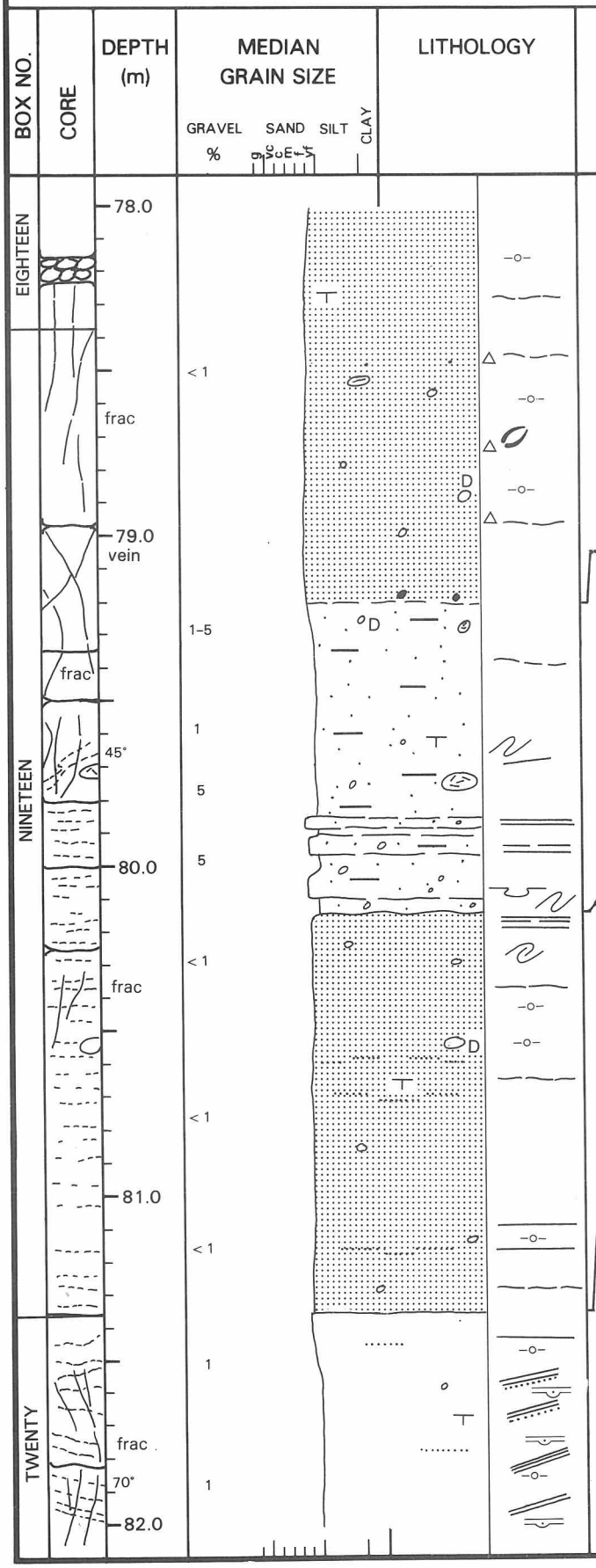
Bedrock clasts up to 8 mm form $<1\%$ of core but are slightly more common towards the base. Most are subangular to subrounded. They include basement and basic volcanic lithologies.

The sub-unit has numerous subvertical fractures and associated mouldic porosity.

PROJECT : CIROS -1

SHEET NO. : 15

SCALE : 1:20



DESCRIPTION

contact gradational over 20 cm –

Sub-unit 3.6

79.14 - 80.13 m

DIAMICTITE

Hard, weakly to well stratified, **slightly conglomeratic muddy very fine sandstone (diamictite)** (dark olive grey 2.5GY 4/1).

Bedding inclined (upto 45), diffuse, weak and on cm scale in upper part; well stratifed with matrix alternating between muddy and sandy and on mm scale in lower part.

Bedrock clasts form between 2 and 5% of core, and range up to 30 mm long. Most are subangular to subrounded. They include basement (50%), dolerite (30%) and basic volcanic (20%).

Numerous synsedimentary fractures, occasionally parallel to stratification but mainly steeply dipping. Contorted fine sandstone lamina 3 mm thick at 79.70 m.

contact sharp –

Sub-unit 3.7

80.13 to 81.46 m

SANDSTONE

Hard, mainly broken, weakly stratified (mm- to cm-bedded), poorly sorted, **muddy fine sandstone** (dark olive grey 2.5GY 4/1).

Stratification loaded and slightly disrupted near top.

Clasts mainly rare scattered granules, but include a 30 mm long dolerite.

Dark **gritty sandstone** layer 15 mm thick at 81.15 m. Occasional thin, less muddy, pale grey brown sandy laminae towards base. Intact core shows irregular subvertical synsedimentary fractures.

contact sharp –

Sub-unit 3.8

81.46 - 82.36 m

SANDSTONE TO MUDSTONE

Hard, well-stratifed (mm- to cm-bedded), poorly sorted, **muddy very fine sandstone to sandy mudstone** (dark greenish grey 10GY 4/1).

Stratification mainly regular but disrupted by synsedimentary faulting. Dips vary from 0 to 12 .

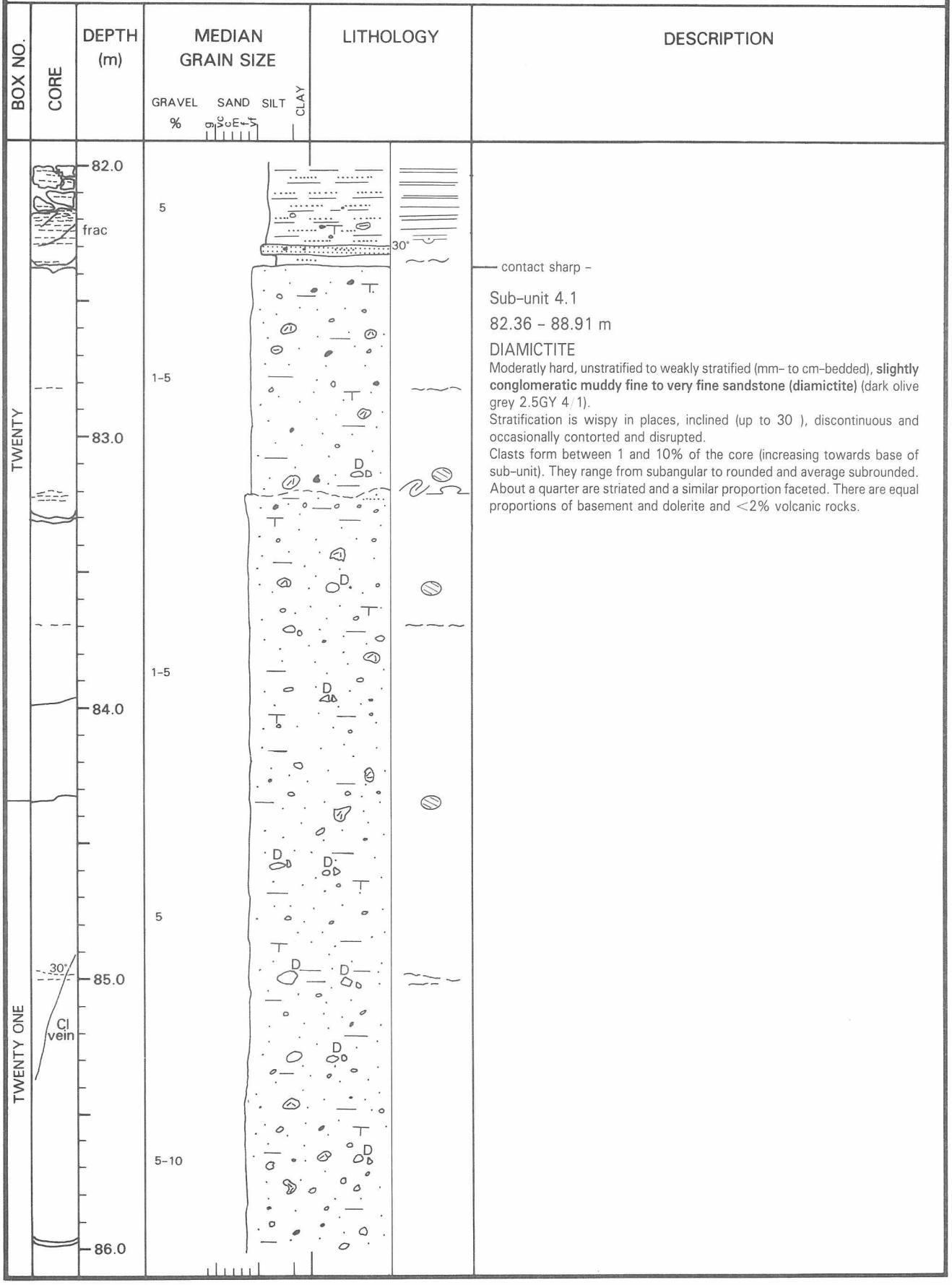
Small lonestones (up to 5 mm) and several dropstones form up to 10% of the core.

About 20% of the interval has rhythmic bedding, with graded alternations of **medium to fine sandstone** and **muddy fine sandstone.** Occasional black laminae. At 81.15 m a low angle fault displaces rhythmites downwards in direction of bedding dip.

PROJECT : CIROS -1

SHEET NO. : 16

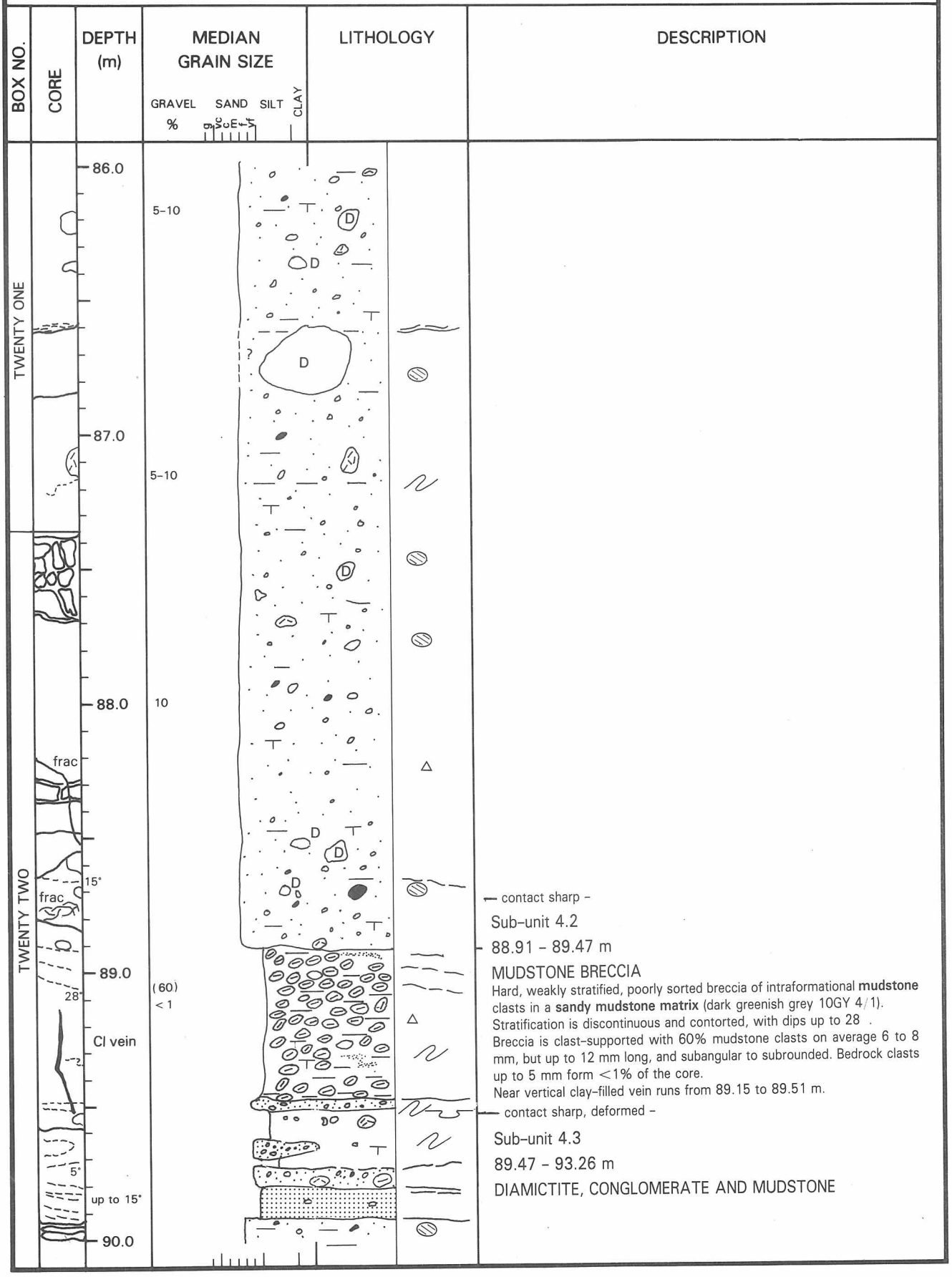
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 17

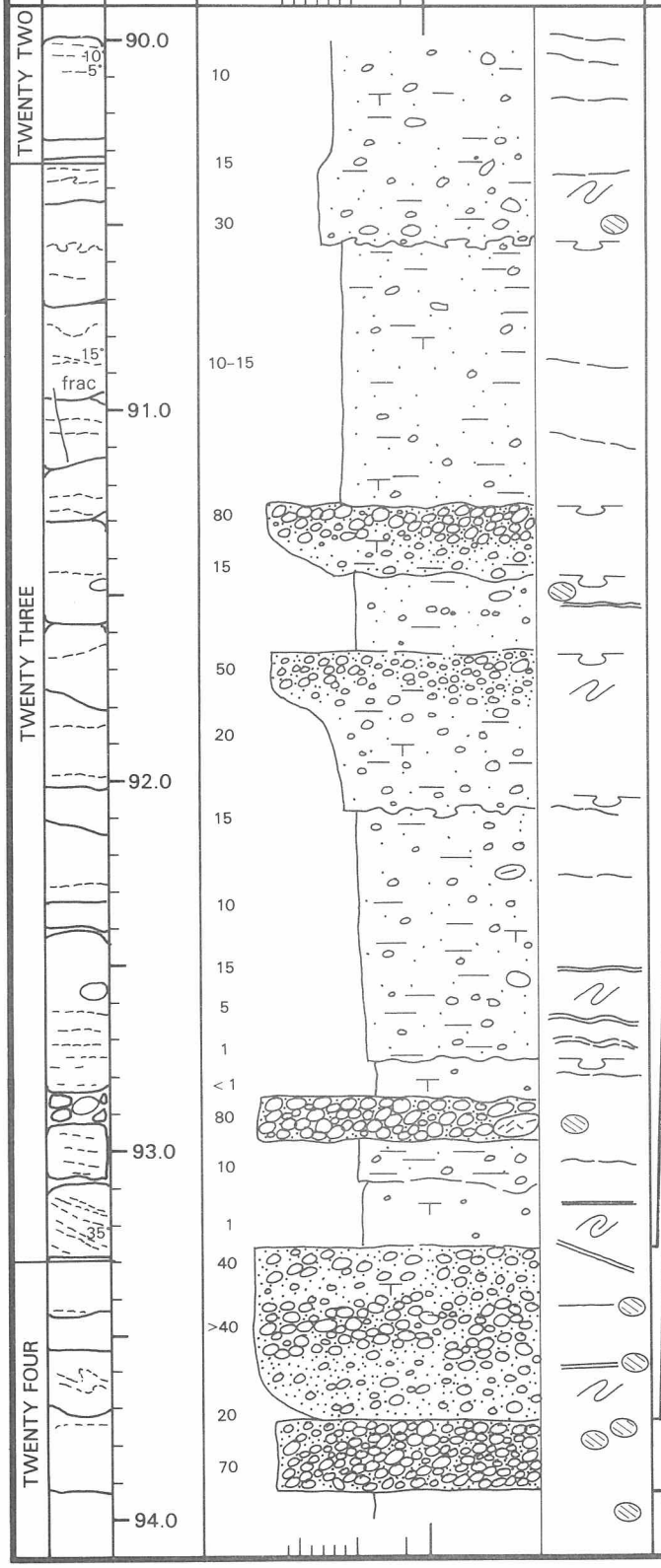
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 18

SCALE : 1:20



DESCRIPTION

contact rapid transition –

Sub-unit 4.4

93.26-93.73 m

CONGLOMERATE

Firm, poorly sorted, weakly stratified, **pebble conglomerate**(matrix – dark olive grey 2.5GY 4 1).

Clasts form 40 to 80% of core but grade down to 20% at base. Most are 4 to 20 mm, but range up to 45 mm long. They range from angular to rounded, averaging subrounded and over half are striated. About 70% are basement, 25% dolerite and 5% basic volcanic.

Synsedimentary flow fold with horizontal fold axis near base.

contact sharp –

Sub-unit 4.5

93.73 - 93.91 m

CONGLOMERATE

Hard, unstratified, moderately well sorted, **sandy pebble conglomerate.**

Clasts form 70% of the core and range from 4 to 20 mm long. They are subangular to subrounded. Some are striated. Most are basement and dolerite.

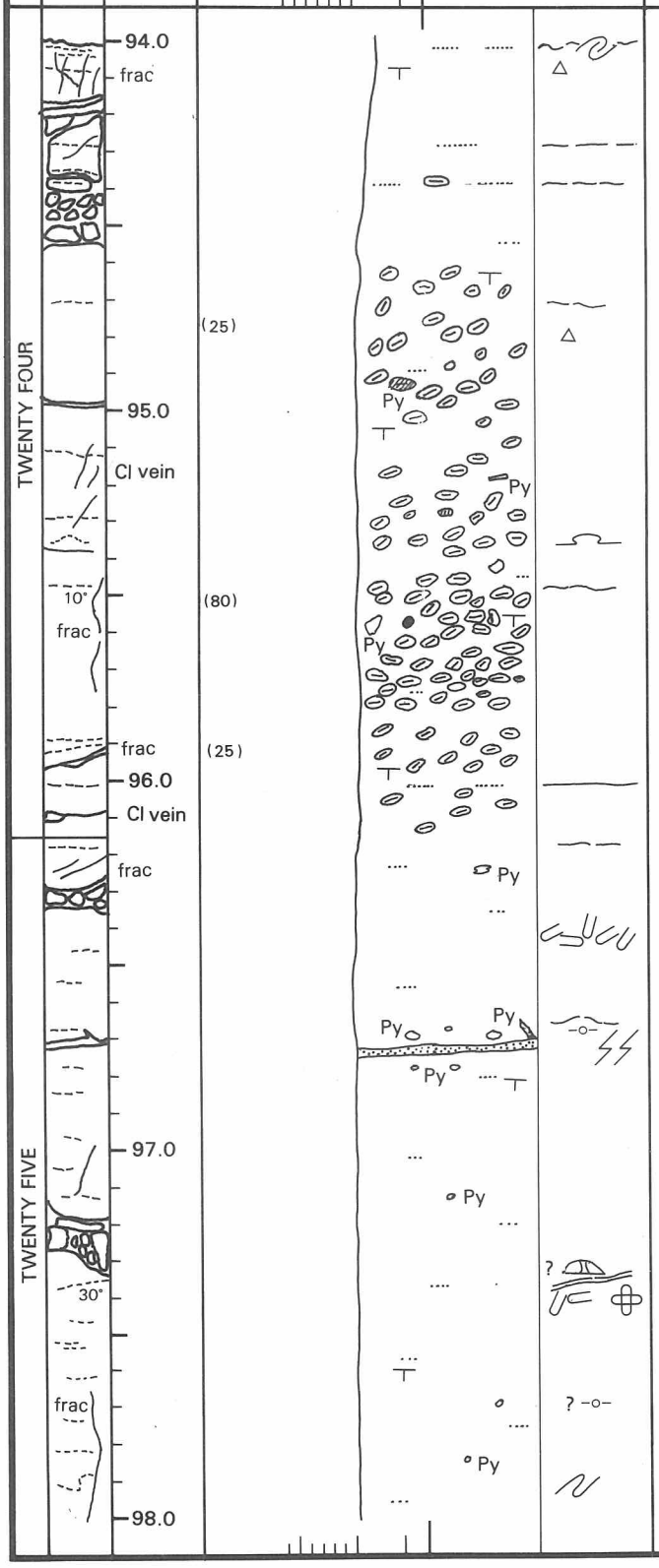
Matrix is **medium to fine sandstone** (dark olive grey 2.5GY 4 1).

contact sharp –

PROJECT : CIROS -1

SHEET NO. : 19

SCALE : 1:20



DESCRIPTION

Sub-unit 5.1

93.91 — 121.16 m

MUDSTONE

Hard, weakly stratified (mm- and cm-bedded), moderately well sorted, **sandy mudstone** (greenish grey to olive grey 5BG 4/1 to 5GY 4/1).

Stratification is wispy mainly horizontal, but is locally contorted and dips up to 40 .

A few scattered lonestones mostly 5 to 10 mm long, but one granite at 105.50 m is >160 mm. Lithologies are basement, dolerite and volcanic.

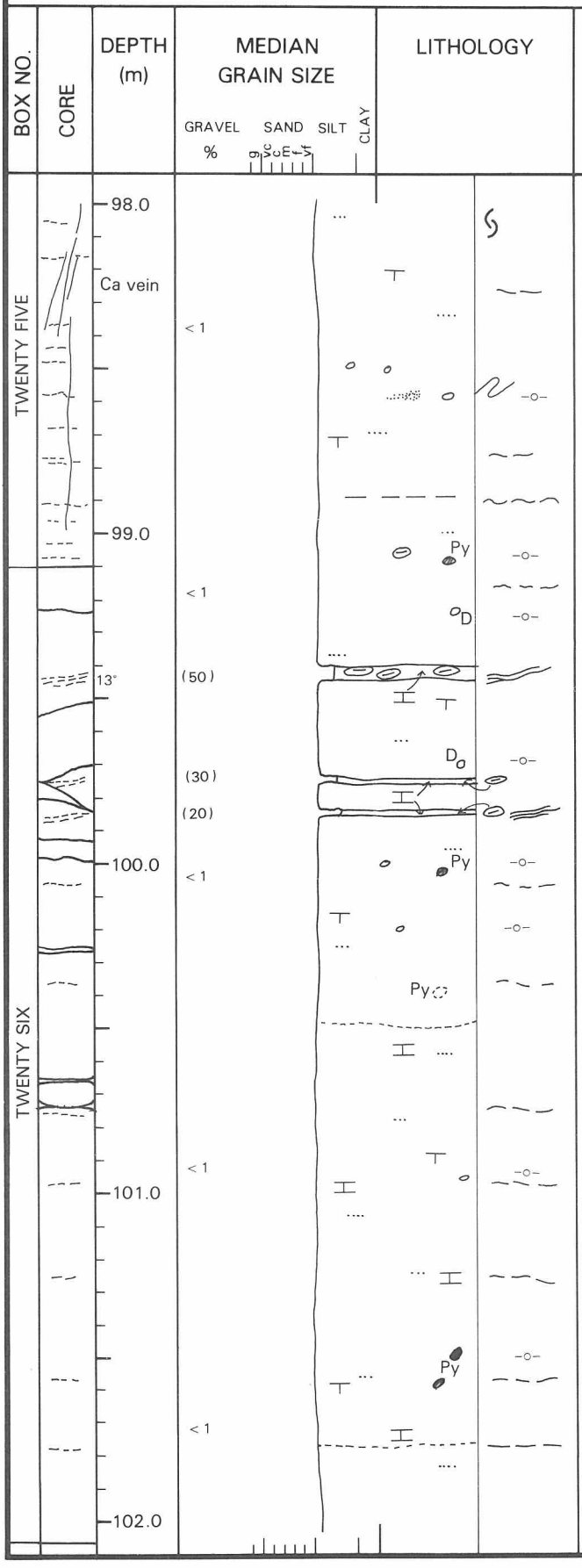
The sub-unit is brecciated with sandy mudstone matrix between 94.60 and 96.10 m. Below this the sub-unit becomes slightly calcareous and changes colour to dark olive grey to grey (5GY 4/1 to 7.5Y 4.1). No brecciation can be seen but the pervasive, wispy stratification and mottling, along with definite burrowing locally, indicate moderately strong bioturbation. Most burrows are 1 to 2 mm wide and range from horizontal to vertical. A few burrows are 10 mm wide.

Three pale grey flake breccia beds of strongly calcareous, **mudstone** at 99.40 to 99.44, 99.73 to 99.74 and 99.84 to 99.85 m. Dykes of poorly sorted, **fine sandstone** at 96.10, 96.72, 109.10 and 111.60 m. Possible echinoids at 97.35, 111.25 and 111.53 m. Scattered nodular and disseminated pyrite crystals.

PROJECT : CIROS -1

SHEET NO. : 20

SCALE : 1:20



Sub-unit 5.1

93.91 - 121.16 m

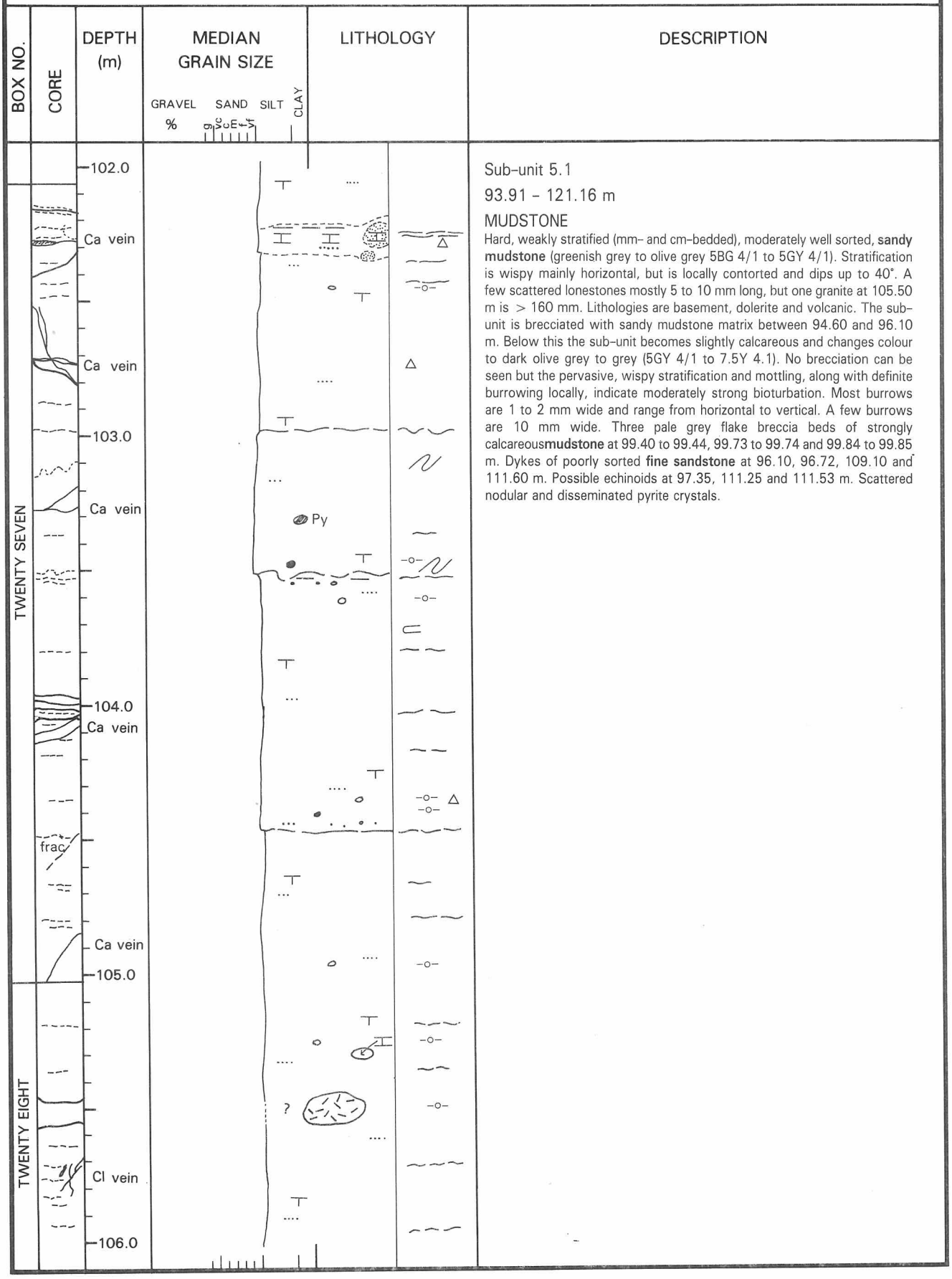
MUDSTONE

Hard, weakly stratified (mm- and cm-bedded), moderately well sorted, **sandy mudstone** (greenish grey to olive grey 5BG 4/1 to 5GY 4/1). Stratification is wispy mainly horizontal, but is locally contorted and dips up to 40°. A few scattered lonestones mostly 5 to 10 mm long, but one granite at 105.50 m is > 160 mm. Lithologies are basement, dolerite and volcanic. The sub-unit is brecciated with sandy mudstone matrix between 94.60 and 96.10 m. Below this the sub-unit becomes slightly calcareous and changes colour to dark olive grey to grey (5GY 4/1 to 7.5Y 4.1). No brecciation can be seen but the pervasive, wispy stratification and mottling, along with definite burrowing locally, indicate moderately strong bioturbation. Most burrows are 1 to 2 mm wide and range from horizontal to vertical. A few burrows are 10 mm wide. Three pale grey flake breccia beds of strongly calcareous**mudstone** at 99.40 to 99.44, 99.73 to 99.74 and 99.84 to 99.85 m. Dykes of poorly sorted **fine sandstone** at 96.10, 96.72, 109.10 and 111.60 m. Possible echinoids at 97.35, 111.25 and 111.53 m. Scattered nodular and disseminated pyrite crystals.

PROJECT : CIROS -1

SHEET NO. : 21

SCALE : 1:20



Sub-unit 5.1

93.91 - 121.16 m

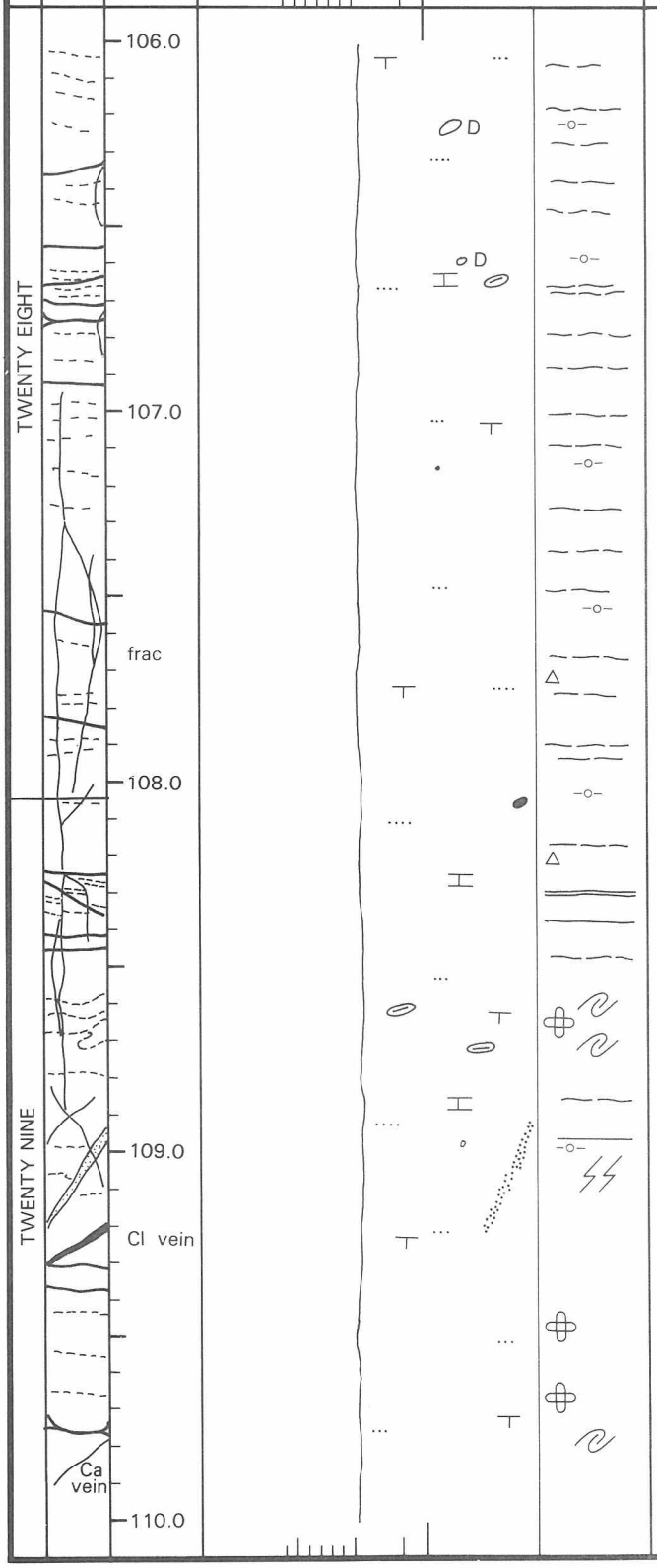
MUDSTONE

Hard, weakly stratified (mm- and cm-bedded), moderately well sorted, **sandy mudstone** (greenish grey to olive grey 5BG 4/1 to 5GY 4/1). Stratification is wispy mainly horizontal, but is locally contorted and dips up to 40°. A few scattered lonestones mostly 5 to 10 mm long, but one granite at 105.50 m is > 160 mm. Lithologies are basement, dolerite and volcanic. The sub-unit is brecciated with sandy mudstone matrix between 94.60 and 96.10 m. Below this the sub-unit becomes slightly calcareous and changes colour to dark olive grey to grey (5GY 4/1 to 7.5Y 4.1). No brecciation can be seen but the pervasive, wispy stratification and mottling, along with definite burrowing locally, indicate moderately strong bioturbation. Most burrows are 1 to 2 mm wide and range from horizontal to vertical. A few burrows are 10 mm wide. Three pale grey flake breccia beds of strongly calcareous**mudstone** at 99.40 to 99.44, 99.73 to 99.74 and 99.84 to 99.85 m. Dykes of poorly sorted **fine sandstone** at 96.10, 96.72, 109.10 and 111.60 m. Possible echinoids at 97.35, 111.25 and 111.53 m. Scattered nodular and disseminated pyrite crystals.

PROJECT : CIROS -1

SHEET NO. : 22

SCALE : 1:20



DESCRIPTION

Sub-unit 5.1

93.91 - 121.16 m

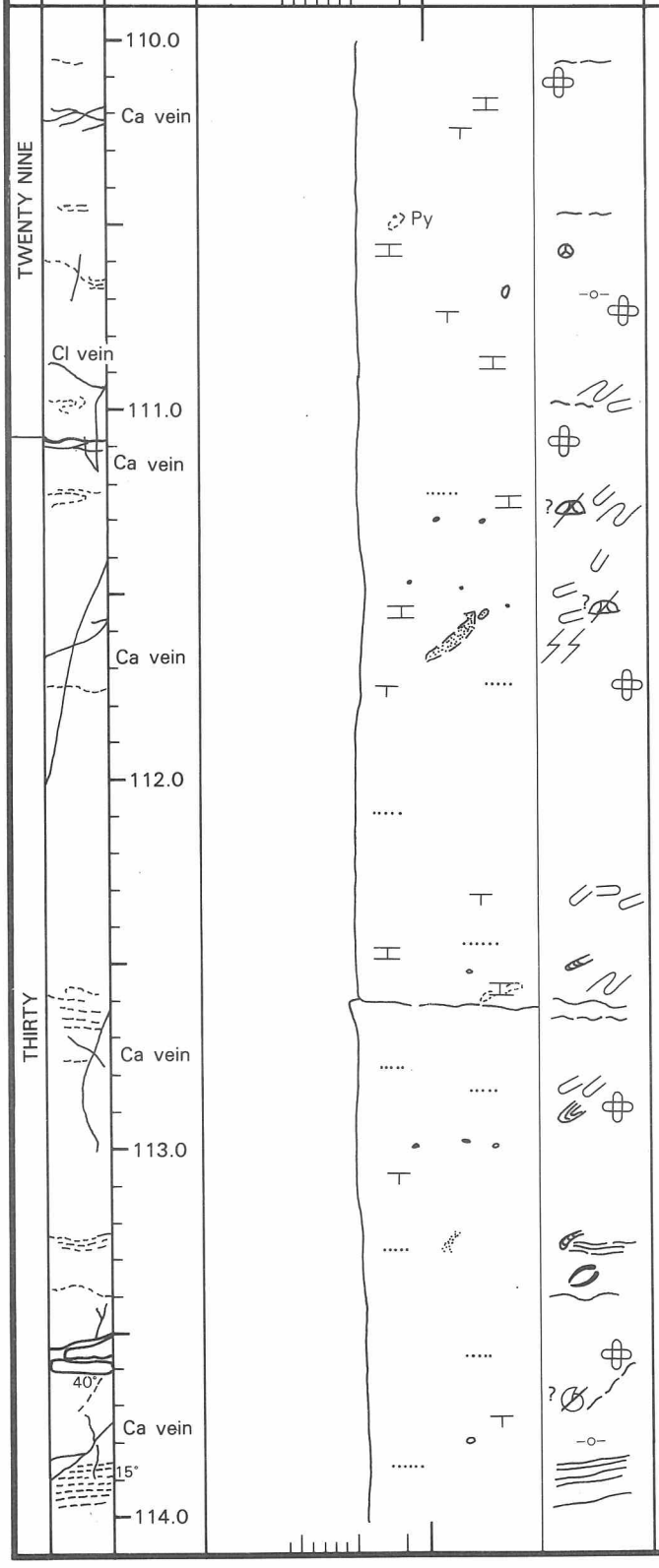
MUDSTONE

Hard, weakly stratified (mm- and cm-bedded), moderately well sorted, **sandy mudstone** (greenish grey to olive grey 5BG 4/1 to 5GY 4/1). Stratification is wispy mainly horizontal, but is locally contorted and dips up to 40°. A few scattered lonestones mostly 5 to 10 mm long, but one granite at 105.50 m is > 160 mm. Lithologies are basement, dolerite and volcanic. The sub-unit is brecciated with sandy mudstone matrix between 94.60 and 96.10 m. Below this the sub-unit becomes slightly calcareous and changes colour to dark olive grey to grey (5GY 4/1 to 7.5Y 4.1). No brecciation can be seen but the pervasive, wispy stratification and mottling, along with definite burrowing locally, indicate moderately strong bioturbation. Most burrows are 1 to 2 mm wide and range from horizontal to vertical. A few burrows are 10 mm wide. Three pale grey flake breccia beds of strongly calcareous**mudstone** at 99.40 to 99.44, 99.73 to 99.74 and 99.84 to 99.85 m. Dykes of poorly sorted **fine sandstone** at 96.10, 96.72, 109.10 and 111.60 m. Possible echinoids at 97.35, 111.25 and 111.53 m. Scattered nodular and disseminated pyrite crystals.

PROJECT : CIROS -1

SHEET NO. : 23

SCALE : 1:20



Sub-unit 5.1

93.91 - 121.16 m

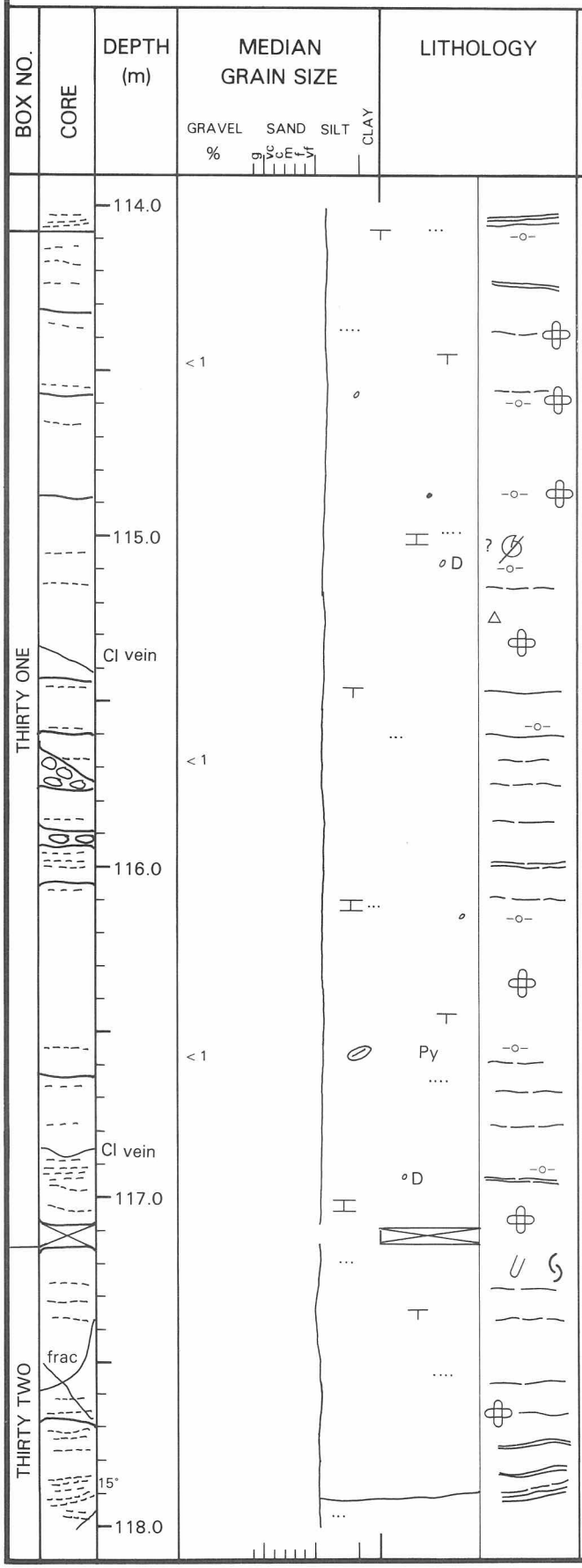
MUDSTONE

Hard, weakly stratified (mm- and cm-bedded), moderately well sorted, **sandy mudstone** (greenish grey to olive grey 5BG 4/1 to 5GY 4/1). Stratification is wispy mainly horizontal, but is locally contorted and dips up to 40°. A few scattered lonestones mostly 5 to 10 mm long, but one granite at 105.50 m is > 160 mm. Lithologies are basement, dolerite and volcanic. The sub-unit is brecciated with sandy mudstone matrix between 94.60 and 96.10 m. Below this the sub-unit becomes slightly calcareous and changes colour to dark olive grey to grey (5GY 4/1 to 7.5Y 4.1). No brecciation can be seen but the pervasive, wispy stratification and mottling, along with definite burrowing locally, indicate moderately strong bioturbation. Most burrows are 1 to 2 mm wide and range from horizontal to vertical. A few burrows are 10 mm wide. Three pale grey flake breccia beds of strongly calcareous**mudstone** at 99.40 to 99.44, 99.73 to 99.74 and 99.84 to 99.85 m. Dykes of poorly sorted **fine sandstone** at 96.10, 96.72, 109.10 and 111.60 m. Possible echinoids at 97.35, 111.25 and 111.53 m. Scattered nodular and disseminated pyrite crystals.

PROJECT : CIROS -1

SHEET NO. : 24

SCALE : 1:20



DESCRIPTION

Sub-unit 5.1

93.91 - 121.16 m

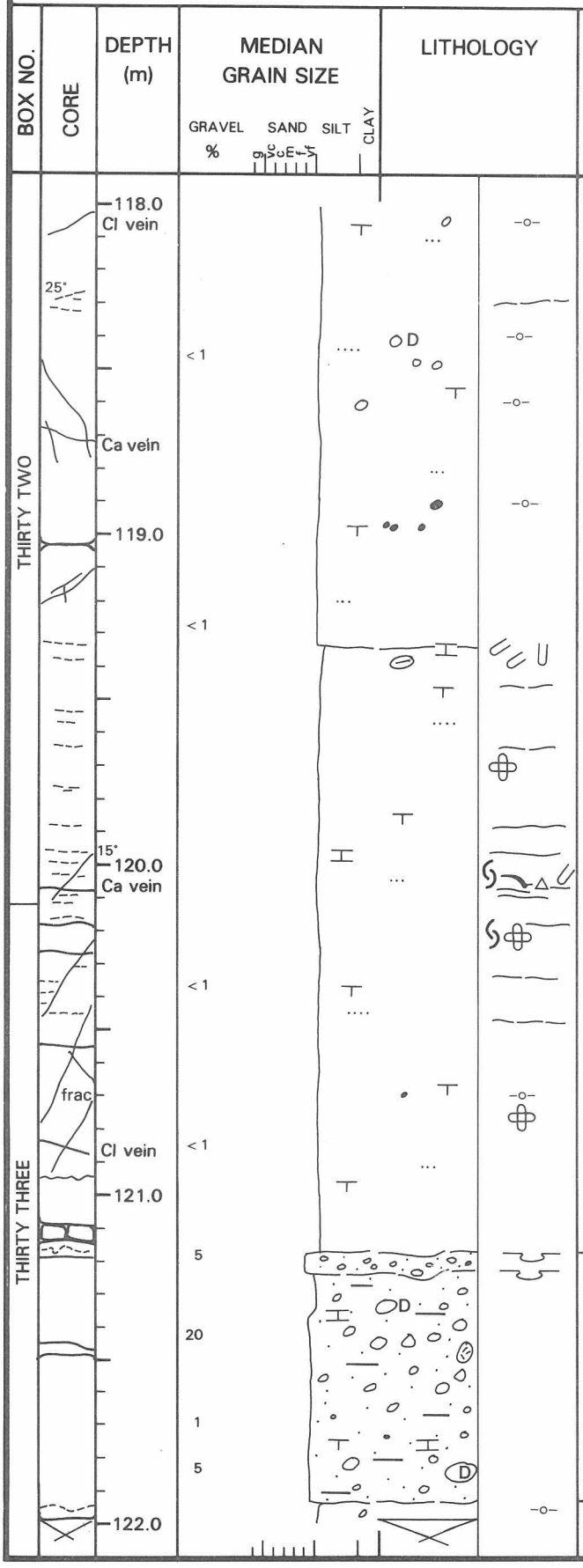
MUDSTONE

Hard, weakly stratified (mm- and cm-bedded), moderately well sorted, **sandy mudstone** (greenish grey to olive grey 5BG 4/1 to 5GY 4/1). Stratification is wispy mainly horizontal, but is locally contorted and dips up to 40°. A few scattered lonestones mostly 5 to 10 mm long, but one granite at 105.50 m is > 160 mm. Lithologies are basement, dolerite and volcanic. The sub-unit is brecciated with sandy mudstone matrix between 94.60 and 96.10 m. Below this the sub-unit becomes slightly calcareous and changes colour to dark olive grey to grey (5GY 4/1 to 7.5Y 4.1). No brecciation can be seen but the pervasive, wispy stratification and mottling, along with definite burrowing locally, indicate moderately strong bioturbation. Most burrows are 1 to 2 mm wide and range from horizontal to vertical. A few burrows are 10 mm wide. Three pale grey flake breccia beds of strongly calcareous**mudstone** at 99.40 to 99.44, 99.73 to 99.74 and 99.84 to 99.85 m. Dykes of poorly sorted **fine sandstone** at 96.10, 96.72, 109.10 and 111.60 m. Possible echinoids at 97.35, 111.25 and 111.53 m. Scattered nodular and disseminated pyrite crystals.

PROJECT : CIROS -1

SHEET NO. : 25

SCALE : 1:20



Sub-unit 5.1

93.91 - 121.16 m

MUDSTONE

Hard, weakly stratified (mm- and cm-bedded), moderately well sorted, **sandy mudstone** (greenish grey to olive grey 5BG 4/1 to 5GY 4/1). Stratification is wispy mainly horizontal, but is locally contorted and dips up to 40°. A few scattered lonestones mostly 5 to 10 mm long, but one granite at 105.50 m is > 160 mm. Lithologies are basement, dolerite and volcanic. The sub-unit is brecciated with sandy mudstone matrix between 94.60 and 96.10 m. Below this the sub-unit becomes slightly calcareous and changes colour to dark olive grey to grey (5GY 4/1 to 7.5Y 4.1). No brecciation can be seen but the pervasive, wispy stratification and mottling, along with definite burrowing locally, indicate moderately strong bioturbation. Most burrows are 1 to 2 mm wide and range from horizontal to vertical. A few burrows are 10 mm wide. Three pale grey flake breccia beds of strongly calcareous**mudstone** at 99.40 to 99.44, 99.73 to 99.74 and 99.84 to 99.85 m. Dykes of poorly sorted **fine sandstone** at 96.10, 96.72, 109.10 and 111.60 m. Possible echinoids at 97.35, 111.25 and 111.53 m. Scattered nodular and disseminated pyrite crystals.

contact gradational over a few mm and slightly deformed -

Sub-unit 6.1

121.16 - 121.93 m

DIAMICTITE

Hard, slightly calcareous, weakly stratified, **conglomeratic muddy fine sandstone (diamictite)** (grey 7.5Y 4/1).

Stratification is on a cm scale, and is diffuse and irregular. Bounding contacts show soft sediment deformation.

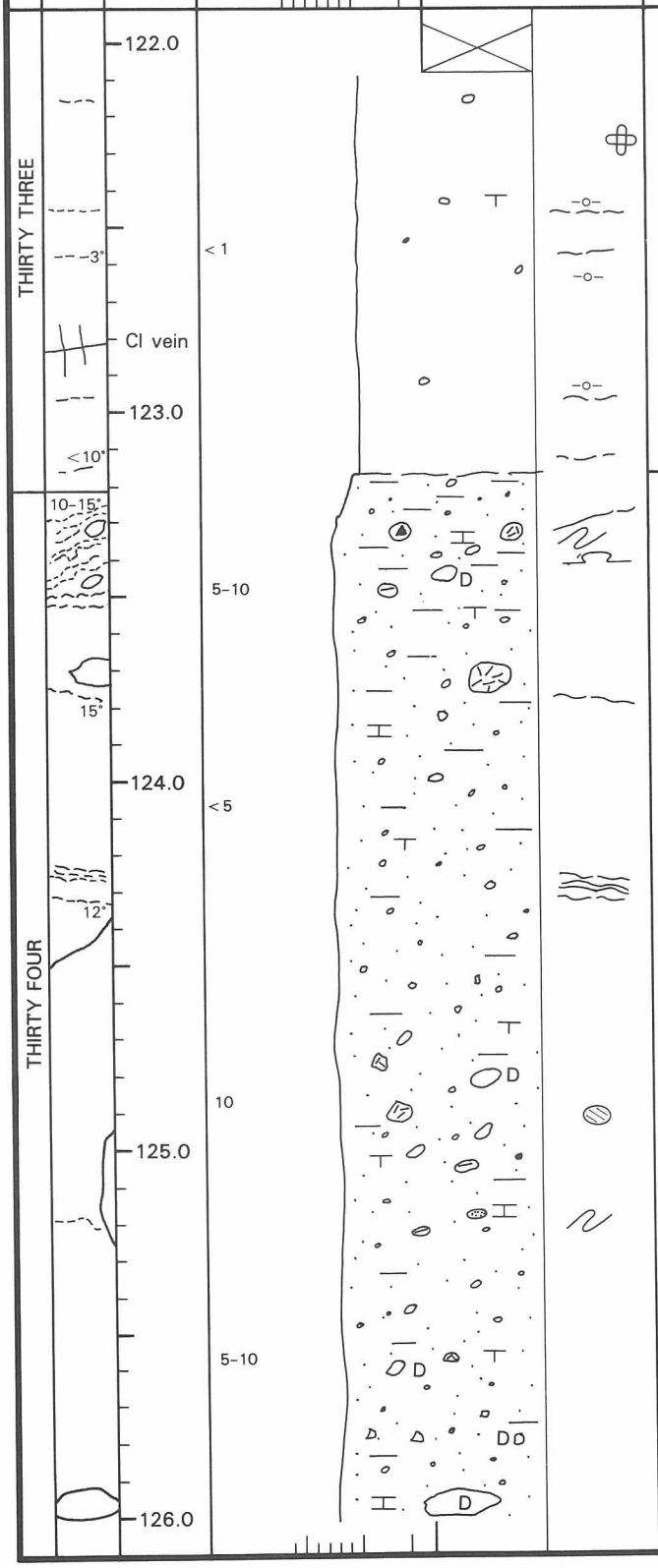
Clast content is variable, forming 1 to 20% of the core. They range up to 30 mm long. Most are subangular to subrounded. About 60% are basement, 30% are dolerite and <10% are volcanic.

contact gradational over a few mm and slightly deformed -

PROJECT : CIROS -1

SHEET NO. : 26

SCALE : 1:20



Sub-unit 6.2

121.93 - 123.15 m

MUDSTONE

Hard, weakly stratified (mm-bedded), moderately well sorted to poorly sorted, **sandy mudstone** (grey 7.5Y 4/1).

Stratification is wispy and irregular, suggestive of bioturbation. It is mainly horizontal but locally dips at up to 10 .

A few subangular bedrock clasts from 5 to 11 mm long.

contact gradational over 2 to 5 cm

Sub-unit 6.3

123.15 - 126.36 m

DIAMICTITE

Hard, slightly calcareous, unstratified to weakly stratified (mm- to cm-bedded), **conglomeratic muddy fine sandstone** (grey 10Y 4/1).

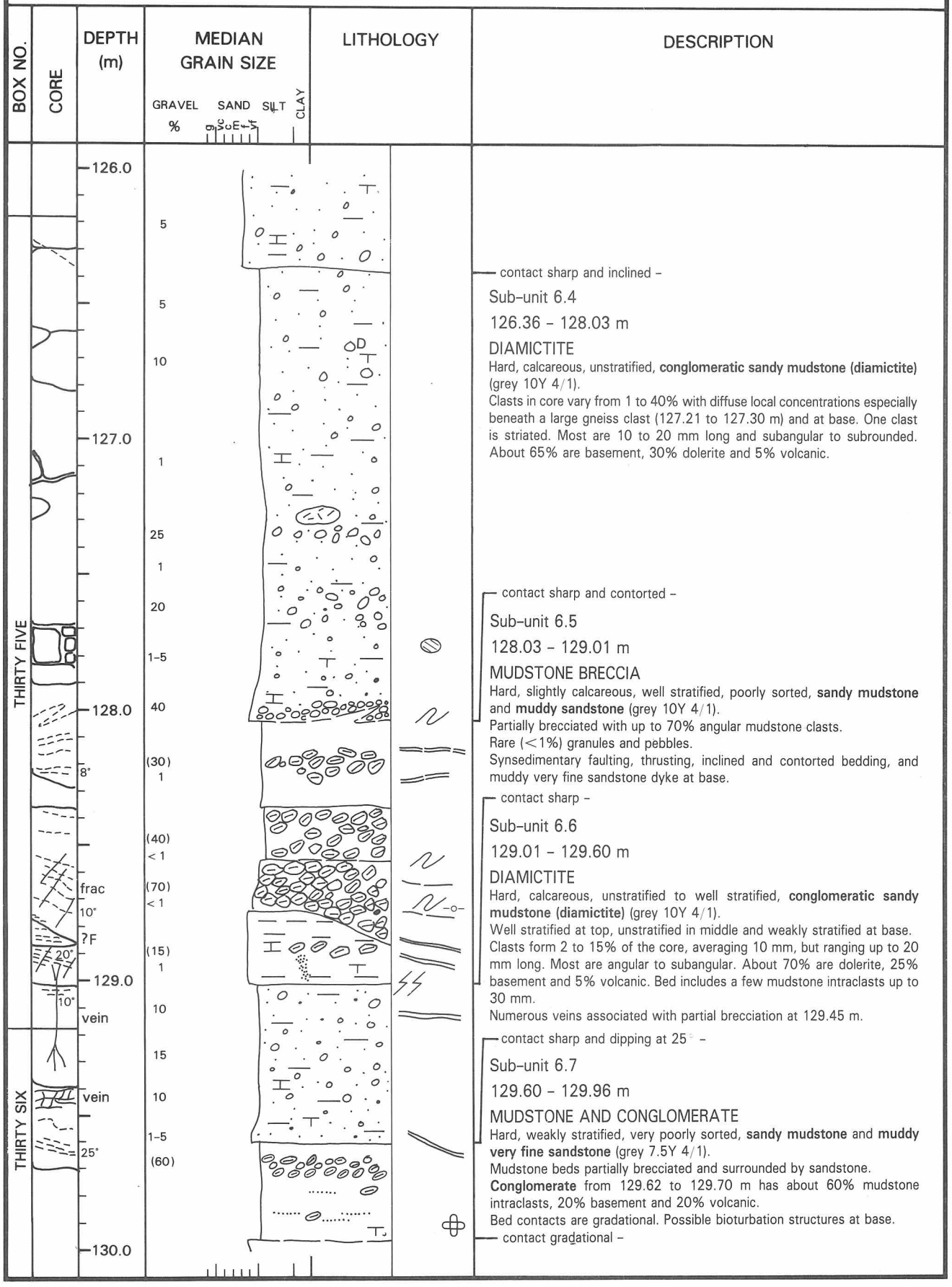
Stratification includes horizontal and inclined (10-15) bedding, contorted in places.

Clasts form 5 to 10% of the core, averaging 10 to 15 mm, and reaching 60 mm, in length. Clasts are mostly subrounded, one is striated. They consist of equal proportions of basement and dolerite. Occasional mudstone and sandstone intraclasts.

PROJECT : CIROS -1

SHEET NO. : 27

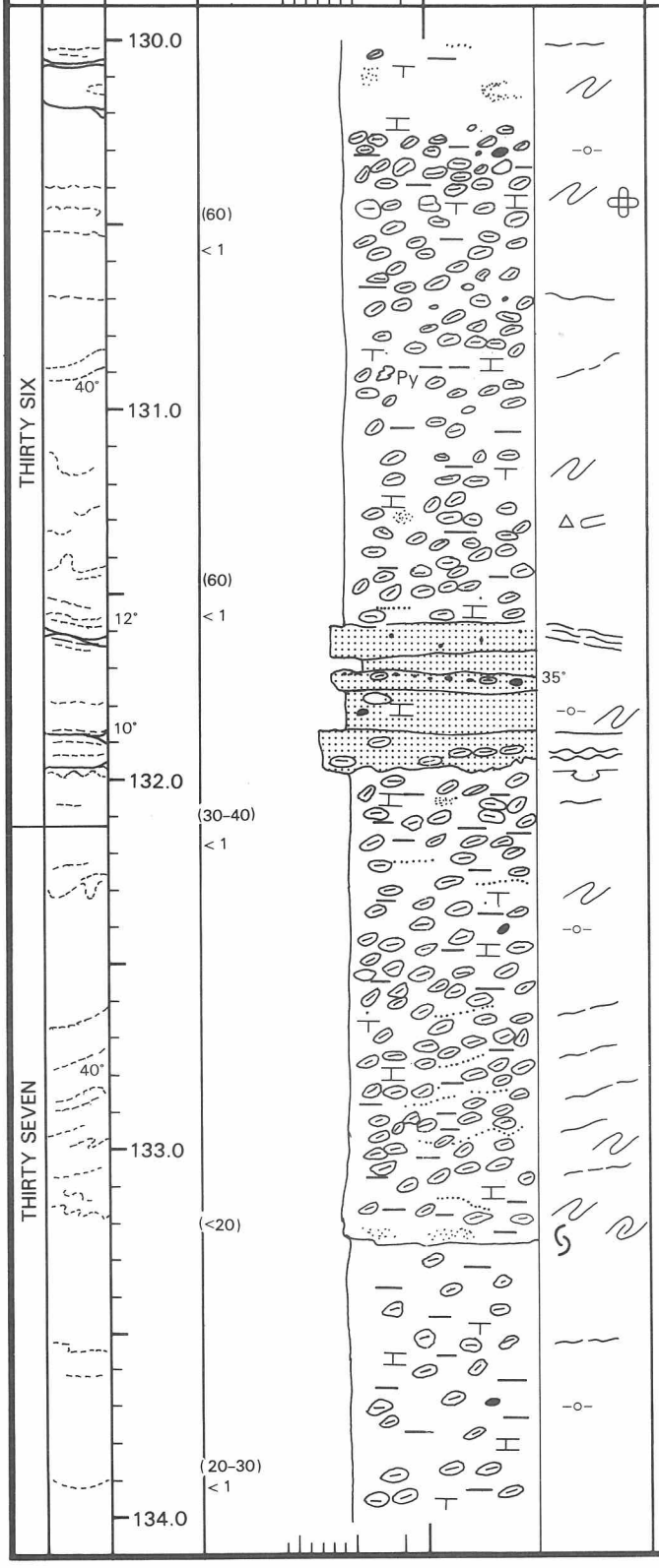
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 28

SCALE : 1:20



Sub-unit 7.1

129.96 - 136.01 m

MUDSTONE

Hard, calcareous, unstratified to weakly stratified, poorly sorted, intraformational **mudstone clast breccia** with a sandy mudstone matrix (grey 10Y 4/1).

Stratification is generally discontinuous and variable in dip up to 40 .

Mudstone clasts average 8 to 12 mm long. Bedrock clasts form <1% of the core, and are either basement or dolerite.

The sub-unit includes thin beds of **fine to very fine sandstone** (olive black N 3/1) that are contorted and occasionally disrupted. Sandstone dykes occur irregularly throughout the sub-unit.

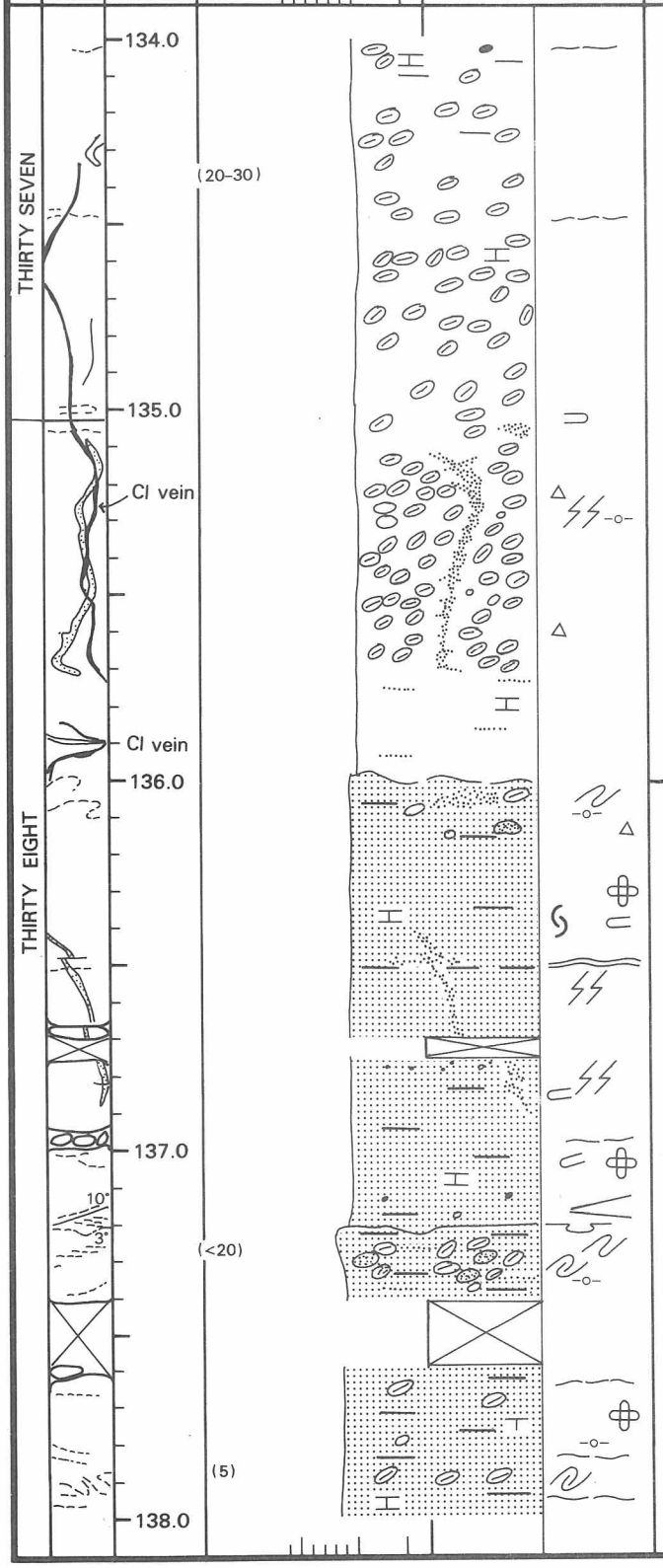
Two beds of **muddy medium to very fine sandstone** (dark greenish grey 7.5GY 4/1 to 3/1) from 129.96 to 130.25 m and 131.58 to 131.97 m with irregular and contorted bedding.

A few burrows and bioturbation structures.

PROJECT : CIROS -1

SHEET NO. : 29

SCALE : 1:20



Sub-unit 7.1

129.96 - 136.01 m

MUDSTONE

Hard, calcareous, unstratified to weakly stratified, poorly sorted, intraformational **mudstone clast breccia** with a sandy mudstone matrix (grey 10Y 4/1). Stratification is generally discontinuous and variable in dip up to 40°. Mudstone clasts average 8 to 12 mm long. Bedrock clasts form < 1% of the core, and are either basement or dolerite. The sub-unit includes thin beds of **fine to very fine sandstone** (olive black N 3/1) that are contorted and occasionally disrupted. Sandstone dykes occur irregularly throughout the sub-unit. Two beds of **muddy medium to very fine sandstone** (dark greenish grey 7.5GY 4/1 to 3/1) from 129.96 to 130.25 m and 131.58 to 131.97 m with irregular and contorted bedding. A few burrows and bioturbation structures.

— contact gradational over 20 cm –

Sub-unit 8.1

136.01 - 152.94 m

SANDSTONE

Hard to moderately hard (but soft in a few places), calcareous, unstratified to weakly stratified and well stratified (mm-bedded), moderately well sorted, **fine to very fine sandstone** (dark olive grey 5GY 3/1 to 4/1).

Muddy near top of sub-unit. Patches of greater carbonate cementation are slightly lighter (olive grey 2.5GY 5/1).

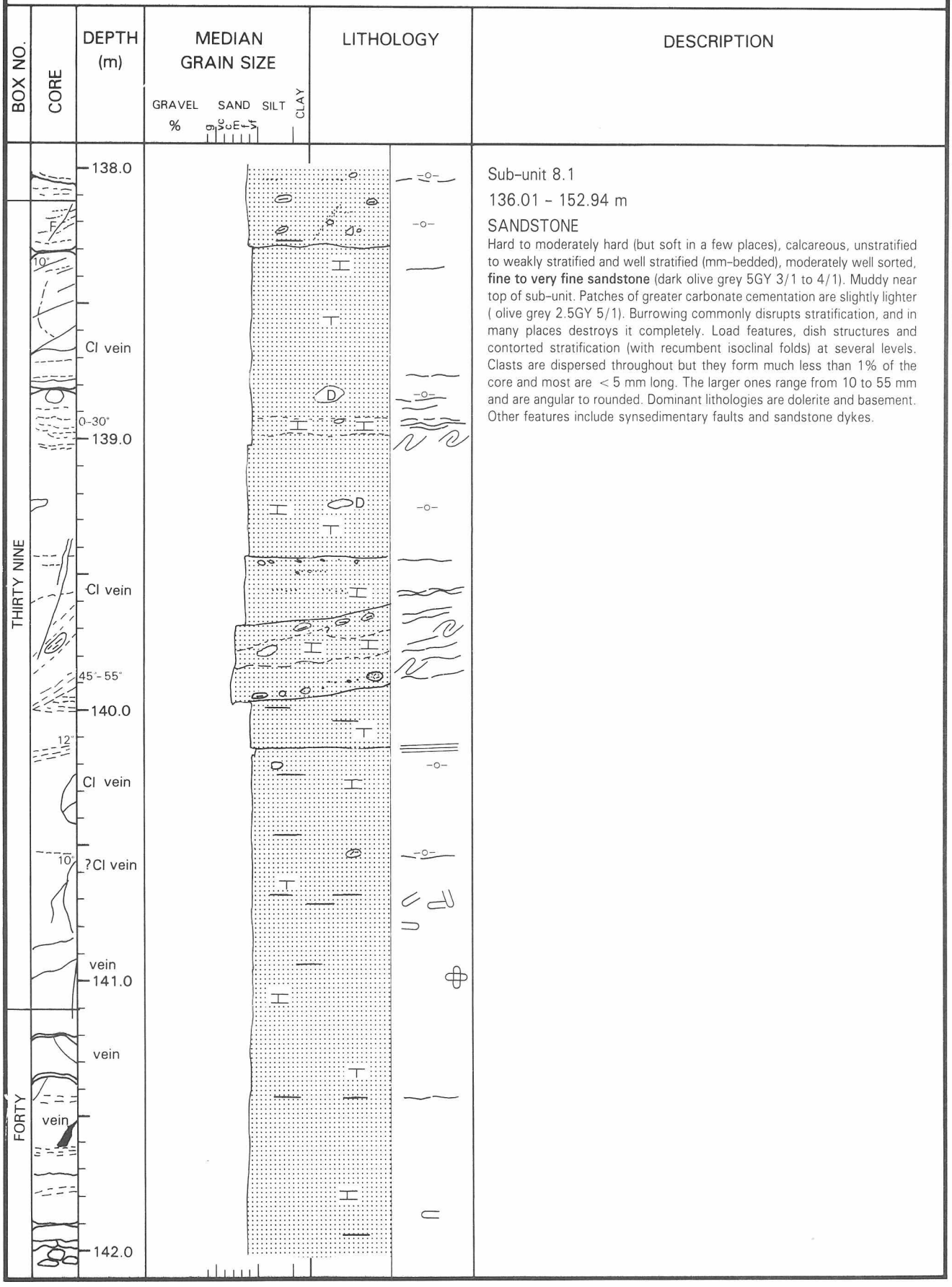
Burrowing commonly disrupts stratification, and in many places destroys it completely. Load features, dish structures and contorted stratification (with recumbent isoclinal folds) at several levels.

Clasts are dispersed throughout but they form much less than 1% of the core and most are <5 mm long. The larger ones range from 10 to 55 mm and are angular to rounded. Dominant lithologies are dolerite and basement. Other features include synsedimentary faults and sandstone dykes.

PROJECT : CIROS -1

SHEET NO. : 30

SCALE : 1:20



Sub-unit 8.1

136.01 - 152.94 m

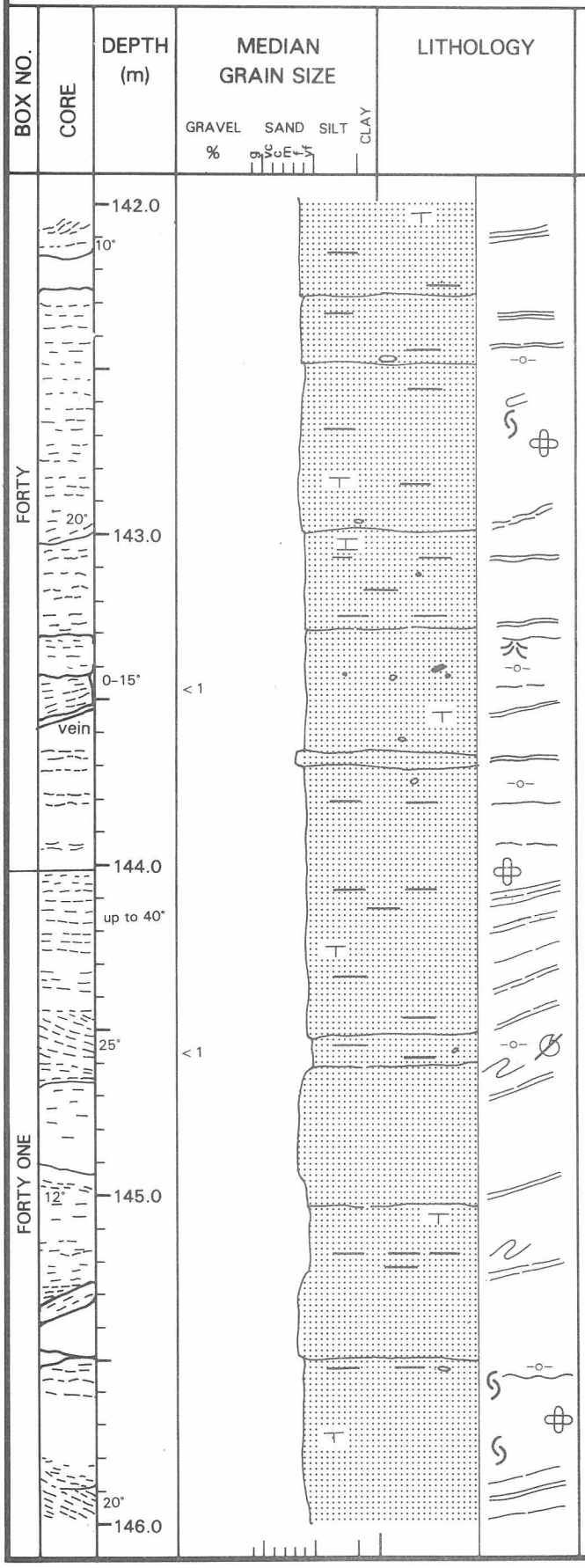
SANDSTONE

Hard to moderately hard (but soft in a few places), calcareous, unstratified to weakly stratified and well stratified (mm-bedded), moderately well sorted, **fine to very fine sandstone** (dark olive grey 5GY 3/1 to 4/1). Muddy near top of sub-unit. Patches of greater carbonate cementation are slightly lighter (olive grey 2.5GY 5/1). Burrowing commonly disrupts stratification, and in many places destroys it completely. Load features, dish structures and contorted stratification (with recumbent isoclinal folds) at several levels. Clasts are dispersed throughout but they form much less than 1% of the core and most are < 5 mm long. The larger ones range from 10 to 55 mm and are angular to rounded. Dominant lithologies are dolerite and basement. Other features include synsedimentary faults and sandstone dykes.

PROJECT : CIROS -1

SHEET NO. : 31

SCALE : 1:20



DESCRIPTION

Sub-unit 8.1

136.01 - 152.94 m

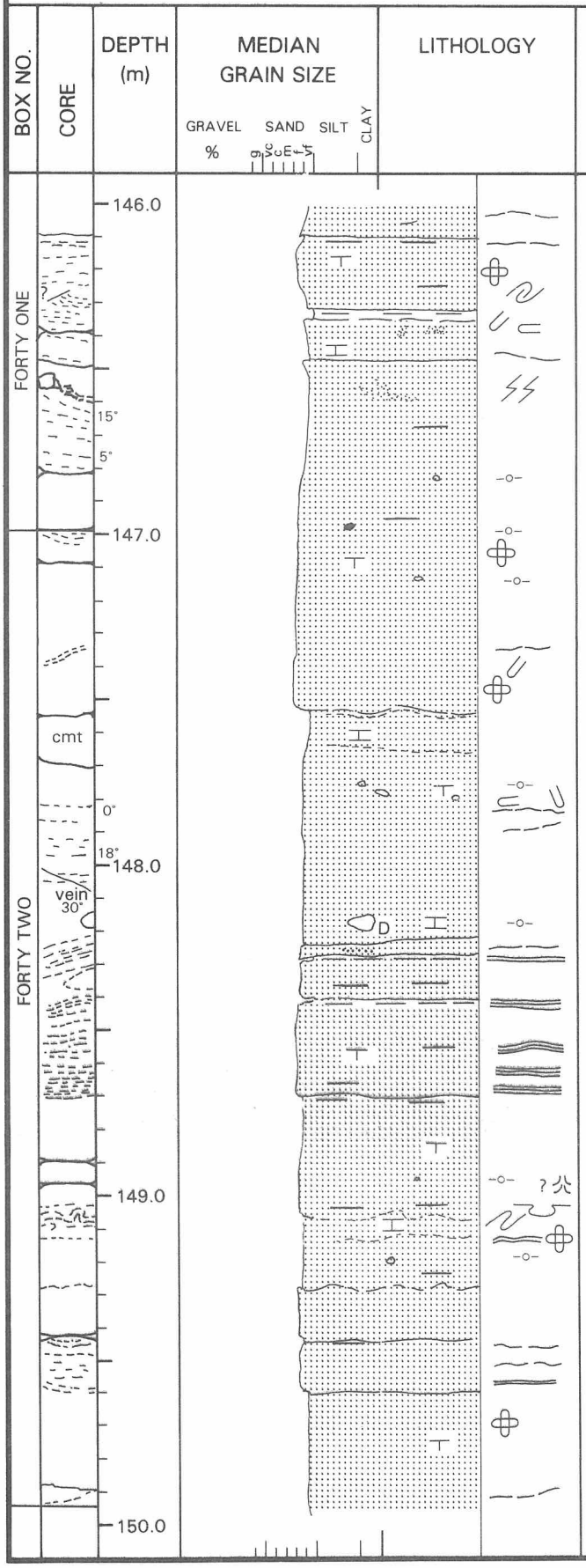
SANDSTONE

Hard to moderately hard (but soft in a few places), calcareous, unstratified to weakly stratified and well stratified (mm-bedded), moderately well sorted, **fine to very fine sandstone** (dark olive grey 5GY 3/1 to 4/1). Muddy near top of sub-unit. Patches of greater carbonate cementation are slightly lighter (olive grey 2.5GY 5/1). Burrowing commonly disrupts stratification, and in many places destroys it completely. Load features, dish structures and contorted stratification (with recumbent isoclinal folds) at several levels. Clasts are dispersed throughout but they form much less than 1% of the core and most are < 5 mm long. The larger ones range from 10 to 55 mm and are angular to rounded. Dominant lithologies are dolerite and basement. Other features include synsedimentary faults and sandstone dykes.

PROJECT : CIROS -1

SHEET NO. : 32

SCALE : 1:20



DESCRIPTION

Sub-unit 8.1

136.01 - 152.94 m

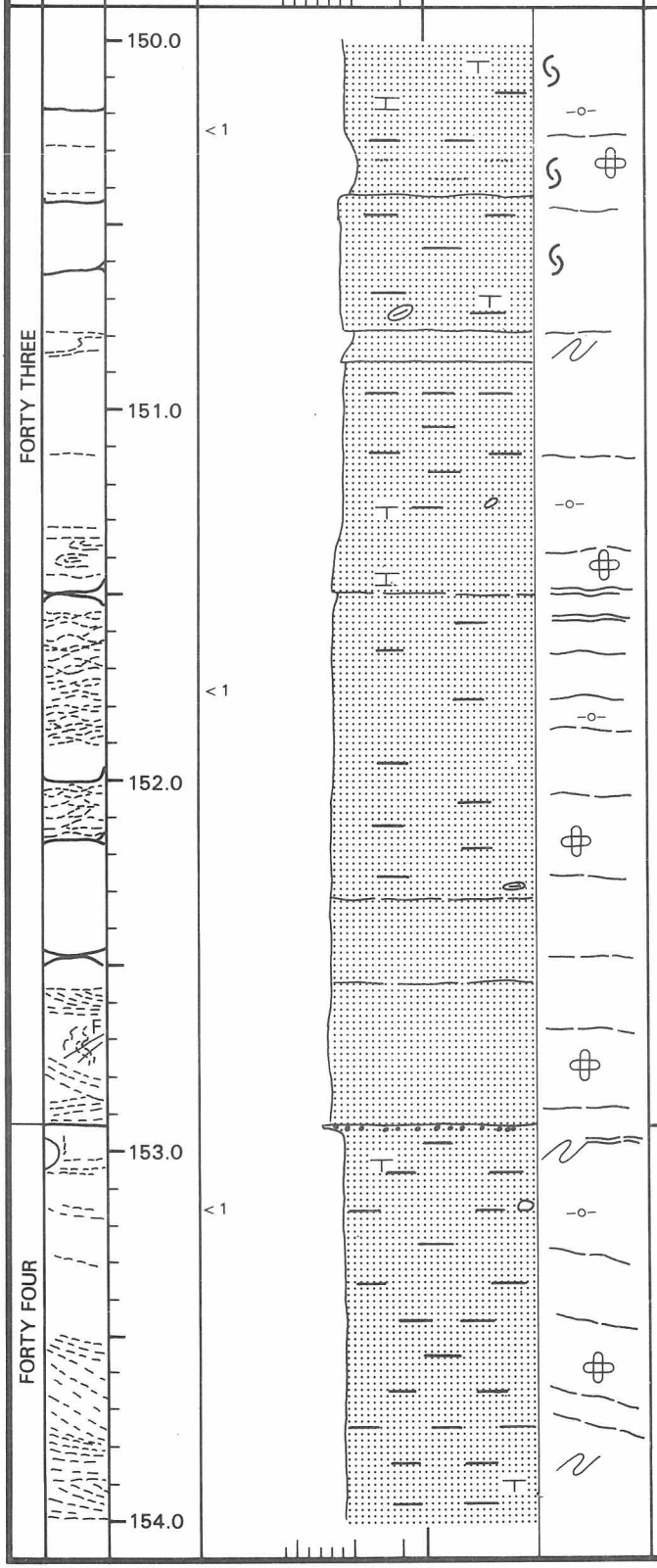
SANDSTONE

Hard to moderately hard (but soft in a few places), calcareous, unstratified to weakly stratified and well stratified (mm-bedded), moderately well sorted, **fine to very fine sandstone** (dark olive grey 5GY 3/1 to 4/1). Muddy near top of sub-unit. Patches of greater carbonate cementation are slightly lighter (olive grey 2.5GY 5/1). Burrowing commonly disrupts stratification, and in many places destroys it completely. Load features, dish structures and contorted stratification (with recumbent isoclinal folds) at several levels Clasts are dispersed throughout but they form much less than 1% of the core and most are < 5 mm long. The larger ones range from 10 to 55 mm and are angular to rounded. Dominant lithologies are dolerite and basement. Other features include synsedimentary faults and sandstone dykes.

PROJECT : CIROS -1

SHEET NO. : 33

SCALE : 1:20



DESCRIPTION

Sub-unit 8.1

136.01 - 152.94 m

SANDSTONE

Hard to moderately hard (but soft in a few places), calcareous, unstratified to weakly stratified and well stratified (mm-bedded), moderately well sorted, **fine to very fine sandstone** (dark olive grey 5GY 3/1 to 4/1). Muddy near top of sub-unit. Patches of greater carbonate cementation are slightly lighter (olive grey 2.5GY 5/1). Burrowing commonly disrupts stratification, and in many places destroys it completely. Load features, dish structures and contorted stratification (with recumbent isoclinal folds) at several levels. Clasts are dispersed throughout but they form much less than 1% of the core and most are < 5 mm long. The larger ones range from 10 to 55 mm and are angular to rounded. Dominant lithologies are dolerite and basement. Other features include synsedimentary faults and sandstone dykes.

— contact sharp with concentration of granules –

Sub-unit 8.2

152.94 - 156.31 m

SANDSTONE

Mainly hard, well stratified (mm- and cm-bedded), moderately sorted, **muddy fine sandstone** (grey 7.5GY 4/1) and minor sandy mudstone.

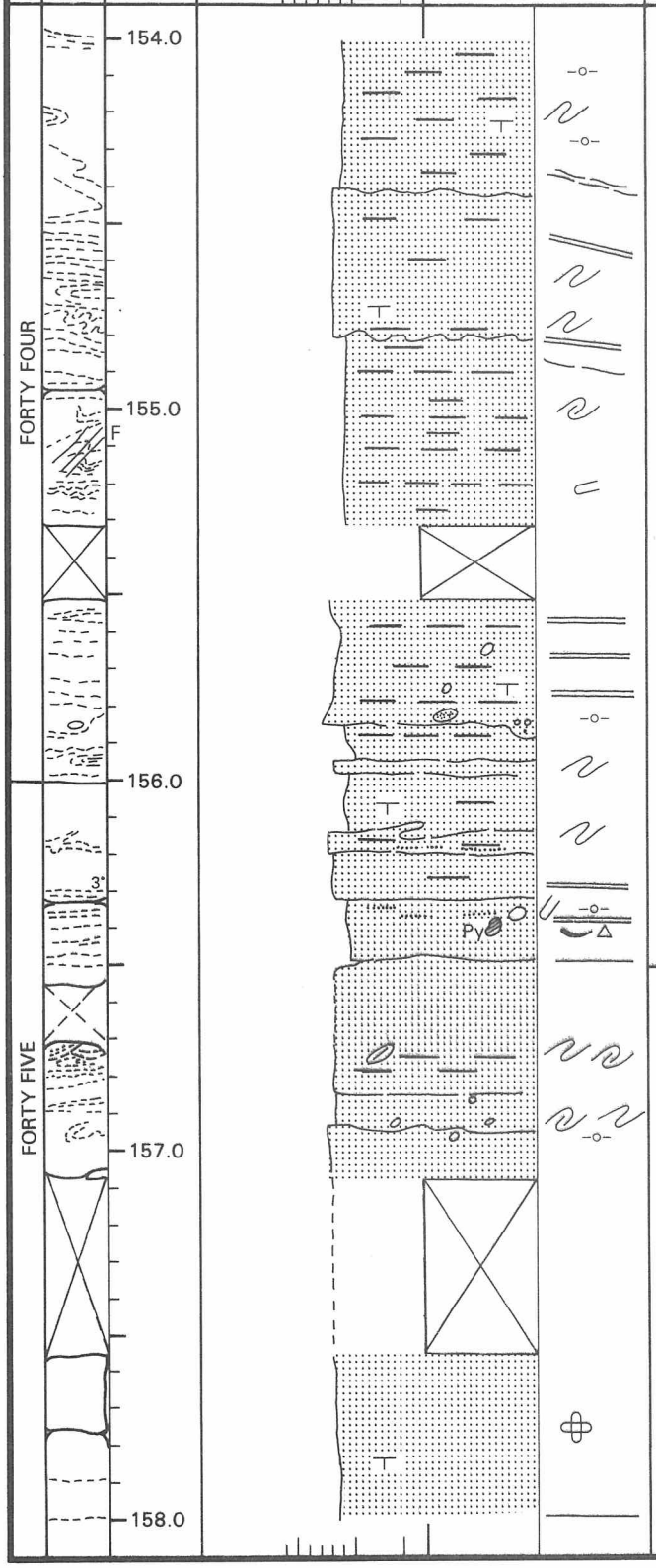
Stratification largely destroyed by bioturbation between 153.20 and 153.80 m. Elsewhere it varies from subhorizontal to overturned in isoclinal slump folds (horizontal fold axes) defined by sandy and muddy beds on a scale of 1 to 10 cm. Faulting followed folding. Bioturbated interval could be large foreset.

A few scattered clasts up to 8 mm long form <1% of the core.

PROJECT : CIROS -1

SHEET NO. : 34

SCALE : 1:20



Sub-unit 8.2

152.94 - 156.31 m

SANDSTONE

Mainly hard, well stratified (mm- and cm-bedded), moderately sorted, **muddy fine sandstone** (grey 7.5GY 4/1) and minor sandy mudstone. Stratification largely destroyed by bioturbation between 153.20 and 153.80 m. Elsewhere it varies from subhorizontal to overturned in isoclinal slump folds (horizontal fold axes) defined by sandy and muddy beds on a scale of 1 to 10 cm. Faulting followed folding. Biotubated interval could be large foreset. A few scattered clasts up to 8 mm long form < 1% of the core.

— contact sharp -

Sub-unit 9.1

156.31 - 158.57 m

SANDSTONE

Hard (in parts soft), weakly stratified (mm- and cm-bedded), moderately well sorted, **fine to very fine sandstone** (greenish grey to dark greenish grey 7.5GY 5/1 to 4 1).

Olive grey (2.5GY 6 1) patches of calcareous cement.

Stratification ranges from subhorizontal and discontinuous to disrupted and contorted. Normally graded bedding from 158.12 to 158.41 m.

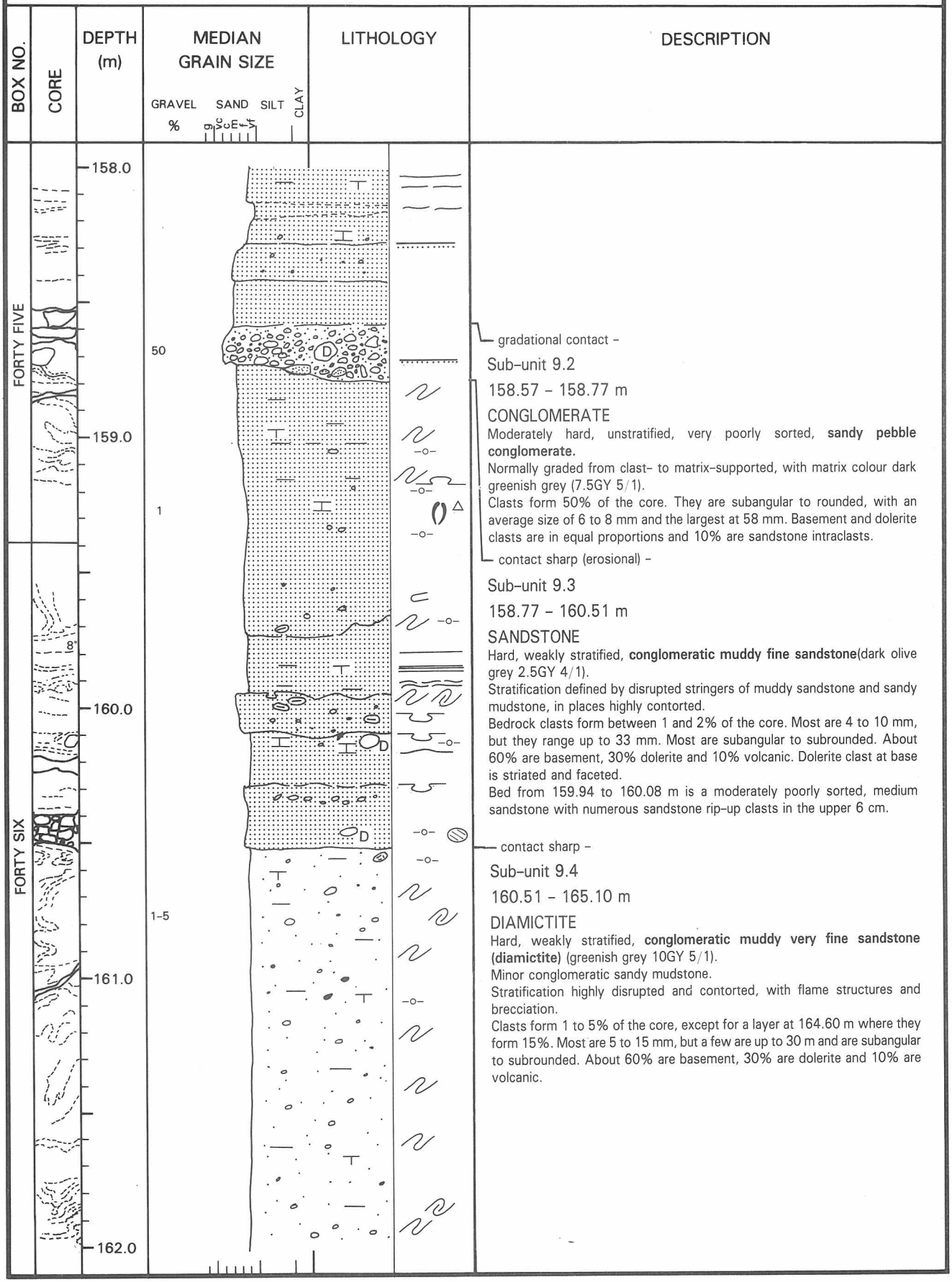
Rare bedrock lonestones and mudstone intraclasts.

Some burrows, shell moulds and nodular pyrite.

PROJECT : CIROS -1

SHEET NO. : 35

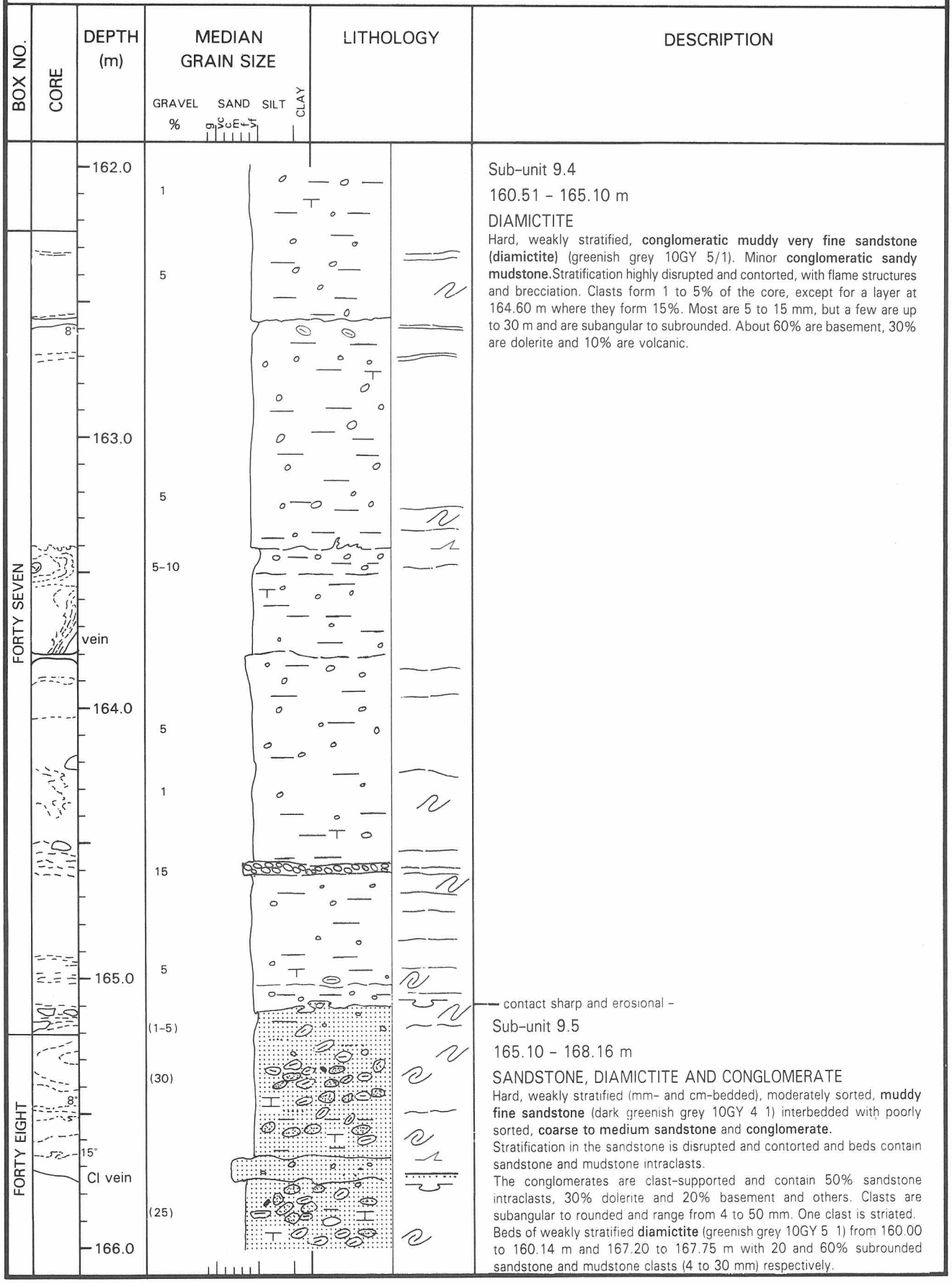
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 36

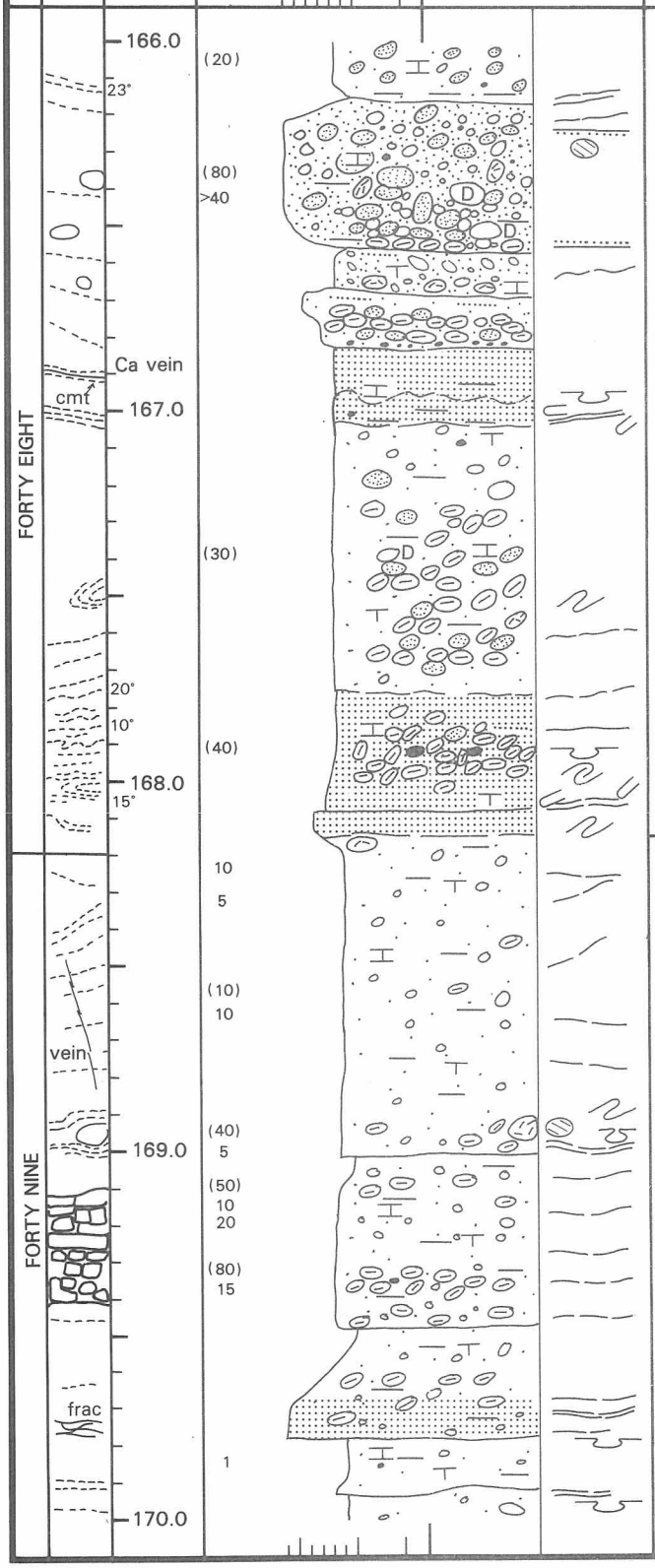
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 37

SCALE : 1:20



Sub-unit 9.5

165.10 - 168.16 m

SANDSTONE, DIAMICTITE AND CONGLOMERATE

Hard, weakly stratified (mm- and cm-bedded), moderately sorted, **muddy fine sandstone** (dark greenish grey 10GY 4/1) interbedded with poorly sorted, **coarse to medium sandstone** and **conglomerate.** Stratification in the sandstone is disrupted and contorted and beds contain sandstone and mudstone intraclasts. The conglomerates are clast-supported and contain 50% sandstone intraclasts, 30% dolerite and 20% basement and others. Clasts are subangular to rounded and range from 4 to 50 mm. One clast is striated. Beds of weakly stratified diamictite (greenish grey 10GY 5/1) from 160.00 to 160.14 m and 167.20 to 167.75 m with 20 and 60% subrounded sandstone and mudstone clasts (4 to 30 mm) respectively.

— contact gradational over 3 cm –

Sub-unit 9.6

168.16 - 170.09 m

DIAMICTITE

Hard, weakly stratified, **conglomeratic muddy fine sandstone (diamictite)** (dark olive grey 5GY 4/1).

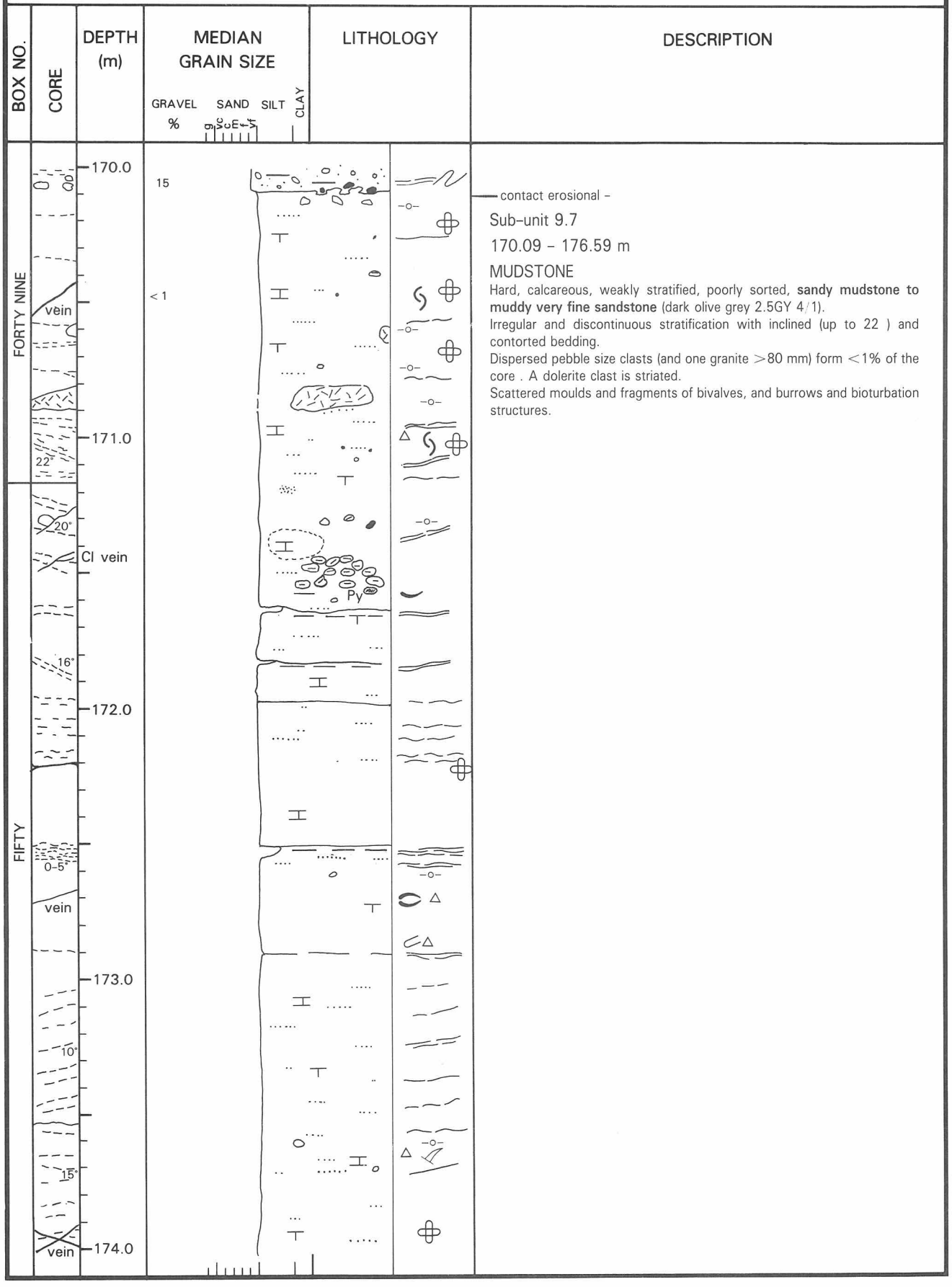
Stratification partially destroyed by bioturbation and slight to partial synsedimentary brecciation (in places mudstone fragments form up to 60% of core) with muddier clasts surrounded by veins of sandy material. Bedding contorted in one or two places.

Bedrock clasts form between 5 and 15% of the core. Most are 4 to 20 mm, but several are more than 50 mm. They are subangular to subrounded. About 70% are basement and 30% dolerite. One gneiss clast is striated. Soft sediment boudinage at 169.00 m.

PROJECT : CIROS -1

SHEET NO. : 38

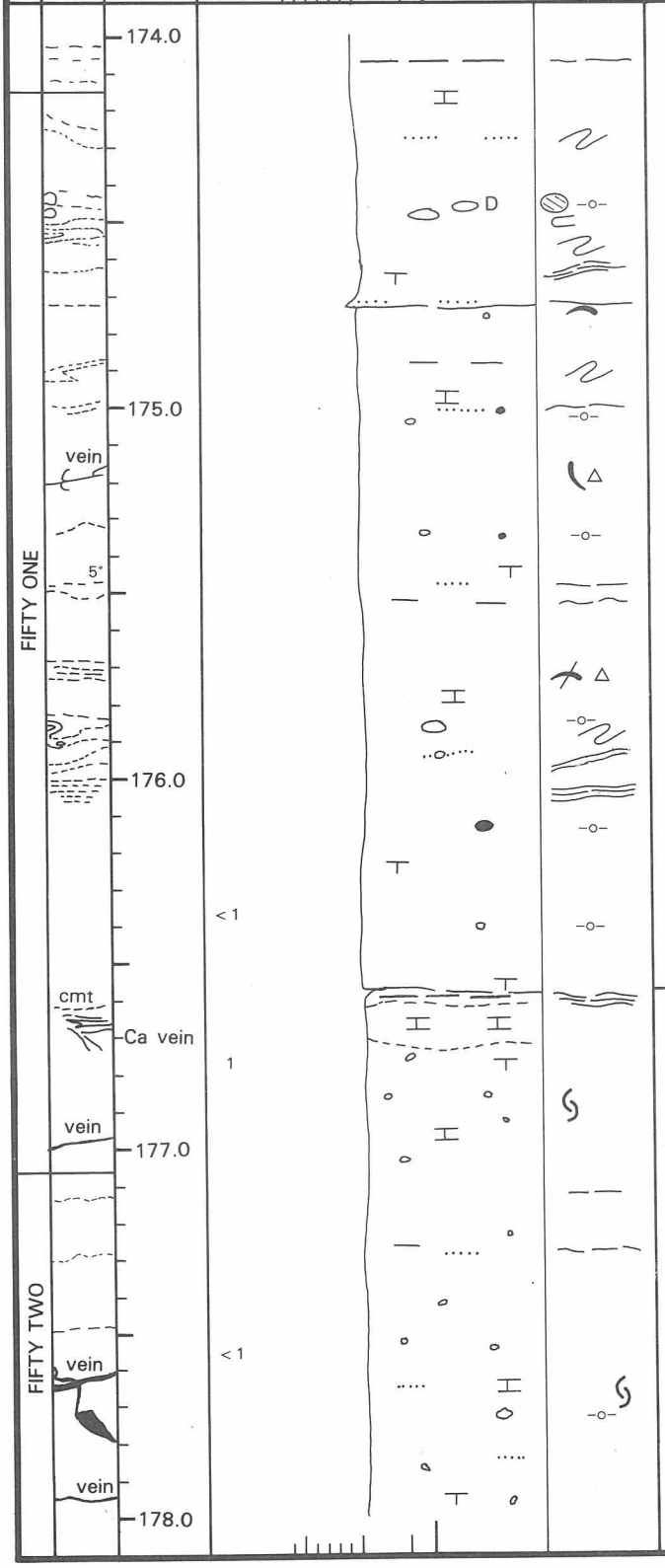
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 39

SCALE : 1:20



Sub-unit 9.7

170.09 - 176.59 m

MUDSTONE

Hard, calcareous, weakly stratified, poorly sorted, **sandy mudstone to muddy very fine sandstone** (dark olive grey 2.5GY 4/1). Irregular and discontinuous stratification with inclined (up to 22°) and contorted bedding. Dispersed pebble size clasts (and one granite > 80 mm) form < 1% of the core. A dolerite clast is striated. Scattered moulds and fragments of bivalves, and burrows and bioturbation structures.

contact sharp but relation between sub-units gradational

Sub-unit 9.8

176.59 - 180.30 m

MUDSTONE AND DIAMICTITE

Hard, calcareous, weakly stratified, **slightly conglomeratic sandy mudstone (diamictite** in more conglomeratic parts with gradational boundaries to mudstone beds) (dark olive grey 2.5GY 4/1).

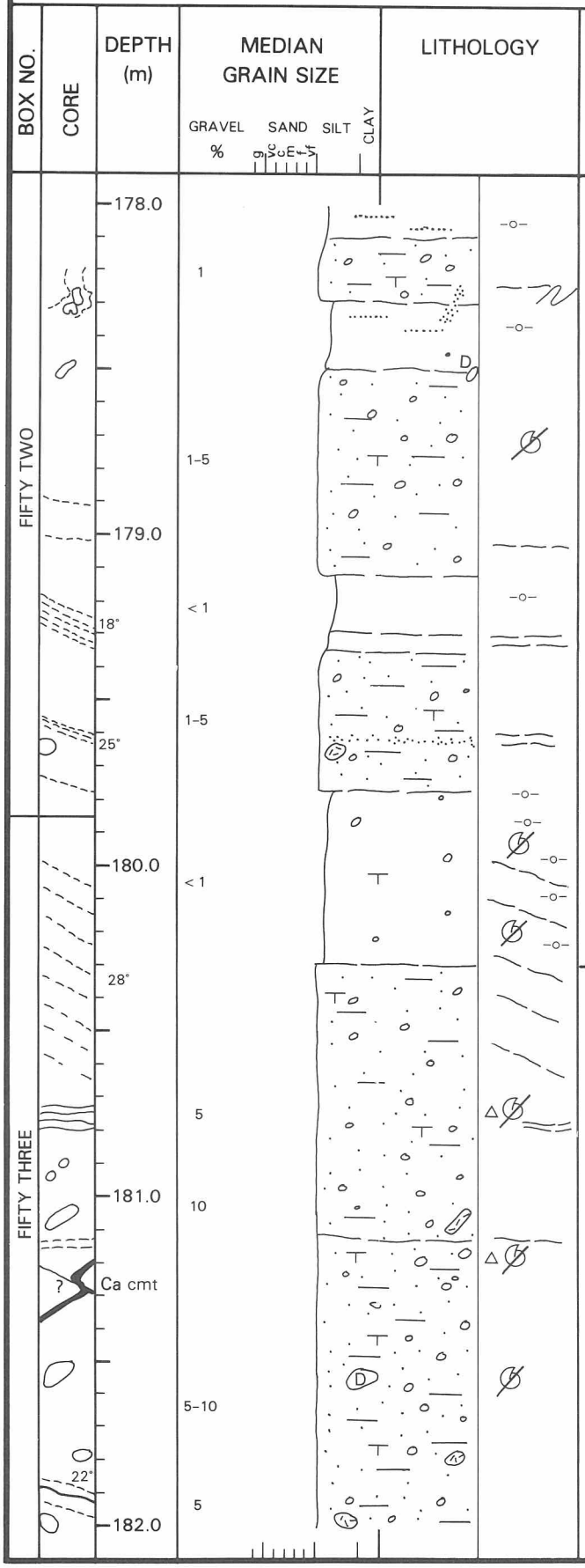
Stratification is discontinuous, irregular and occasionally contorted. Some contorted sandy laminae. Locally mottled appearance is probably due to bioturbation.

Clasts (1 to 2% of core) are up to 25 mm long and mainly subangular to subrounded. Lithologies include basement, dolerite amd volcanic rocks.

PROJECT : CIROS -1

SHEET NO. : 40

SCALE : 1:20



DESCRIPTION

Sub-unit 9.8

176.59 - 180.30 m

MUDSTONE AND DIAMICTITE

Hard, calcareous, weakly stratified, **slightly conglomeratic sandy mudstone (diamictite** in more conglomeratic parts with gradational boundaries to mudstone beds) (dark olive grey 2.5GY 4/1). Stratification is discontinuous, irregular and occasionally contorted. Some contorted sandy laminae. Locally mottled appearance is probably due to bioturbation. Clasts (1 to 2% of core) are up to 25 mm long and mainly subangular to subrounded. Lithologies include basement, dolerite amd volcanic rocks.

— contact transitional over 20 cm -

Sub-unit 9.9

180.30 - 182.79 m

DIAMICTITE

Hard, calcareous, weakly stratified, **conglomeratic sandy mudstone (diamictite)** (dark olive grey 2.5GY 4 1).

Sub-unit very homogeneous.

Stratification is wispy and inclined (upto 50).

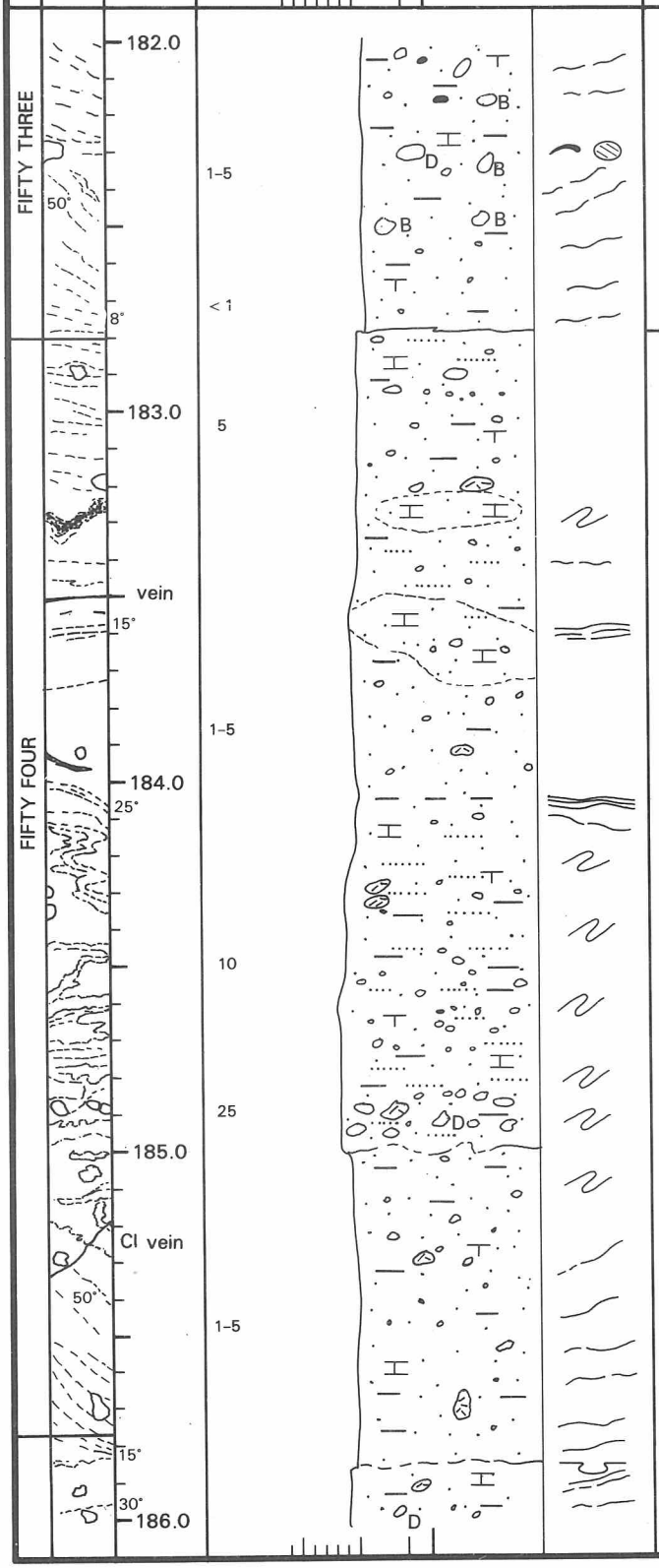
Clasts form 5 to 10% of the core. Most are 10 to 20 mm, but range up to 52 mm. One dolerite clast is striated. About 50% are basement, 30% are dolerite, 15% Beacon sandstone and 5% basalt.

Shell fragments evident from moulds. Faulted synsedimentary dyke from 181.20 to 181.35 m.

PROJECT : CIROS -1

SHEET NO. : 41

SCALE : 1:20



— contact sharp –

Sub-unit 9.10

182.79 - 200.73 m

DIAMICTITE

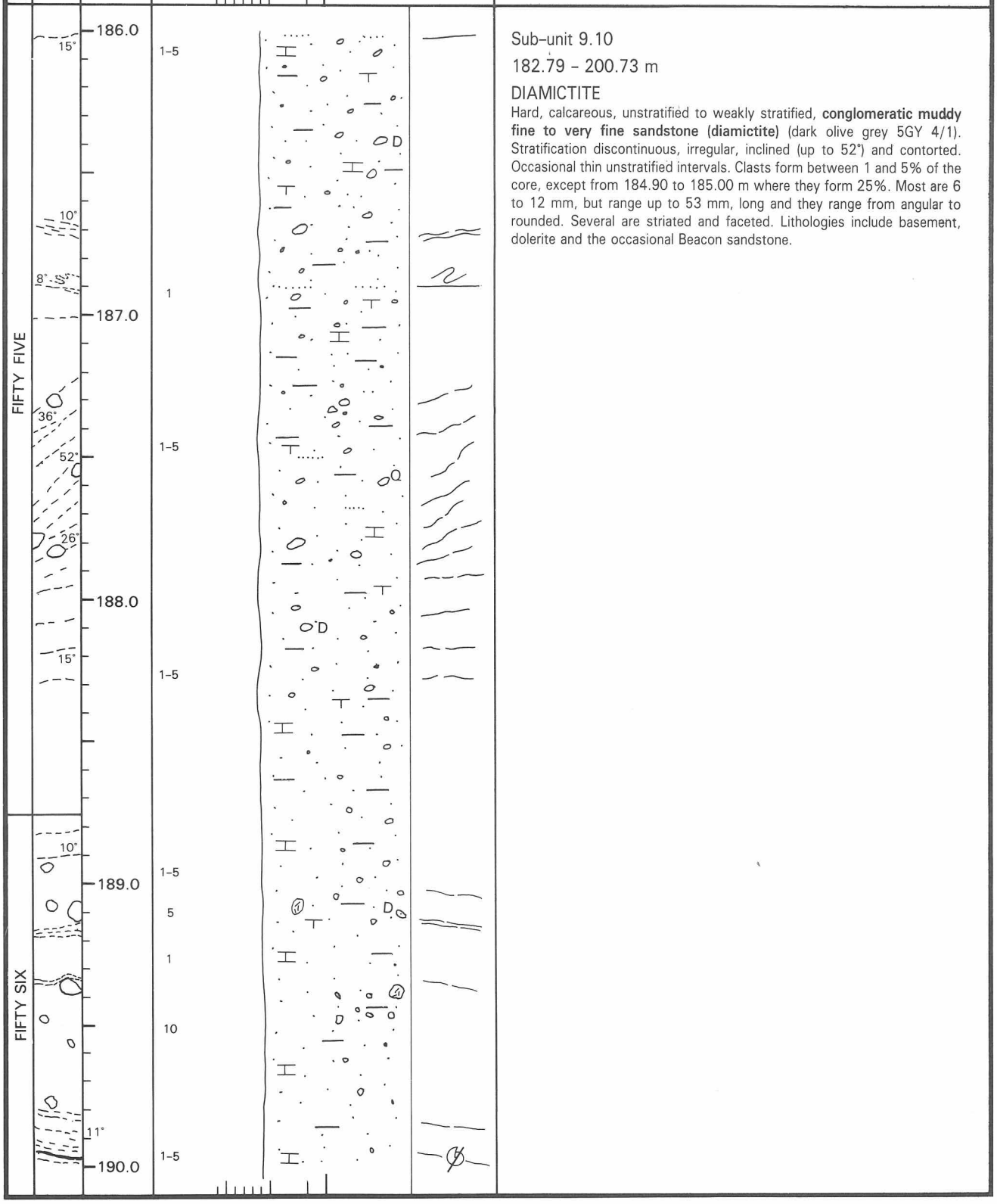
Hard, calcareous, unstratified to weakly stratified, **conglomeratic muddy fine to very fine sandstone (diamictite)** (dark olive grey 5GY 4/1). Stratification discontinuous, irregular, inclined (up to 52°) and contorted. Occasional thin unstratified intervals.

Clasts form between 1 and 5% of the core, except from 184.90 to 185.00 m where they form 25%. Most are 6 to 12 mm, but range up to 53 mm, long and they range from angular to rounded. Several are striated and faceted. Lithologies include basement, dolerite and the occasional Beacon sandstone.

PROJECT : CIROS -1

SHEET NO. : 42

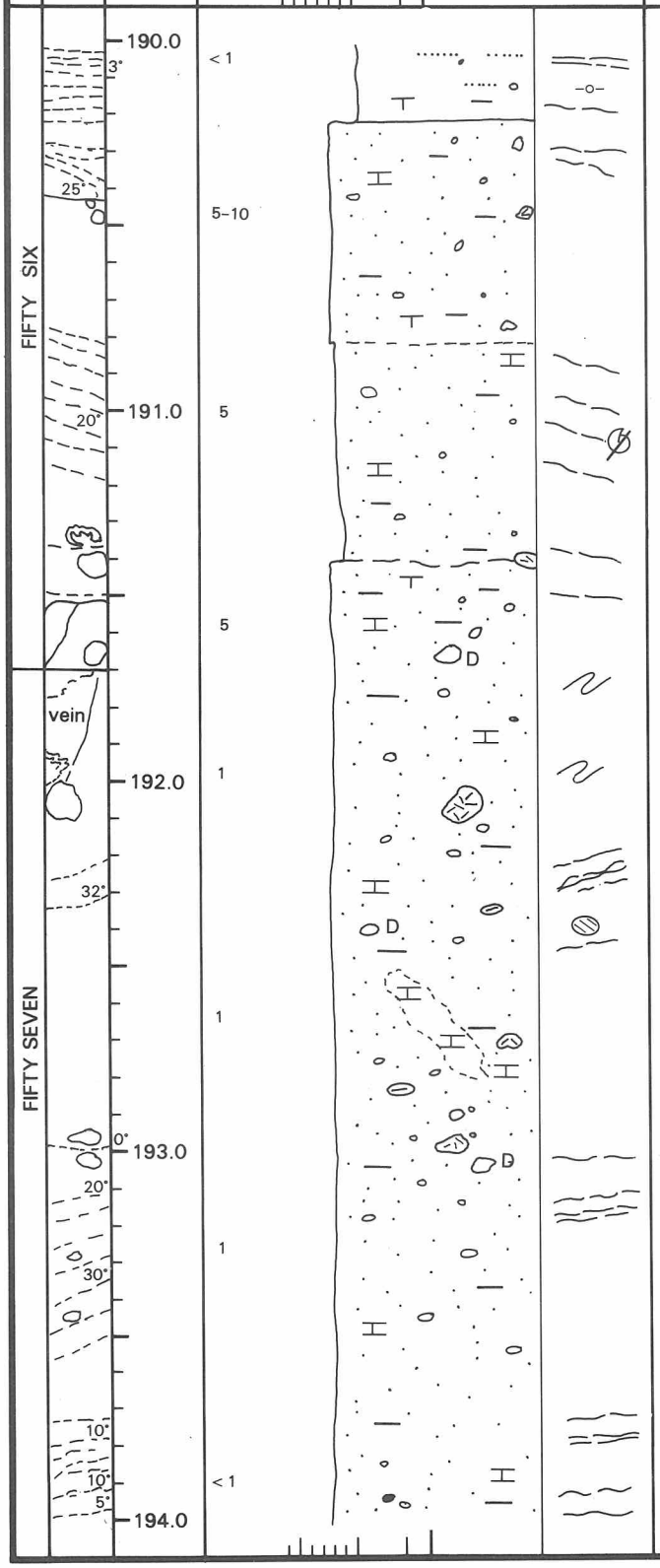
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 43

SCALE : 1:20



DESCRIPTION

Sub-unit 9.10

182.79 - 200.73 m

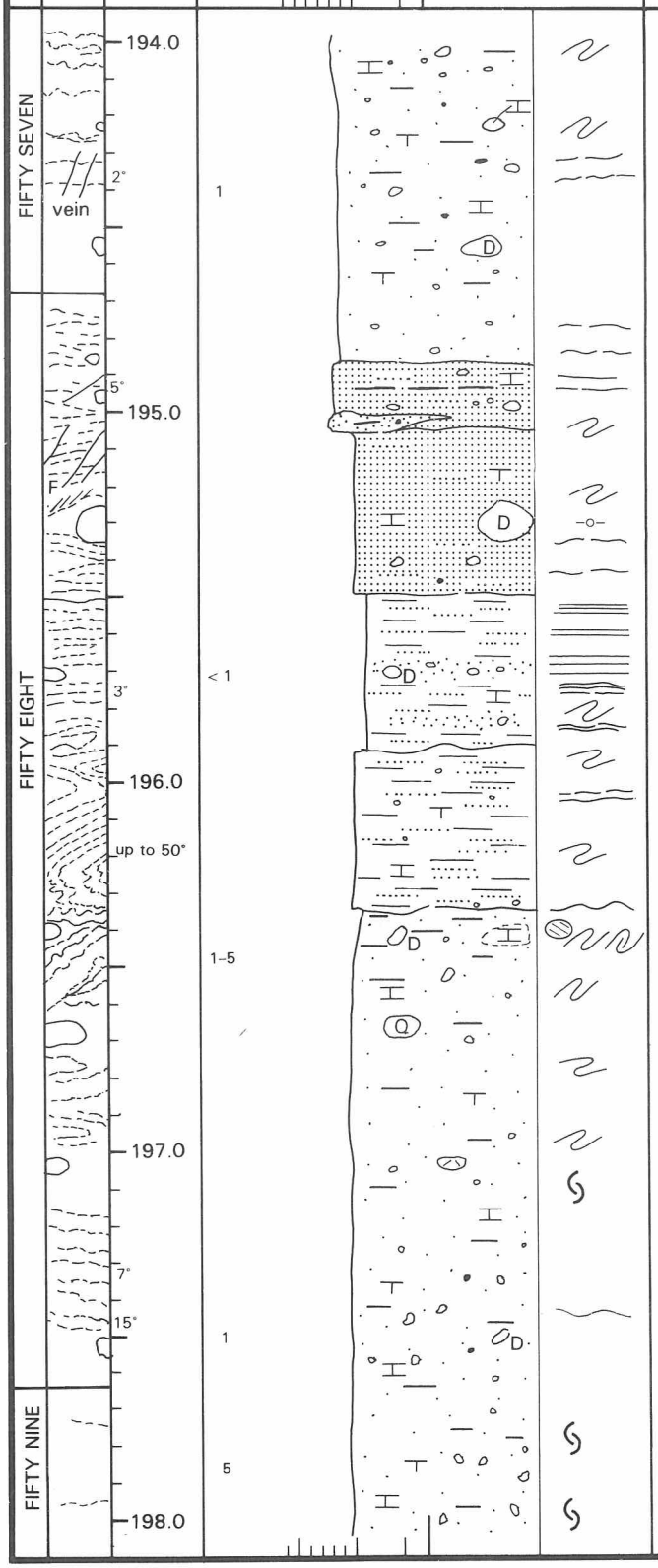
DIAMICTITE

Hard, calcareous, unstratified to weakly stratified, **conglomeratic muddy fine to very fine sandstone (diamictite)** (dark olive grey 5GY 4/1). Stratification discontinuous, irregular, inclined (up to 52°) and contorted. Occasional thin unstratified intervals. Clasts form between 1 and 5% of the core, except from 184.90 to 185.00 m where they form 25%. Most are 6 to 12 mm, but range up to 53 mm, long and they range from angular to rounded. Several are striated and faceted. Lithologies include basement, dolerite and the occasional Beacon sandstone.

PROJECT : CIROS -1

SHEET NO. : 44

SCALE : 1:20



Sub-unit 9.10

182.79 - 200.73 m

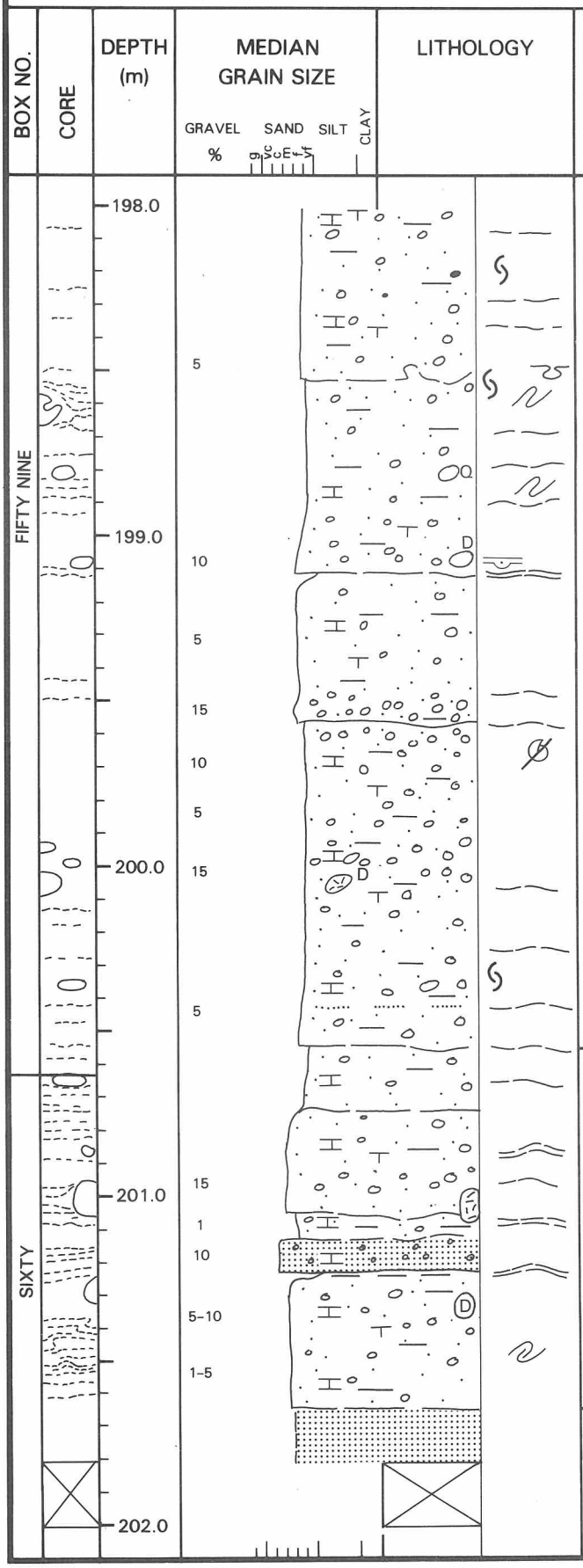
DIAMICTITE

Hard, calcareous, unstratified to weakly stratified, **conglomeratic muddy fine to very fine sandstone (diamictite)** (dark olive grey 5GY 4/1). Stratification discontinuous, irregular, inclined (up to 52°) and contorted. Occasional thin unstratified intervals. Clasts form between 1 and 5% of the core, except from 184.90 to 185.00 m where they form 25%. Most are 6 to 12 mm, but range up to 53 mm, long and they range from angular to rounded. Several are striated and faceted. Lithologies include basement, dolerite and the occasional Beacon sandstone.

PROJECT : CIROS -1

SHEET NO. : 45

SCALE : 1:20



Sub-unit 9.10

182.79 - 200.73 m

DIAMICTITE

Hard, calcareous, unstratified to weakly stratified, **conglomeratic muddy fine to very fine sandstone (diamictite)** (dark olive grey 5GY 4/1). Stratification discontinuous, irregular, inclined (up to 52°) and contorted. Occasional thin unstratified intervals. Clasts form between 1 and 5% of the core, except from 184.90 to 185.00 m where they form 25%. Most are 6 to 12 mm, but range up to 53 mm, long and they range from angular to rounded. Several are striated and faceted. Lithologies include basement, dolerite and the occasional Beacon sandstone.

contact gradational over 2 cm -

Sub-unit 10.1

200.73 - 201.65 m

DIAMICTITE

Moderately hard, well stratified, **conglomeratic muddy medium sandstone (diamictite)** (olive grey 2.5GY 6/1).

Stratification irregular, disrupted and in places contorted. Some wispy mudstone laminae and intraclasts.

Bedrock clasts form from 4 to 15% of the core. Most are from 4 to 20 mm but they range up to 75 mm. Most are basement and dolerite.

Bed from 201.13 to 201.23 m of well stratified, **slightly conglomeratic coarse sandstone** with pebbles up to 20 mm.

contact gradational over 1 cm -

Sub-unit 10.2

201.65 - 202.01 m

SAND

Soft, weakly stratified, moderately well sorted, **medium to fine sand** (olive grey 2.5GY 6/1).

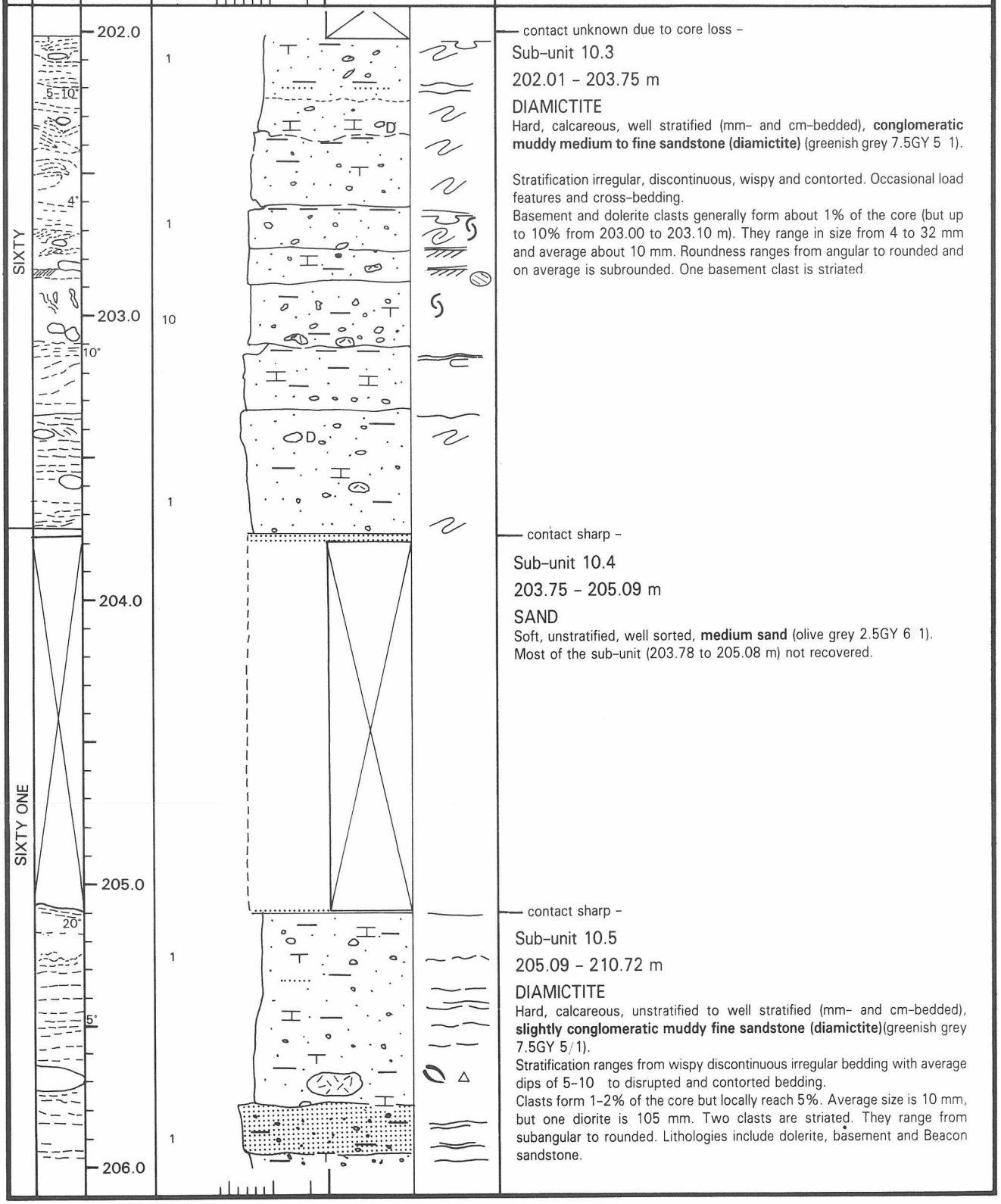
Grains rounded and mostly quartz. No clasts.

Lost core (201.82 to 202.01 m) probably of this lithology and included in this sub-unit.

PROJECT : CIROS -1

SHEET NO. : 46

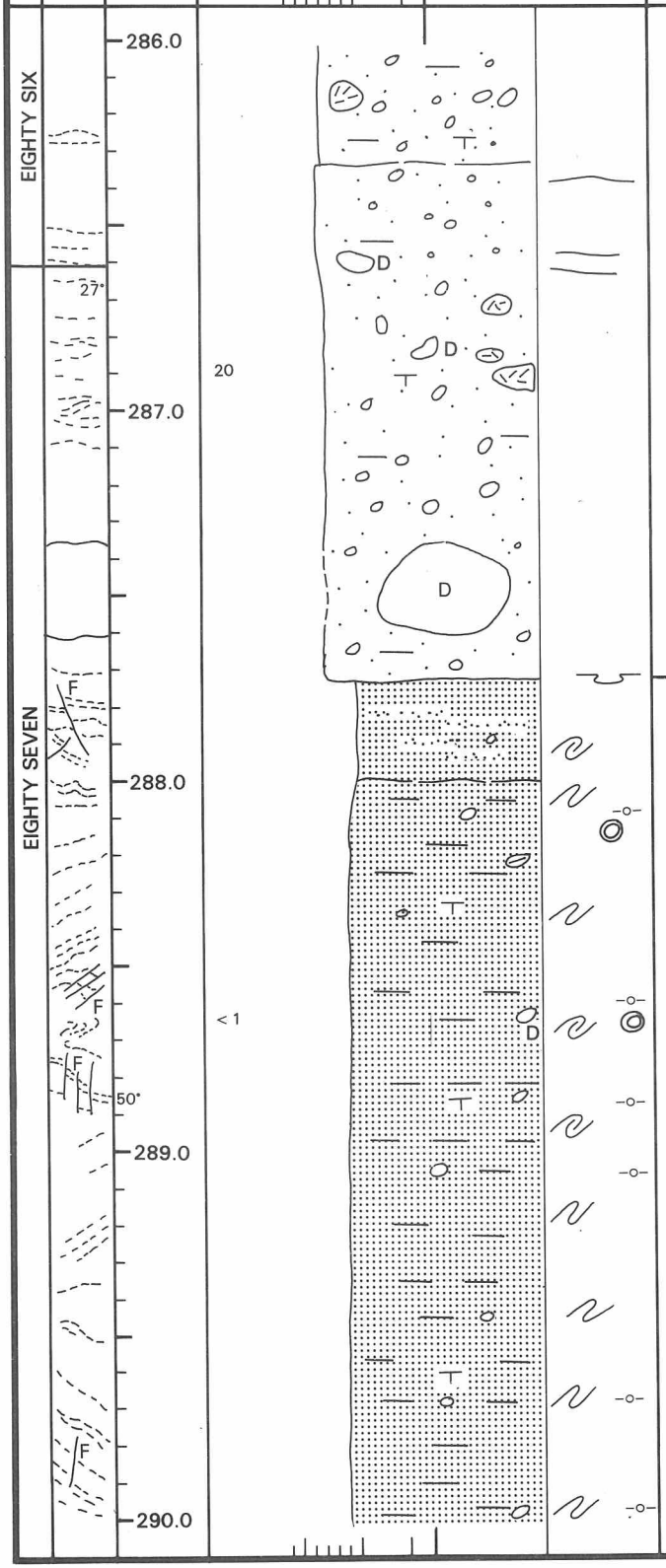
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 67

SCALE : 1:20



DESCRIPTION

DIAMICTITE AND SANDSTONE

Alternating diamictite and sandstone. Hard, calcareous, unstratified to well stratified, **conglomeratic muddy medium to fine sandstone (diamictite)** (grey 10Y 5/1 to 4/1 and dark greenish grey to greenish grey 7.5GY 4/1 to 5/1). Stratification varies through subhorizontal, wavy, inclined (up to 55°), disrupted, convoluted and contorted. Occasional graded bedding and load casts. Clasts form between 2 and 10% of the core, most ranging from 5 to 12 mm, but with one dolerite > 110 mm. They range from subangular to rounded, averaging subrounded. Several are striated and faceted. Some weakly stratified diamictites contain sandstone and mudstone intraclasts, locally comprising 30% of the rock. Most are dolerite (60%) and basement (35 %) with some Beacon sandstone (< 5%). **Sandstone** ranges from weak to well-stratified (mm-bedded), **very fine, fine and medium, mostly muddy** and in places **slightly conglomeratic**, and mottled (greenish grey and grey 10GY 6/1 and 10Y 6/1). Stratification shows a similar range of features to that in the diamictites. Weakly stratified, **muddy very fine sandstone** (mottled greenish grey 10GY 6/1 and grey 10Y 6/1) from 259.17 to 260.20 m. Two **conglomeratic sandstone** beds between 272.30 and 273.50 m have up to 30% gravel, of which 60% of the clasts are intraformational and the remainder bedrock. There is also a sandy conglomerate at 280.70 m of which 90% of the clasts are intraformational. The sandstone is interstratified on a mm scale with mudstone to form **rhythmites** at 266.41 m (35 cm thick), 273.95 m (29 cm thick), 280.56 m (11 cm thick), 282.00 m (14 cm thick) and 282.20 m (12 cm thick). The rhythmites are greyish olive (7.5Y 6/2) and contain dropstones.

— contact sharp and loaded —

Sub-unit 13.1

287.71 - 290.75 m

SANDSTONE

Hard, calcareous, weakly to well stratified, **slightly conglomeratic muddy fine sandstone** (dark greenish grey 10Y 4/1).

Stratification defined by sandstone and mudstone laminae.

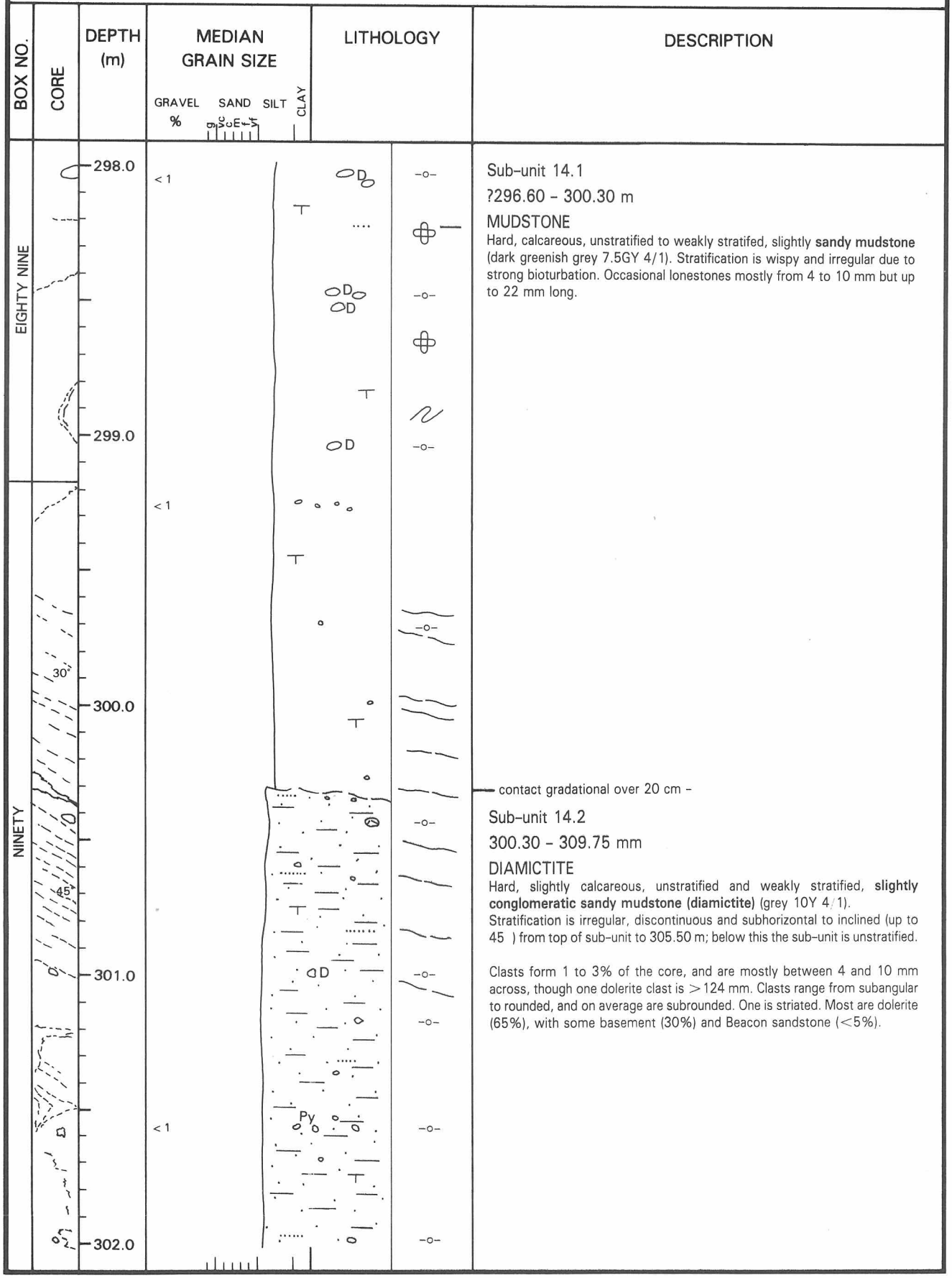
Dispersed dolerite, basement and volcanic clasts up to 25 mm long. They range from angular to subrounded and some are weathered.

Much synsedimentary folding and faulting.

PROJECT : CIROS -1

SHEET NO. : 70

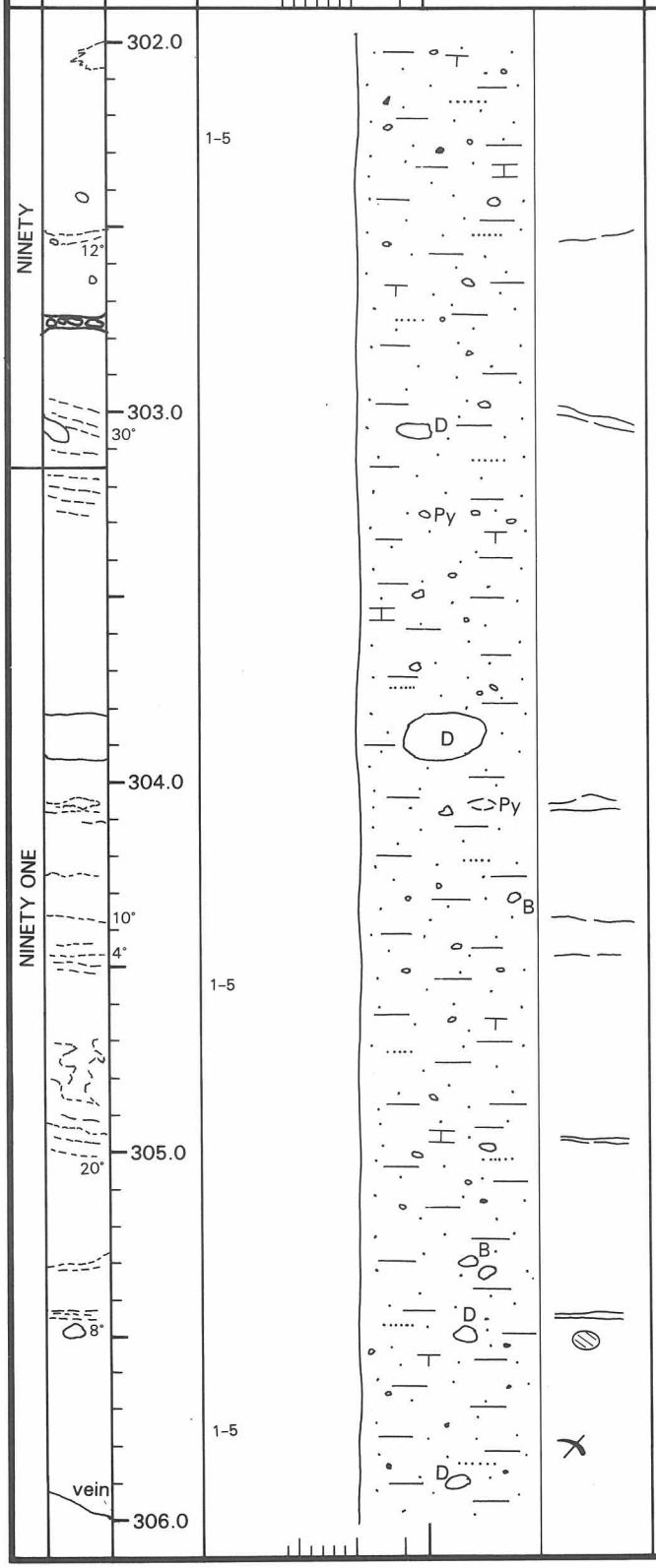
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 71

SCALE : 1:20



Sub-unit 14.2

300.30 - 309.75 m

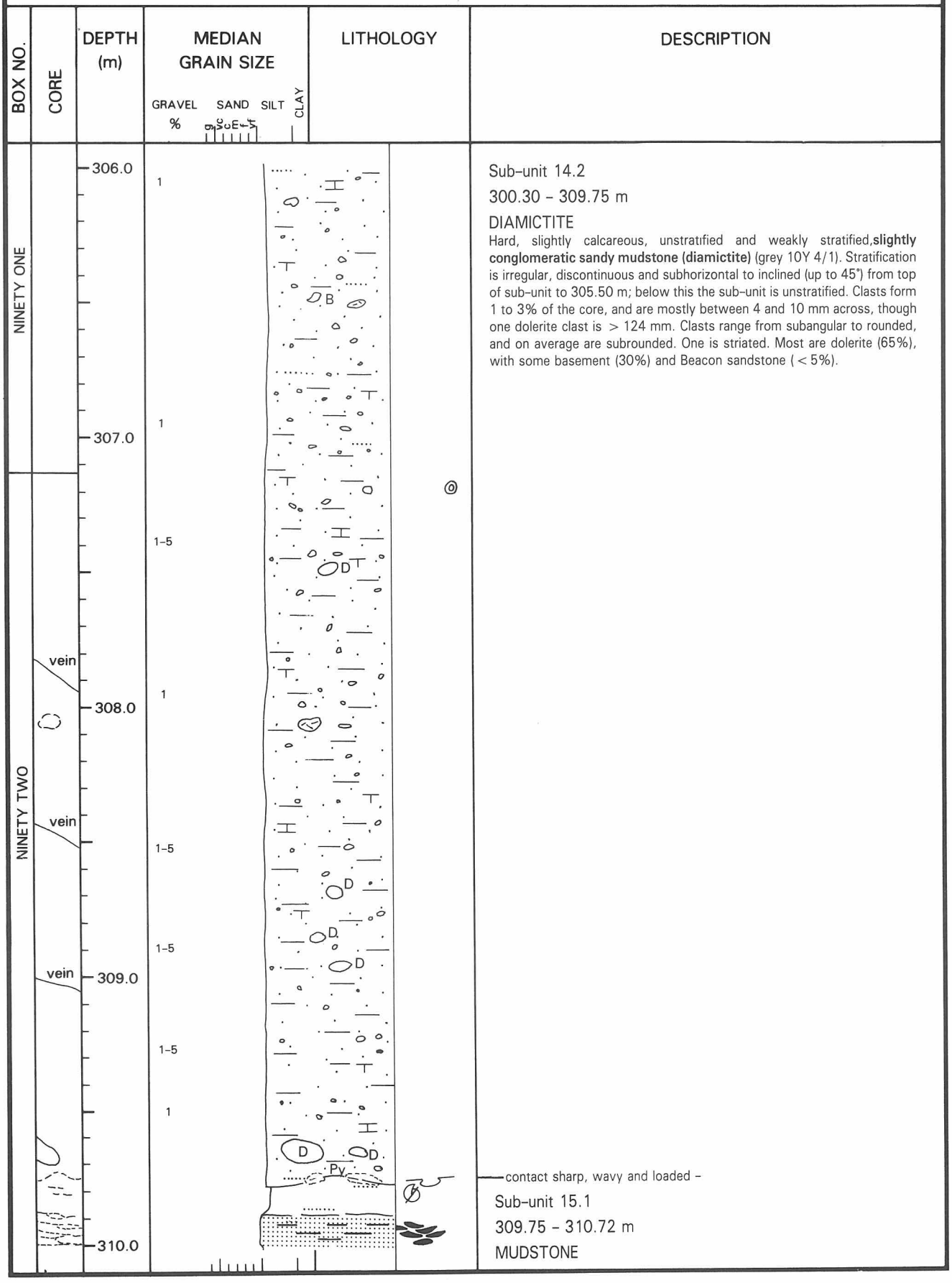
DIAMICTITE

Hard, slightly calcareous, unstratified and weakly stratified, **slightly conglomeratic sandy mudstone (diamictite)** (grey 10Y 4/1). Stratification is irregular, discontinuous and subhorizontal to inclined (up to 45°) from top of sub-unit to 305.50 m; below this the sub-unit is unstratified. Clasts form 1 to 3% of the core, and are mostly between 4 and 10 mm across, though one dolerite clast is > 124 mm. Clasts range from subangular to rounded, and on average are subrounded. One is striated. Most are dolerite (65%), with some basement (30%) and Beacon sandstone (< 5%).

PROJECT : CIROS -1

SHEET NO. : 72

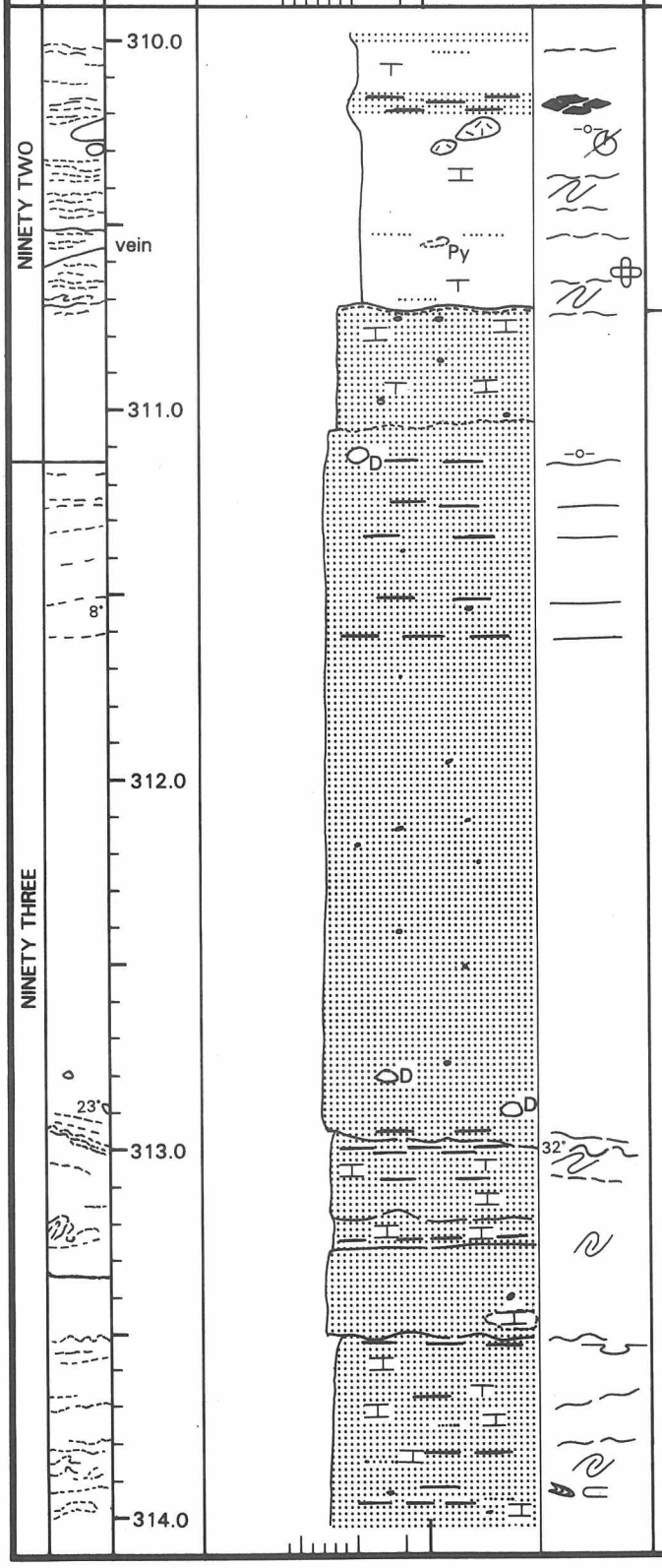
SCALE : 1:20



PROJECT : CIROS -1

SHEET NO. : 73

SCALE : 1:20



DESCRIPTION

Hard, calcareous, weakly to well stratified (mm- and cm-bedded), **sandy mudstone** (dark greenish grey 10GY 4/1).
Stratification irregular, wispy and wavy, locally contorted and probably disrupted by bioturbation.
Only two basement lonestones, >29 and >47 mm long.
Beds from 309.89 to 309.98 m and 310.18 to 310.23 m of **muddy very fine sandstone** with irregular **mudstone** lenses. Shell fragment at 310.82 m.

sharp contact –

Sub-unit 15.2

310.72 – 325.97 m

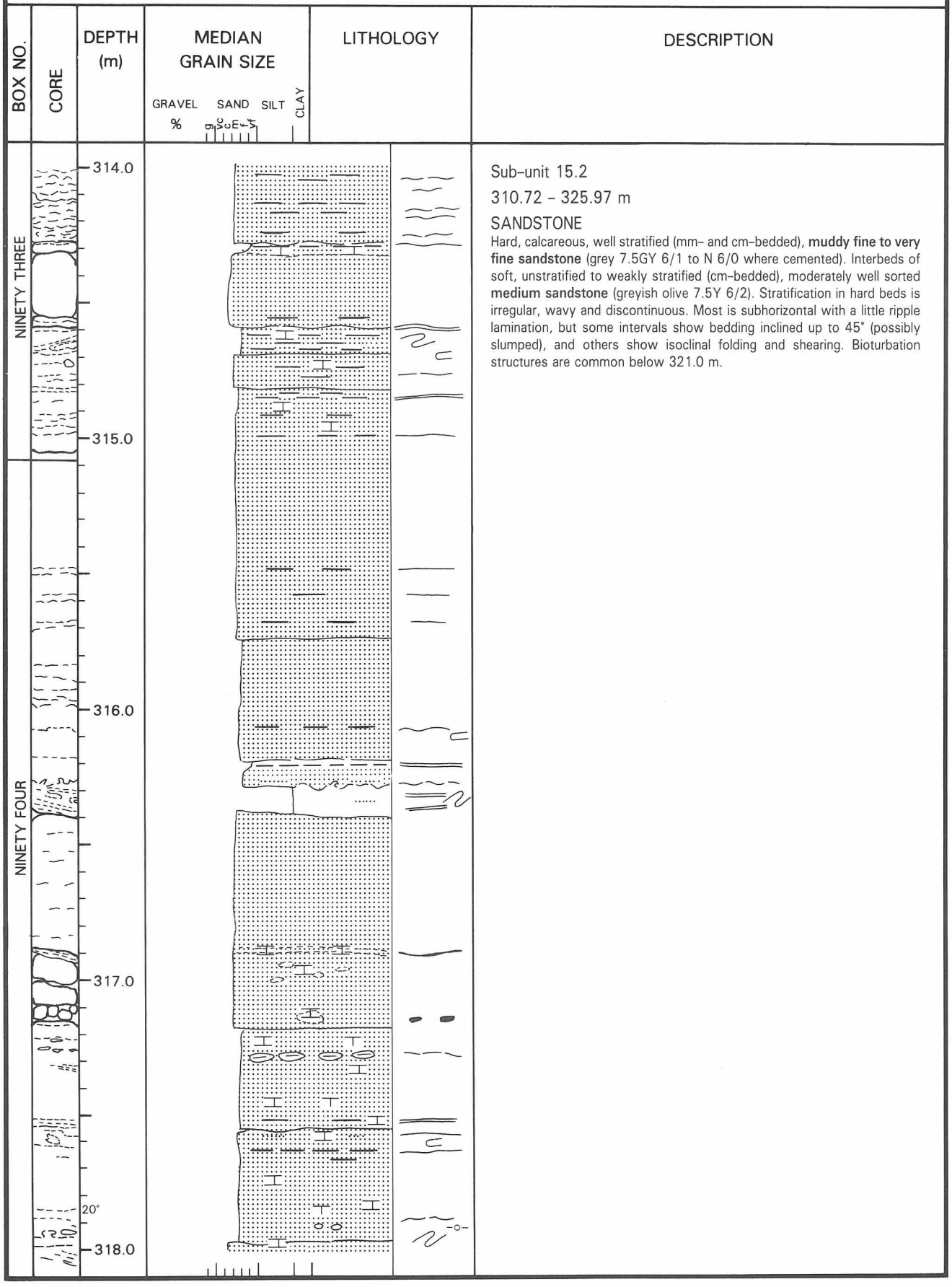
SANDSTONE

Hard, calcareous, well stratified (mm- and cm-bedded), **muddy fine to very fine sandstone** (grey 7.5GY 6/1 to N 6/0 where cemented).
Interbeds of soft, unstratified to weakly stratified (cm-bedded), moderately well sorted, **medium sandstone** (greyish olive 7.5Y 6/2).
Stratification in hard beds is irregular, wavy and discontinuous. Most is subhorizontal with a little ripple lamination, but some intervals show bedding inclined up to 45° (possibly slumped), and others show isoclinal folding and shearing. Bioturbation structures are common below 321.0 m.

PROJECT : CIROS -1

SHEET NO. : 74

SCALE : 1:20



Sub-unit 15.2

310.72 - 325.97 m

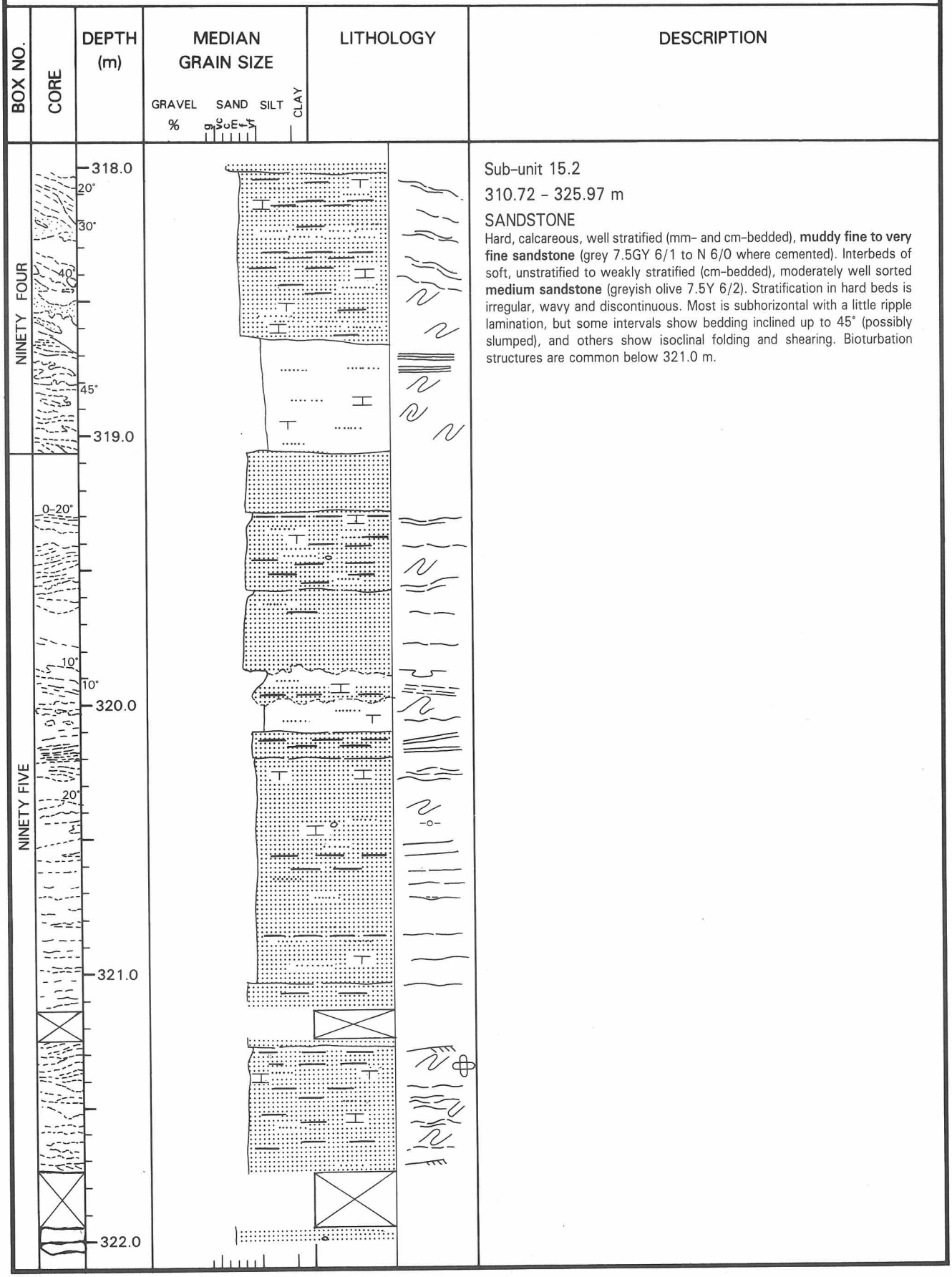
SANDSTONE

Hard, calcareous, well stratified (mm- and cm-bedded), **muddy fine to very fine sandstone** (grey 7.5GY 6/1 to N 6/0 where cemented). Interbeds of soft, unstratified to weakly stratified (cm-bedded), moderately well sorted **medium sandstone** (greyish olive 7.5Y 6/2). Stratification in hard beds is irregular, wavy and discontinuous. Most is subhorizontal with a little ripple lamination, but some intervals show bedding inclined up to 45° (possibly slumped), and others show isoclinal folding and shearing. Bioturbation structures are common below 321.0 m.

PROJECT : CIROS -1

SHEET NO. : 75

SCALE : 1:20



Sub-unit 15.2

310.72 - 325.97 m

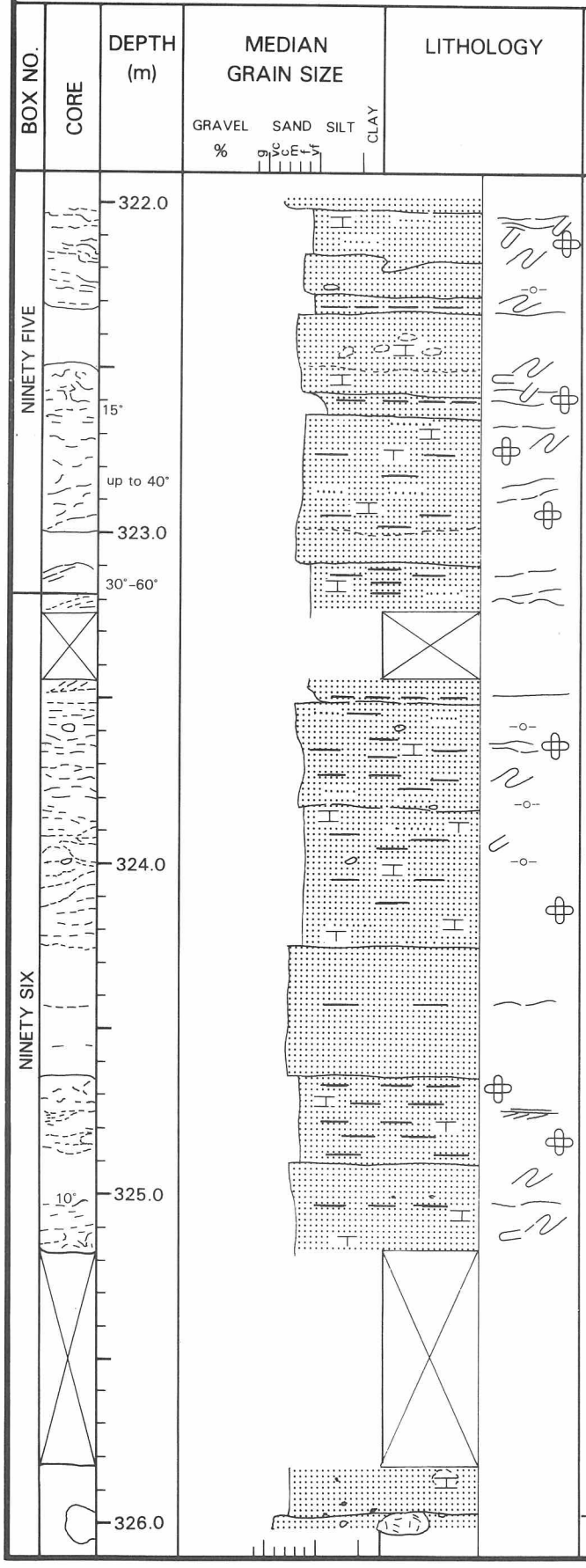
SANDSTONE

Hard, calcareous, well stratified (mm- and cm-bedded), **muddy fine to very fine sandstone** (grey 7.5GY 6/1 to N 6/0 where cemented). Interbeds of soft, unstratified to weakly stratified (cm-bedded), moderately well sorted **medium sandstone** (greyish olive 7.5Y 6/2). Stratification in hard beds is irregular, wavy and discontinuous. Most is subhorizontal with a little ripple lamination, but some intervals show bedding inclined up to 45° (possibly slumped), and others show isoclinal folding and shearing. Bioturbation structures are common below 321.0 m.

PROJECT : CIROS -1

SHEET NO. : 76

SCALE : 1:20



Sub-unit 15.2

310.72 - 325.97 m

SANDSTONE

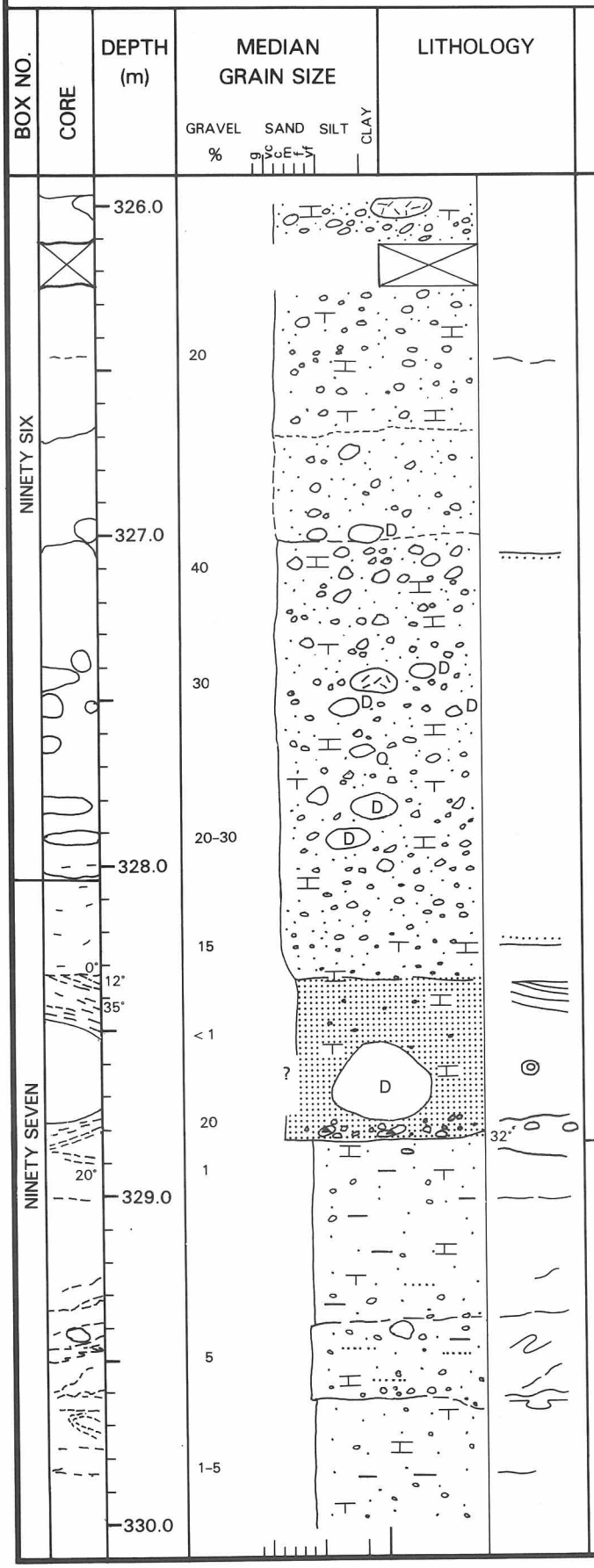
Hard, calcareous, well stratified (mm- and cm-bedded), **muddy fine to very fine sandstone** (grey 7.5GY 6/1 to N 6/0 where cemented). Interbeds of soft, unstratified to weakly stratified (cm-bedded), moderately well sorted **medium sandstone** (greyish olive 7.5Y 6/2). Stratification in hard beds is irregular, wavy and discontinuous. Most is subhorizontal with a little ripple lamination, but some intervals show bedding inclined up to 45° (possibly slumped), and others show isoclinal folding and shearing. Bioturbation structures are common below 321.0 m.

—contact at top of gneiss clast -

PROJECT : CIROS -1

SHEET NO. : 77

SCALE : 1:20



Sub-unit 16.1

325.97 - 328.83 m

CONGLOMERATE

Hard (in places soft), calcareous, unstratified, very poorly sorted, **sandy pebble conglomerate.**

Matrix is poorly sorted, **very coarse to medium sandstone** (grey 7.5Y 6/1), with grains of similar composition to the clasts. Reverse grading occurs from 328.25 m up and normal grading from 327.40 m up.

Clasts are matrix-supported and range in size from small pebbles (4 mm) to boulders (>280 mm from 328.50 to 328.78 m) and are generally subrounded to rounded. Most are basement (60%), with 40% dolerite.

Dolerite boulder at 328.50 m has weathering rind on top surface but has fresh lower surface. Beneath it lies a gritty pebble conglomerate with weak clast long axis alignment subparallel to the base of the sub-unit.

contact sharp and inclined at 32° -

Sub-unit 16.2

328.83 - 342.27 m

DIAMICTITE

Hard, calcareous, unstratified to weakly stratified, **conglomeratic muddy very fine sandstone (diamictite)** (greenish grey to grey 5G 5/1 to 10Y 4/1).

Stratification irregular and discontinuous and mainly subhorizontal, but locally inclined (up to 45°) and contorted. Load structure at 329.62 m.

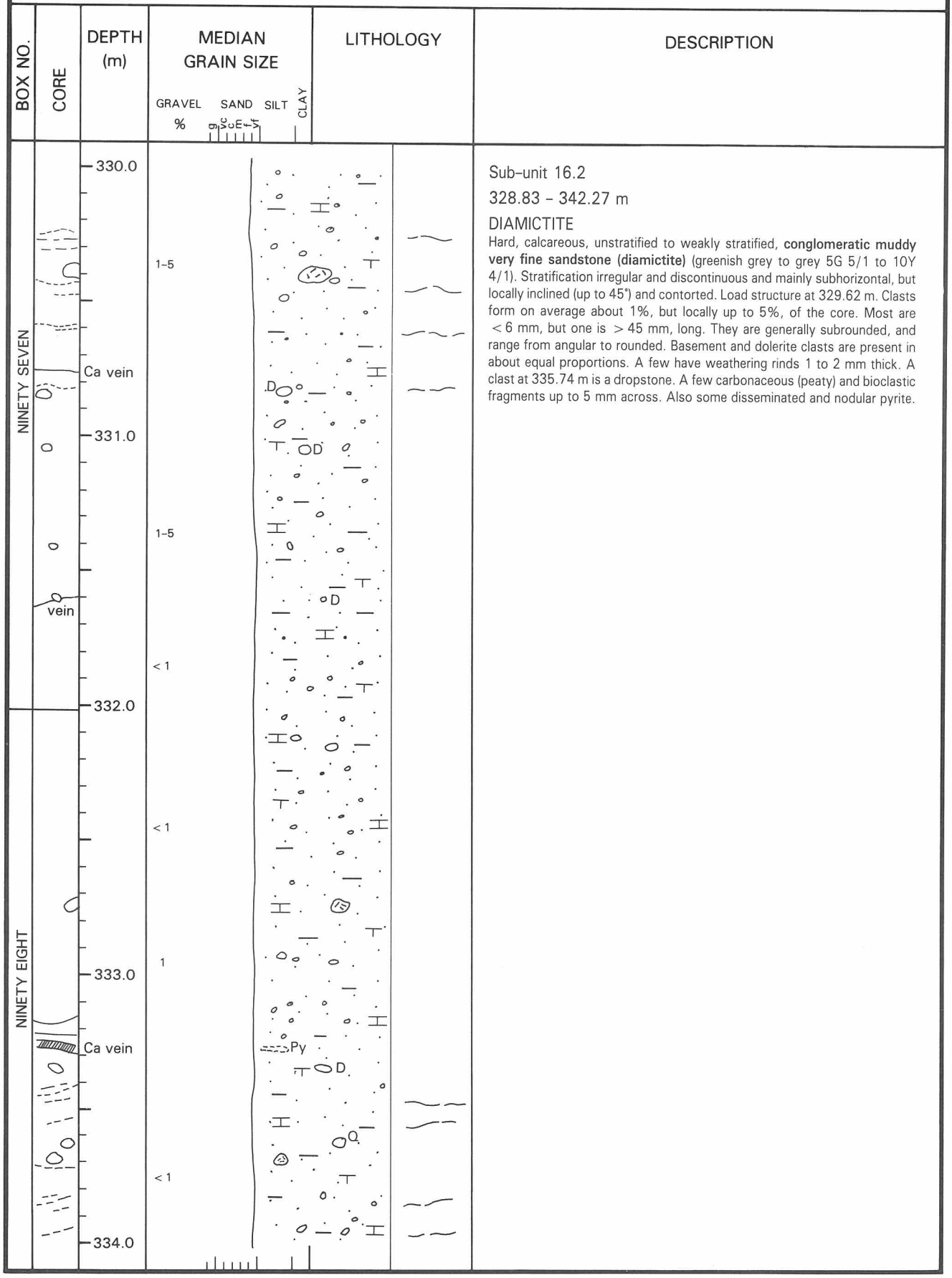
Clasts form on average about 1%, but locally up to 5%, of the core. Most are <6 mm, but one is >45 mm, long. They are generally subrounded, and range from angular to rounded. Basement and dolerite clasts are present in about equal proportions. A few have weathering rinds 1 to 2 mm thick. A clast at 335.74 m is a dropstone.

A few carbonaceous (peaty) and bioclastic fragments up to 5 mm across. Also some disseminated and nodular pyrite.

PROJECT : CIROS -1

SHEET NO. : 78

SCALE : 1:20

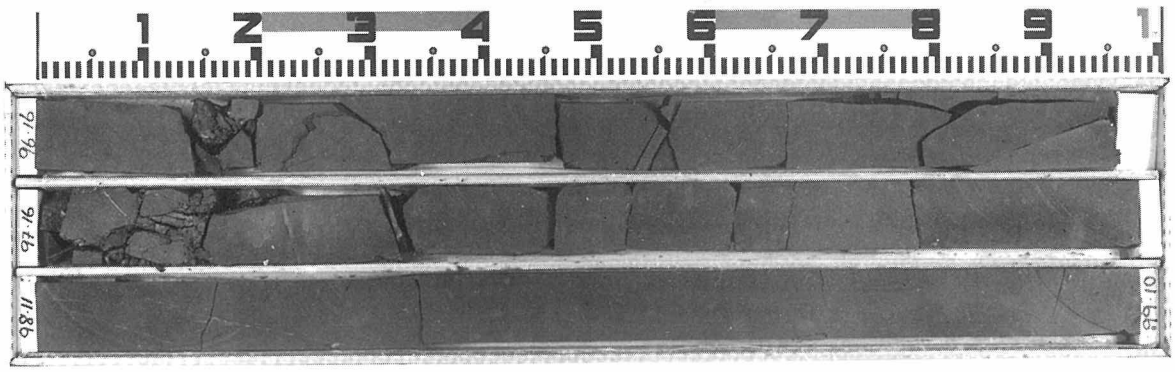


Sub-unit 16.2

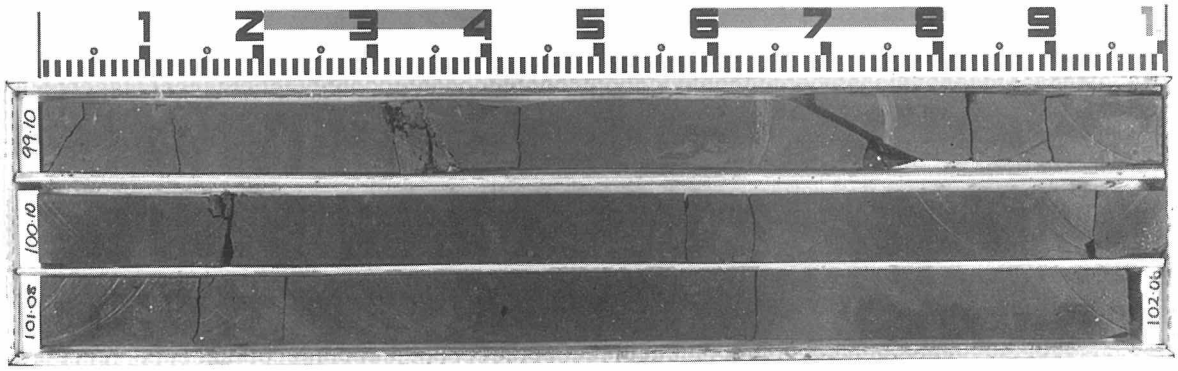
328.83 - 342.27 m

DIAMICTITE

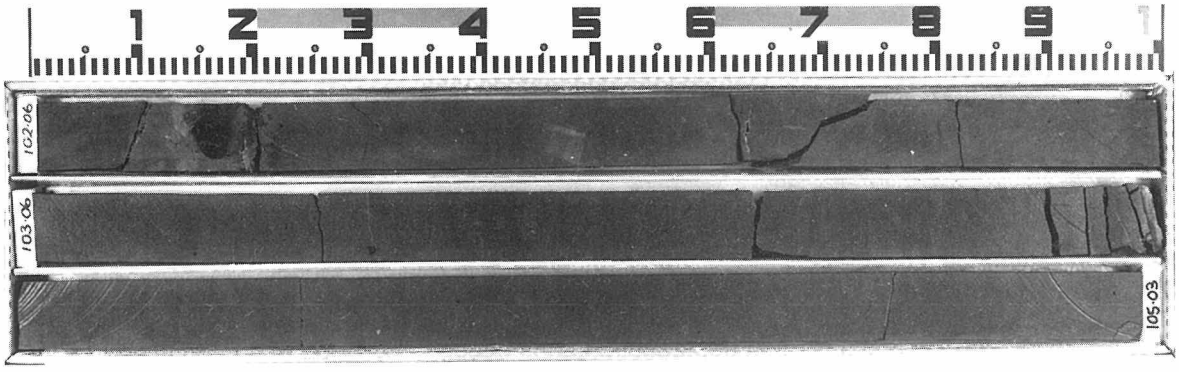
Hard, calcareous, unstratified to weakly stratified, **conglomeratic muddy very fine sandstone (diamictite)** (greenish grey to grey 5G 5/1 to 10Y 4/1). Stratification irregular and discontinuous and mainly subhorizontal, but locally inclined (up to 45°) and contorted. Load structure at 329.62 m. Clasts form on average about 1%, but locally up to 5%, of the core. Most are < 6 mm, but one is > 45 mm, long. They are generally subrounded, and range from angular to rounded. Basement and dolerite clasts are present in about equal proportions. A few have weathering rinds 1 to 2 mm thick. A clast at 335.74 m is a dropstone. A few carbonaceous (peaty) and bioclastic fragments up to 5 mm across. Also some disseminated and nodular pyrite.



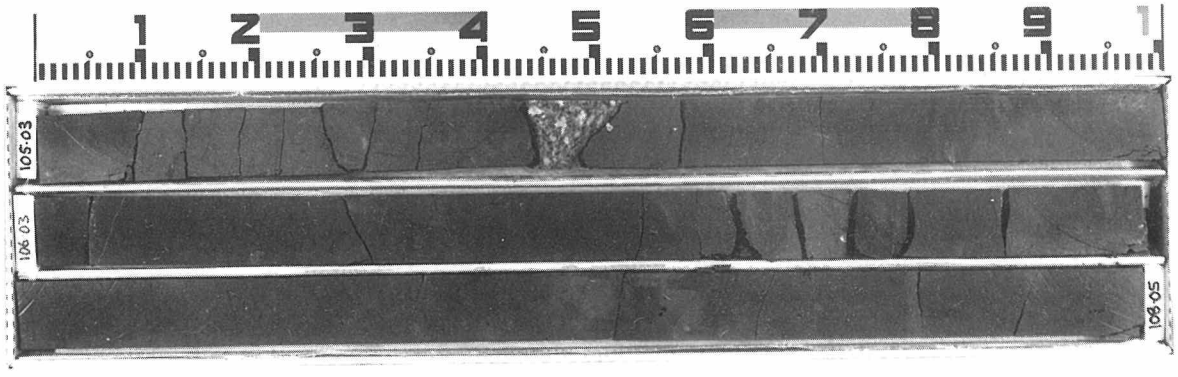
BOX 25 FROM 96.16m TO 99.10m



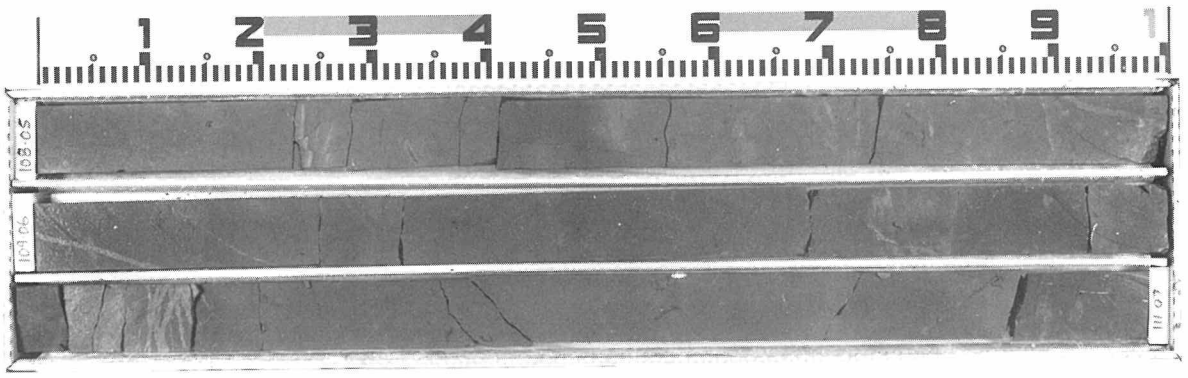
BOX 26 FROM 99.10m TO 102.06m



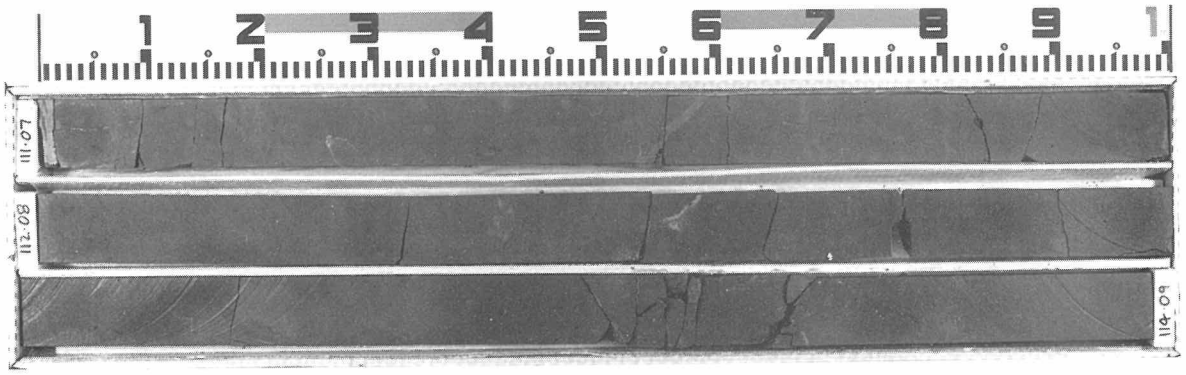
BOX 27 FROM 102.06m TO 105.03m



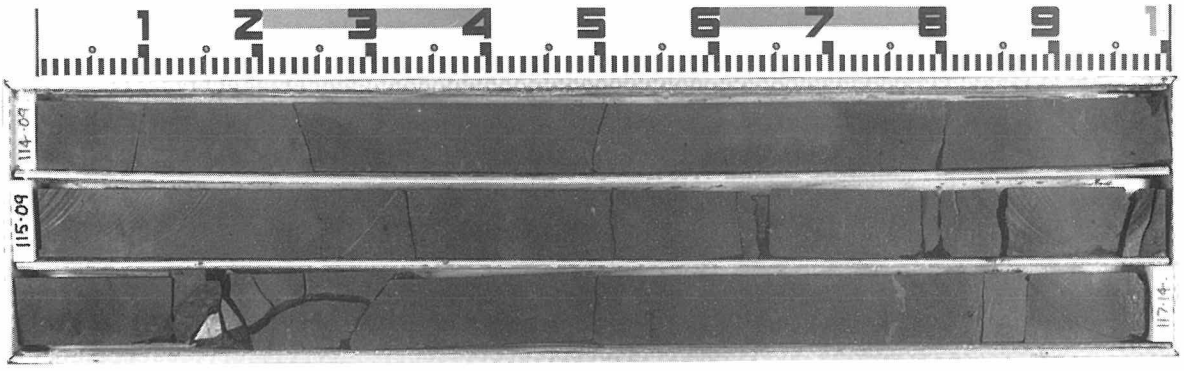
BOX 28 FROM 105.03m TO 108.05m



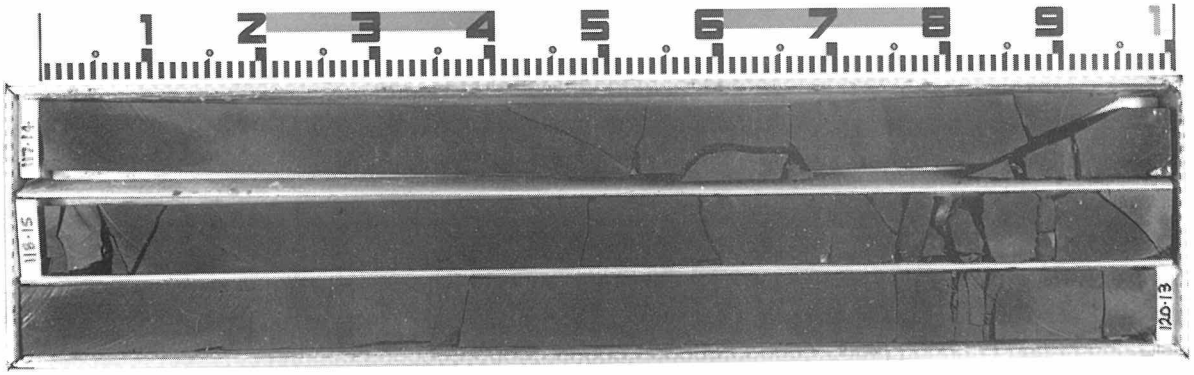
BOX 29 FROM 108·05 m TO 111·07m



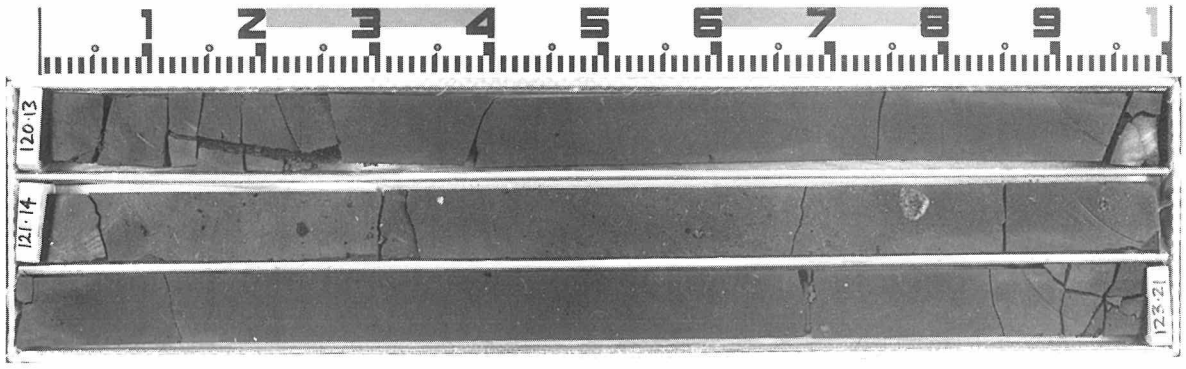
BOX 30 FROM 111·07m TO 114·09m



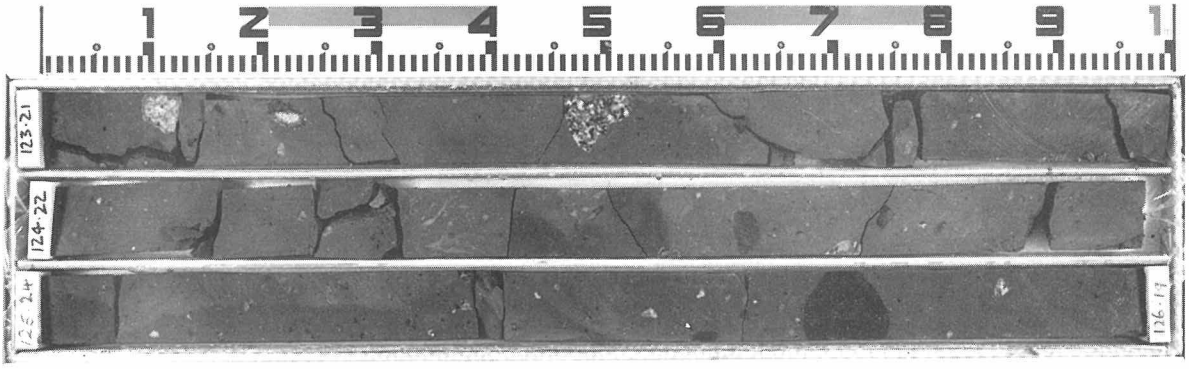
BOX 31 FROM 114·09m TO 117·14m



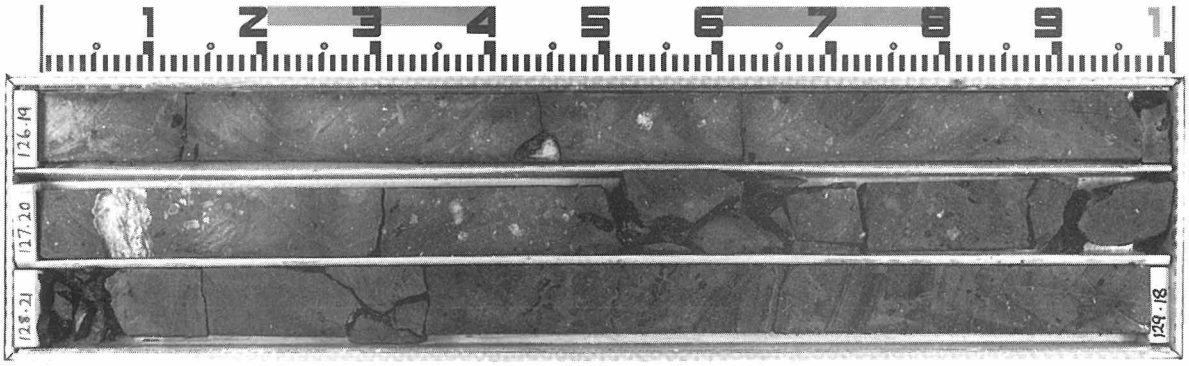
BOX 32 FROM 117·14 m TO 120·13 m



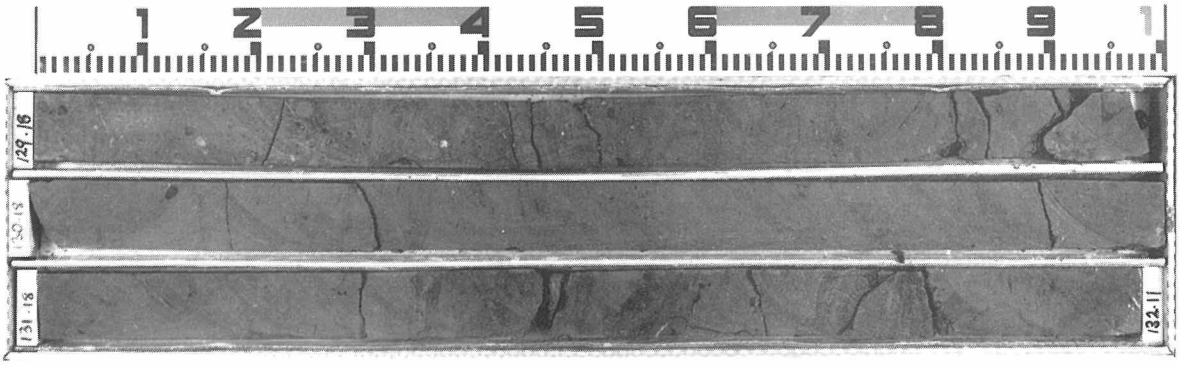
BOX 33 FROM 120·13 m TO 123·21 m



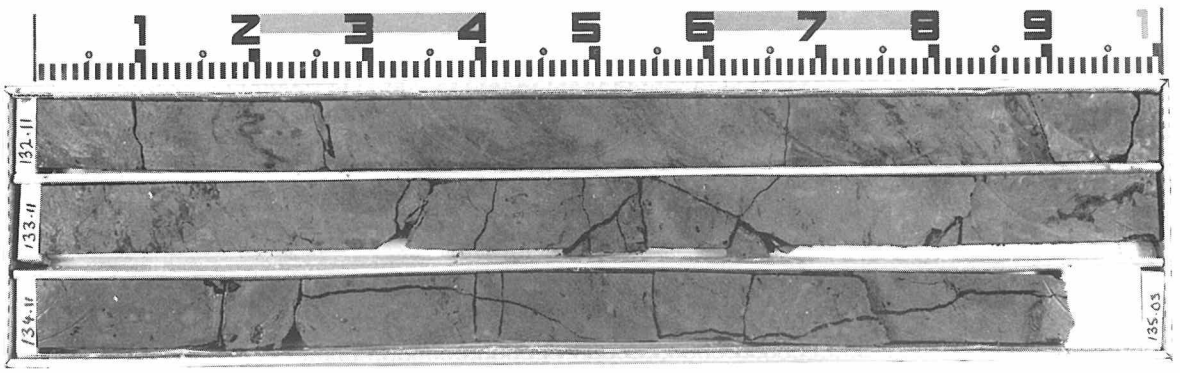
BOX 34 FROM 123·21m TO 126·19m



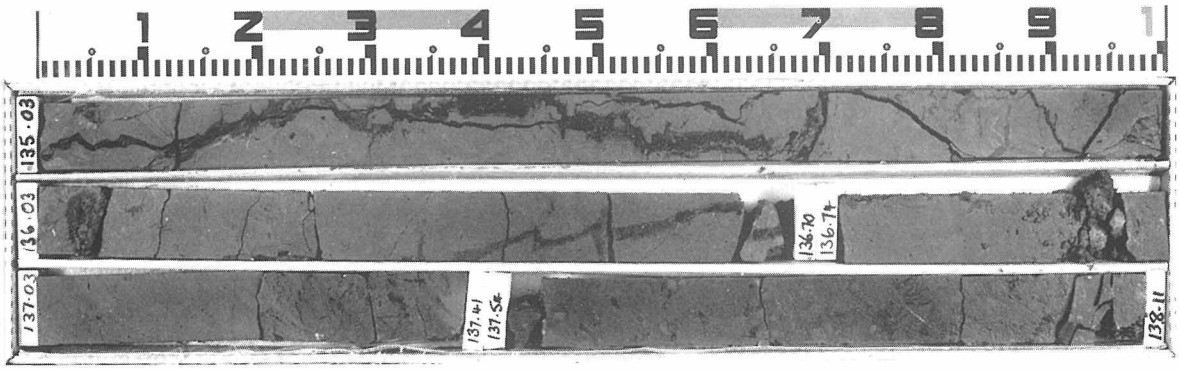
BOX 35 FROM 126·19m TO 129·18m



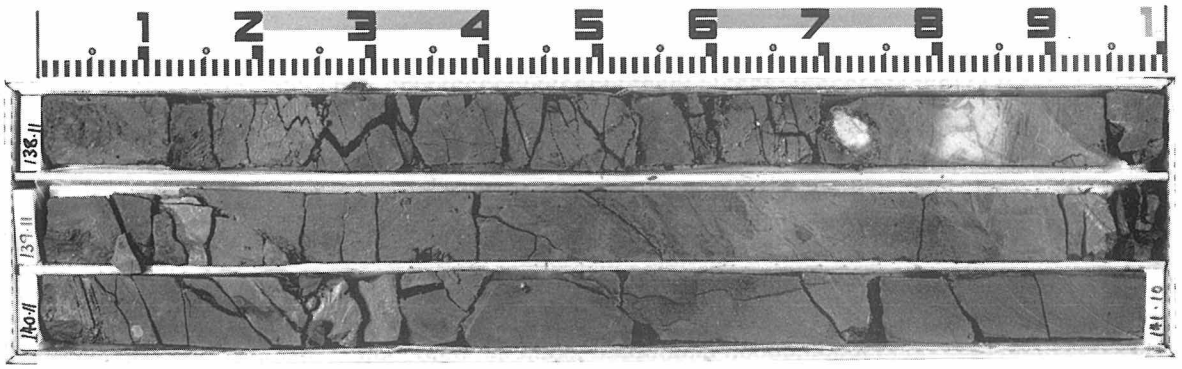
BOX 36 FROM 129·18m TO 132·11m



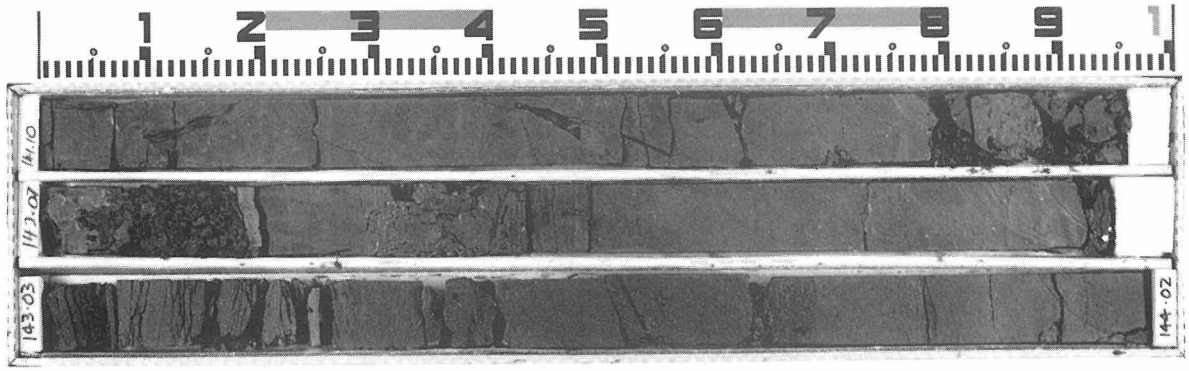
BOX 37 FROM 132.11m TO 135.03m



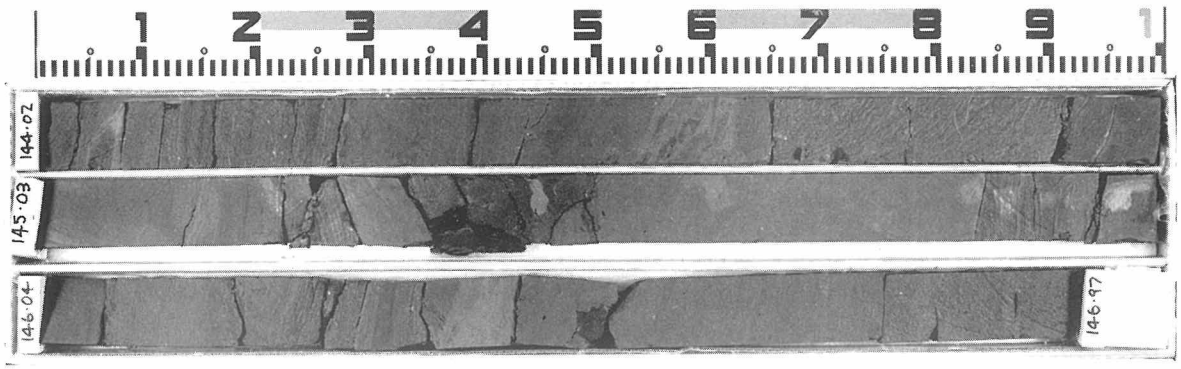
BOX 38 FROM 135.03m TO 138.11m



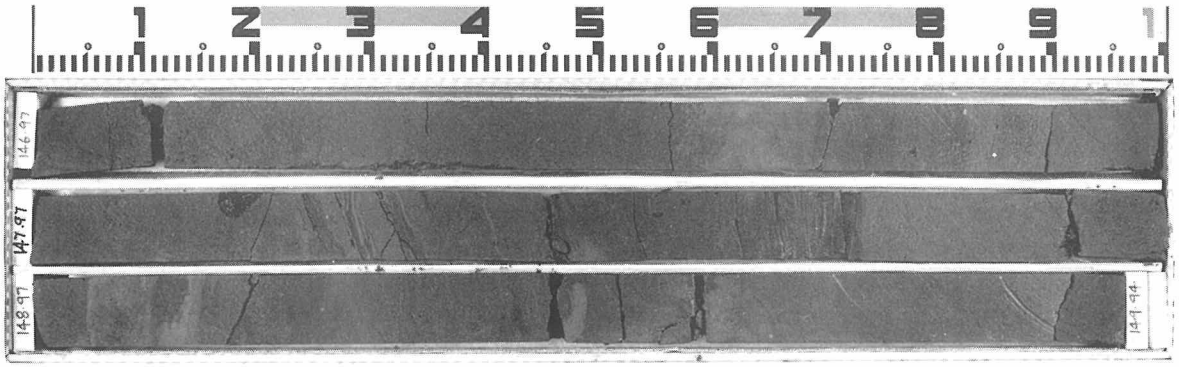
BOX 39 FROM 138.11m TO 141.10m



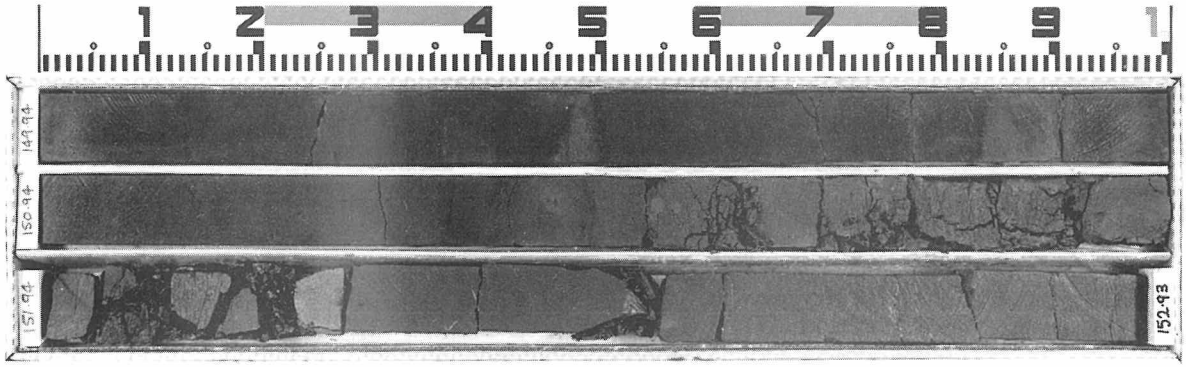
BOX 40 FROM 141.10 m TO 144.02m



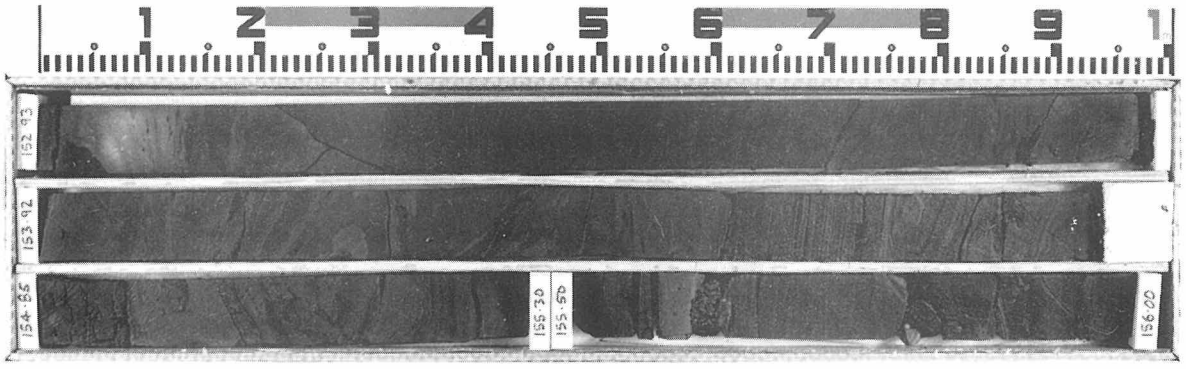
BOX 41 FROM 144.02m TO 146.97m



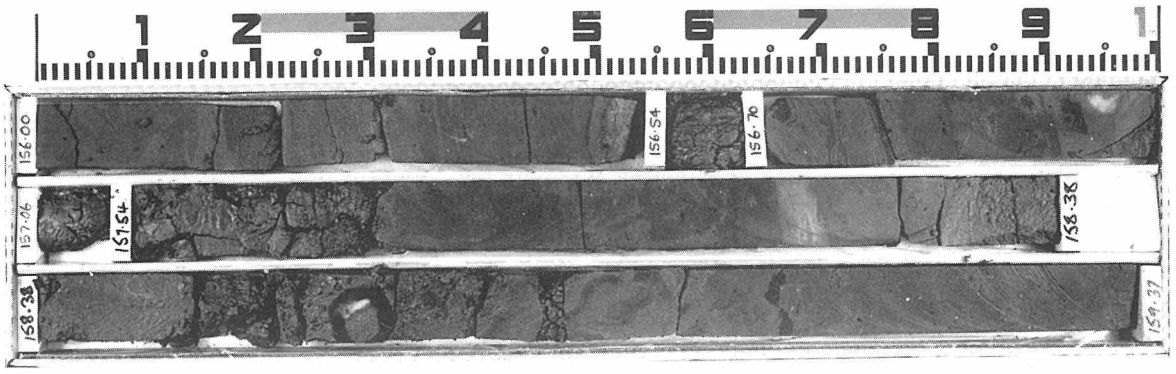
BOX 42 FROM 146.97m TO 149.94m



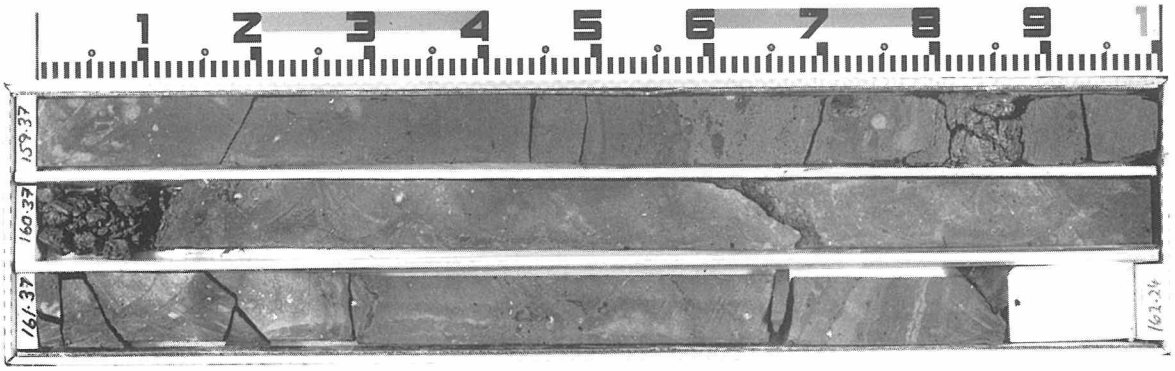
BOX 43 FROM 149.94m TO 152.93m



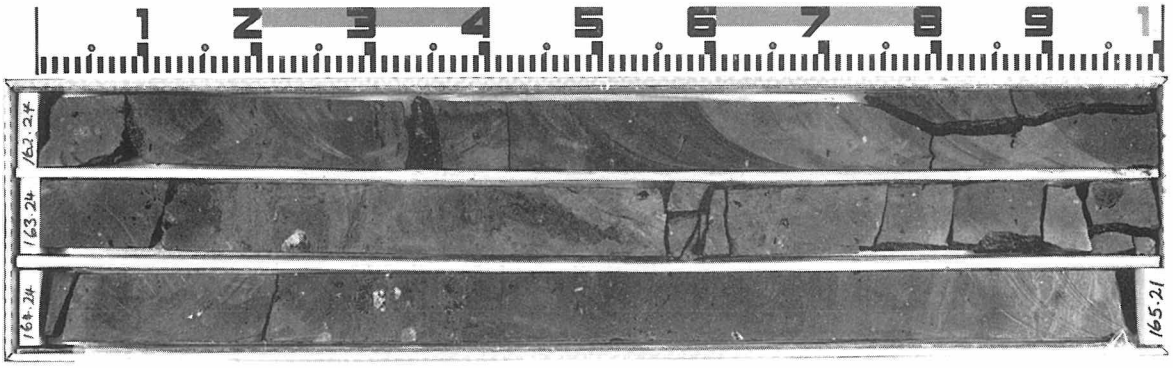
BOX 44 FROM 152.93m TO 156.00m



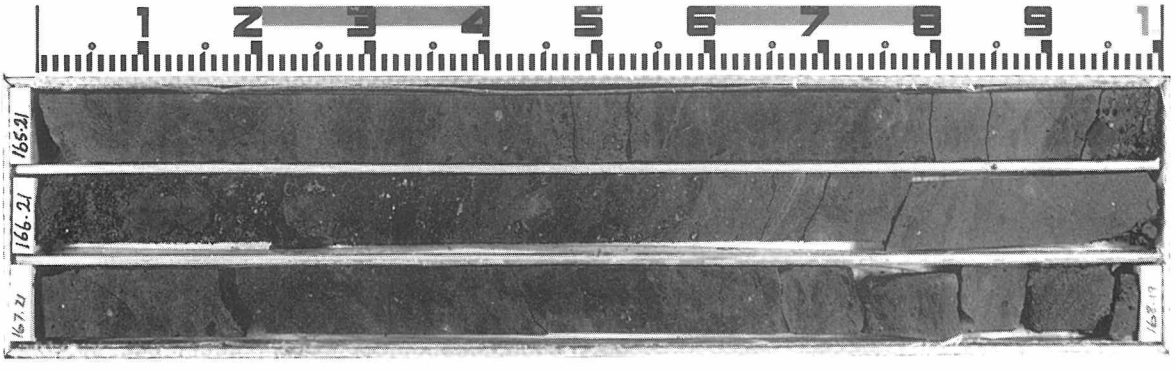
BOX 45 FROM 156.00m TO 159.37m



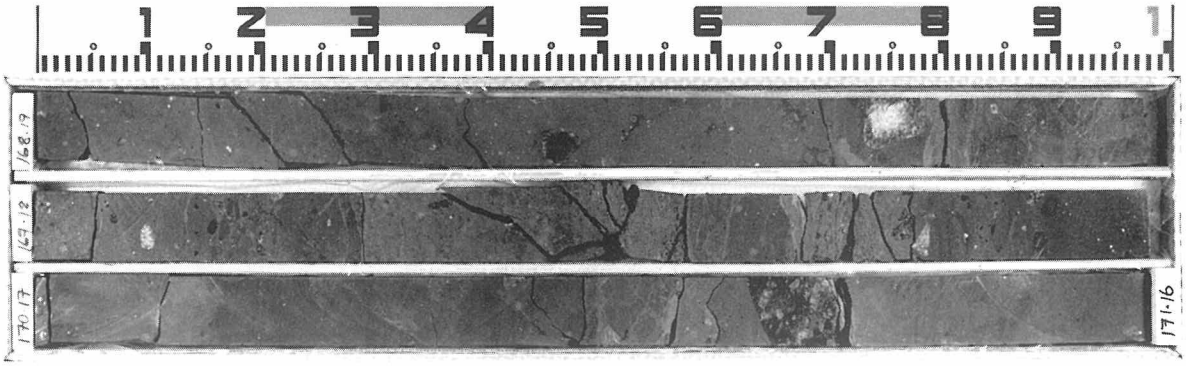
BOX 46 FROM 159.37m TO 162.24m



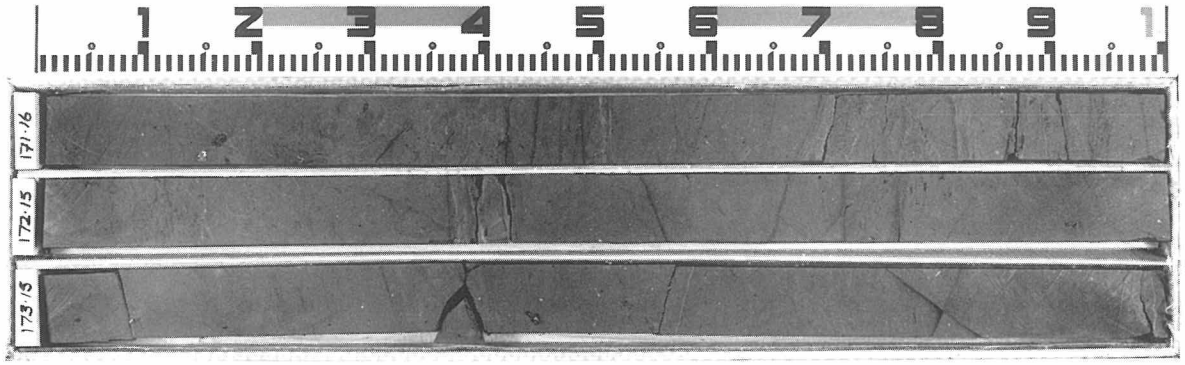
BOX 47 FROM 162.24m TO 165.21m



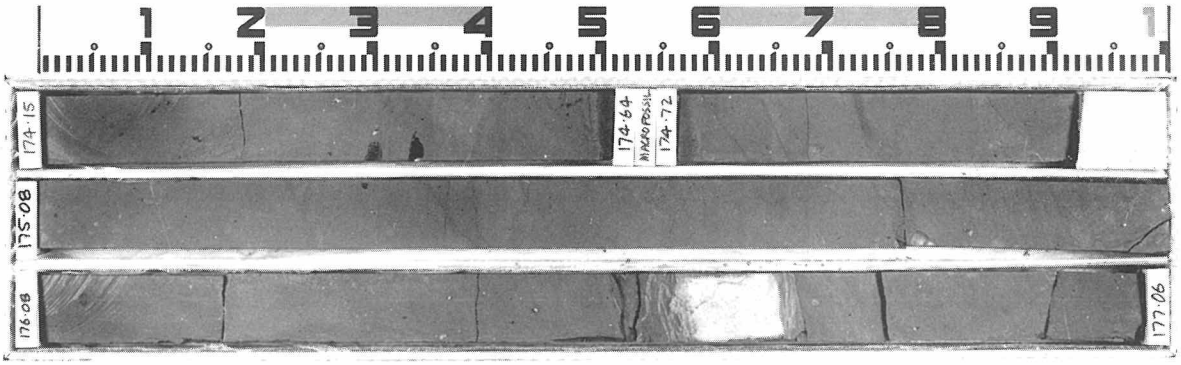
BOX 48 FROM 165.21m TO 168.19m



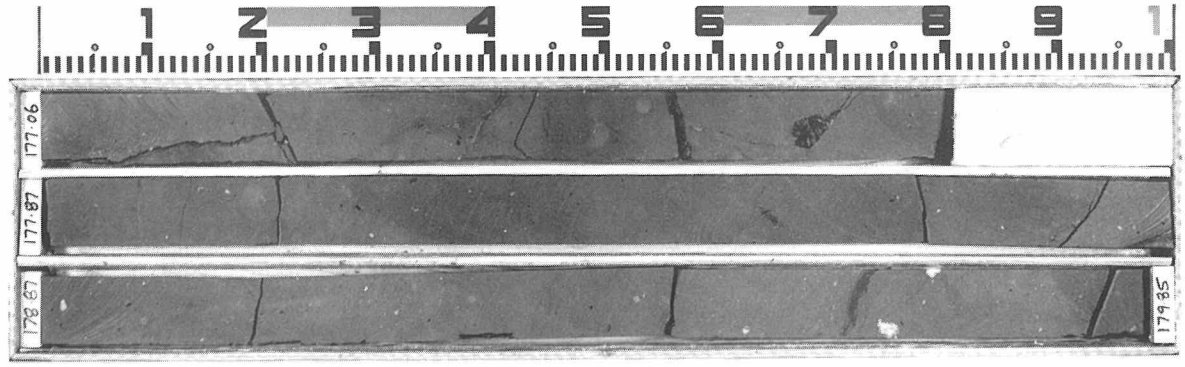
BOX 49 FROM 168.19m TO 171.16m



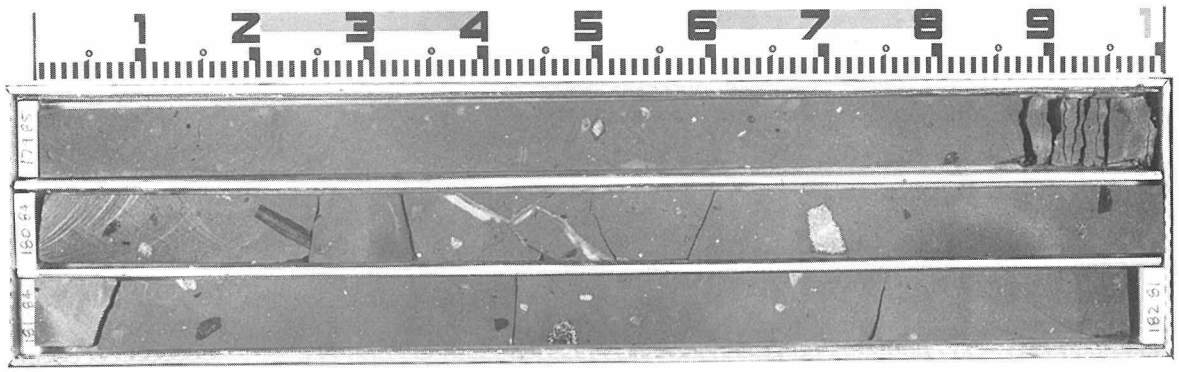
BOX 50 FROM 171.16m TO 174.15m



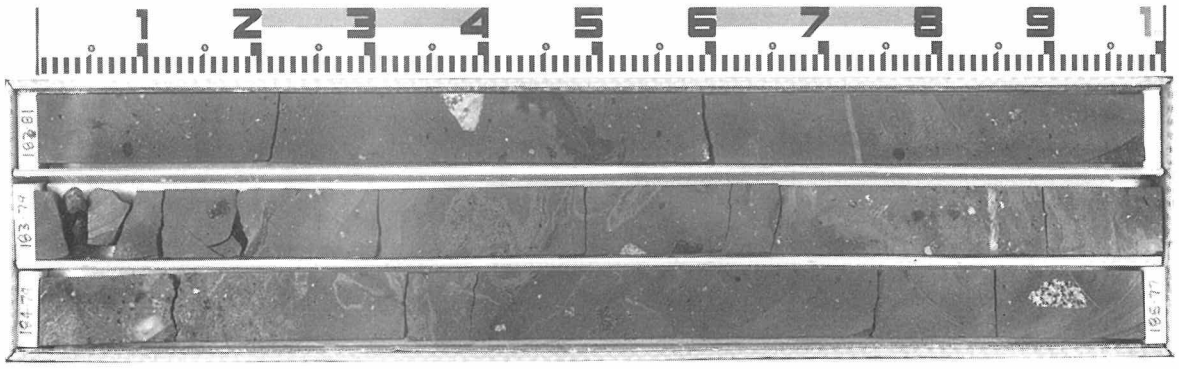
BOX 51 FROM 174.15 m TO 177.06m



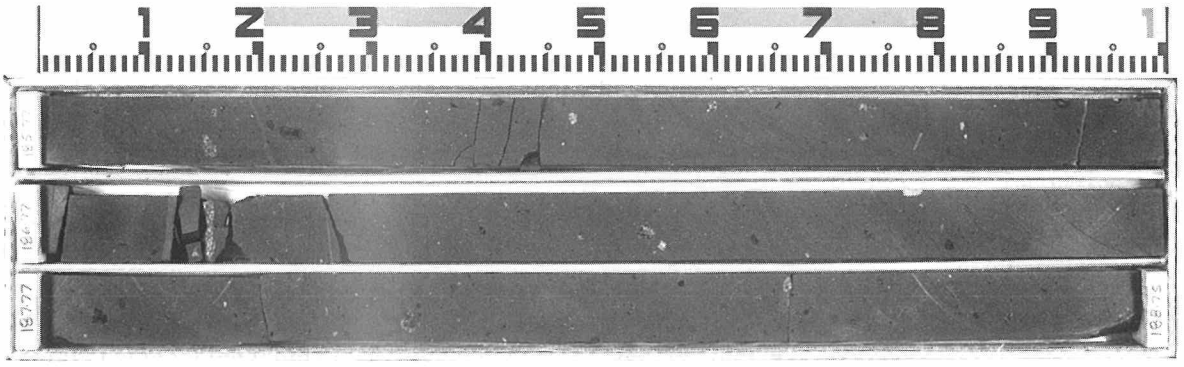
BOX 52 FROM 177.06m TO 179.85m



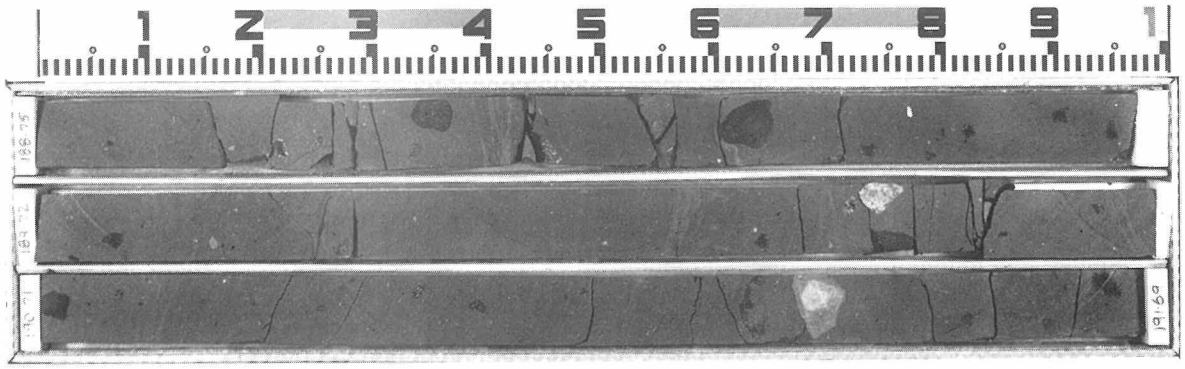
BOX 53 FROM 179·85 m TO 182·81 m



BOX 54 FROM 182·81 m TO 185·77 m



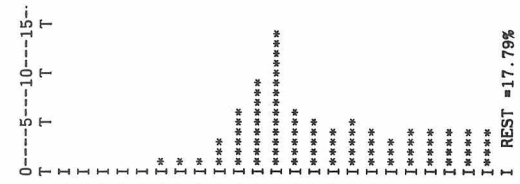
BOX 55 FROM 185·77 m TO 188·75 m



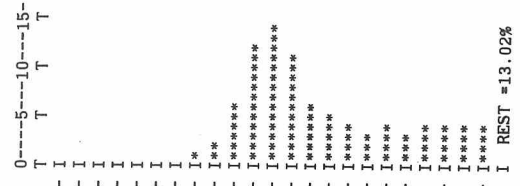
BOX 56 FROM 188·75 m TO 191·69 m

```
CLASS MIDPTS-1.50-0.75-0.25 0.25 0.73 1.21 1.75 2.26 2.70 3.24 3.80 4.28 4.75 5.25 5.75 6.25 6.75 7.25 7.75 8.50 9.50 12.00
CLASS LIMITS-1.00-0.50 0.00 0.49 0.98 1.44 2.06 2.45 2.96 3.53 4.06 4.50 5.00 5.50 6.00 6.50 7.00 7.50 8.00 9.0010.00 14.00

421.38 M  Mw
      DATA 0.00 0.01 0.00 0.00 0.01 0.03 0.04 0.05 0.21 0.94 1.31 1.70 1.01 0.90 0.70 0.94 0.67 0.51 0.80 1.46 1.39  3.77
 FREQUENCY % 0.0  0.1  0.0  0.0  0.1  0.2  0.2  0.4  1.3  5.0  7.5 11.7  6.1  5.5  4.3  5.7  4.1  3.1  4.9  8.9  8.4  22.9
CUMULATIVE % 0.0  0.1  0.1  0.1  0.1  0.3  0.5  0.9  2.1  7.8 15.8 26.1 32.3 37.8 42.0 47.7 51.8 54.9 59.8 68.6 77.1 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  2.54  3.32  4.07  4.46  6.78  9.74 10.99 13.53
MOMENT MEASURES MEAN  7.34  STDEV 3.14  SKEW 0.29  KURT  1.74
GRAPHIC (FOLK)  MEAN  7.28  STDEV 3.28  SKEW 0.27  KURT  0.79  GRAVEL =  0.00 SAND = 15.81 SILT = 43.95 CLAY = 40.24

438.20 M  Dm
      DATA 0.00 0.00 0.03 0.06 0.15 0.25 0.61 0.86 2.04 4.34 3.77 2.02 0.67 0.29 0.20 0.28 0.38 0.32 0.29 0.56 0.65  1.59
 FREQUENCY % 0.0  0.0  0.2  0.3  0.8  1.4  2.5  5.7 10.3 19.7 18.4 11.9  3.5  1.5  1.0  1.4  2.0  1.7  1.5  2.9  3.4  8.2
CUMULATIVE % 0.0  0.0  0.2  0.5  1.2  2.5  5.7 10.1 20.7 43.1 62.6 73.0 76.4 77.9 79.0 80.4 82.4 84.0 85.5 88.4 91.8 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  0.87  1.96  2.76  3.09  3.72  4.79  7.49 11.31
MOMENT MEASURES MEAN  4.69  STDEV 2.82  SKEW 1.51  KURT  4.35
GRAPHIC (FOLK)  MEAN  4.66  STDEV 2.60  SKEW 0.61  KURT  2.26  GRAVEL =  0.00 SAND = 62.55 SILT = 22.99 CLAY = 14.46

452.25 M  Mw
      DATA 0.08 0.02 0.02 0.00 0.03 0.04 0.08 0.11 0.45 1.20 1.79 1.84 1.86 1.08 1.08 0.94 0.46 0.58 0.52 0.80 0.57  1.89
 FREQUENCY % 0.5  0.1  0.1  0.0  0.2  0.3  0.4  0.9  2.9  6.8 10.9 13.5 12.0  7.0  7.0  6.1  3.0  3.8  3.4  5.2  3.7  12.2
CUMULATIVE % 0.5  0.6  0.8  0.8  1.0  1.2  1.7  2.5  5.4 13.1 24.7 36.7 48.7 55.7 62.7 68.8 71.8 75.5 78.9 84.1 87.8 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  1.04  2.91  3.68  4.07  5.09  7.43  8.99 12.91
MOMENT MEASURES MEAN  6.02  STDEV 2.85  SKEW 0.85  KURT  3.09
GRAPHIC (FOLK)  MEAN  5.92  STDEV 2.84  SKEW 0.52  KURT  1.22  GRAVEL =  0.52 SAND = 24.22 SILT = 54.15 CLAY = 21.11

466.51 M  Sw
      DATA 0.00 0.02 0.01 0.02 0.04 0.06 0.13 0.23 0.92 1.78 2.00 1.74 1.38 0.58 0.62 0.46 0.49 0.41 0.48 1.00 0.91  4.64
 FREQUENCY % 0.0  0.1  0.1  0.2  0.4  0.6  1.6  5.0  8.7 10.5 11.0  7.7  3.2  3.5  2.6  2.7  2.3  2.7  5.6  5.1  25.9
CUMULATIVE % 0.0  0.1  0.2  0.3  0.5  0.8  1.6  2.8  8.0 17.9 29.1 38.8 46.5 49.7 53.2 55.7 58.5 60.8 63.4 69.0 74.1 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  1.61  2.72  3.44  3.88  5.54 10.19 12.32 14.00
MOMENT MEASURES MEAN  6.86  STDEV 3.54  SKEW 0.40  KURT  1.63
GRAPHIC (FOLK)  MEAN  7.10  STDEV 3.93  SKEW 0.51  KURT  0.73  GRAVEL =  0.00 SAND = 29.07 SILT = 34.37 CLAY = 36.55

485.03 M  Mw
      DATA 0.00 0.00 0.00 0.01 0.01 0.03 0.08 0.16 0.93 1.83 2.25 1.55 1.24 0.98 0.77 0.95 0.64 0.59 0.72 1.41 1.51  3.21
 FREQUENCY % 0.0  0.0  0.0  0.1  0.1  0.2  0.3  1.1  4.8  8.5 11.2  9.3  6.6  5.2  4.1  5.0  3.4  3.1  3.8  7.5  8.0  17.0
CUMULATIVE % 0.0  0.0  0.0  0.1  0.1  0.3  0.7  1.5  6.5 16.2 28.1 36.3 42.9 48.1 52.1 57.2 60.6 63.7 67.5 75.0 83.0 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  2.24  2.86  3.52  3.94  5.74  9.00 10.15 12.47
MOMENT MEASURES MEAN  6.60  STDEV 3.14  SKEW 0.54  KURT  1.98
GRAPHIC (FOLK)  MEAN  6.47  STDEV 3.11  SKEW 0.37  KURT  0.78  GRAVEL =  0.00 SAND = 28.09 SILT = 39.43 CLAY = 32.49
```

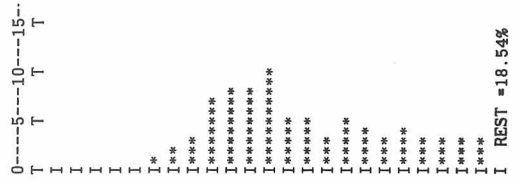
```
CLASS MIDPTS-1.50-0.75-0.25 0.25 0.73 1.21 1.75 2.26 2.70 3.24 3.80 4.28 4.75 5.25 5.75 6.25 6.75 7.25 7.75 8.50 9.50 12.00
CLASS LIMITS-1.00-0.50 0.00 0.49 0.98 1.44 2.06 2.45 2.96 3.53 4.06 4.50 5.00 5.50 6.00 6.50 7.00 7.50 8.00 9.0010.00 14.00

505.52 M  Sw
       DATA 0.00 0.00 0.01 0.00 0.02 0.13 0.20 0.19 0.63 1.67 2.22 2.86 1.31 1.06 0.89 1.21 0.94 0.65 0.96 1.76 1.82  4.01
 FREQUENCY % 0.0  0.0  0.0  0.0  0.1  0.6  0.7  1.1  2.7  6.5  9.3 14.4  5.8  4.7  3.9  5.4  4.2  2.9  4.3  7.8  8.1  17.8
CUMULATIVE % 0.0  0.0  0.0  0.0  0.1  0.7  1.6  2.4  5.2 12.6 22.5 35.2 41.0 45.7 49.6 55.0 59.2 62.1 66.3 74.1 82.2 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  1.69  2.93  3.73  4.16  6.03  9.10 10.26 12.62
MOMENT MEASURES MEAN  6.75  STDEV 3.13  SKEW 0.48  KURT  1.97
GRAPHIC (FOLK)  MEAN  6.67  STDEV 3.10  SKEW 0.33  KURT  0.80  GRAVEL =  0.00 SAND = 22.49 SILT = 43.83 CLAY = 33.67
```



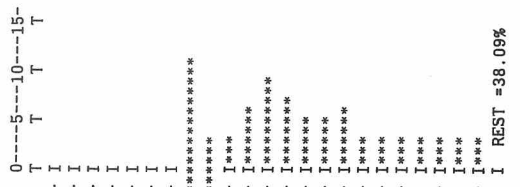

```
525.52 M  Mw
       DATA 0.00 0.02 0.00 0.01 0.02 0.03 0.07 0.11 0.44 1.29 2.35 2.21 1.88 1.03 0.90 0.77 0.58 0.64 0.51 1.35 1.29  2.32
 FREQUENCY % 0.0  0.1  0.0  0.1  0.1  0.2  0.3  0.8  2.4  6.4 12.4 14.1 10.5  5.8  5.1  4.3  3.3  3.6  2.9  7.6  7.2  13.0
CUMULATIVE % 0.0  0.1  0.1  0.2  0.3  0.4  0.8  1.5  3.9 11.2 24.4 36.8 47.3 53.1 58.1 62.5 65.7 69.3 72.2 79.7 87.0 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  2.18  3.08  3.76  4.09  5.23  8.35  9.55 11.77
MOMENT MEASURES MEAN  6.32  STDEV 2.90  SKEW 0.76  KURT  2.43
GRAPHIC (FOLK)  MEAN  6.18  STDEV 2.77  SKEW 0.50  KURT  0.83  GRAVEL =  0.00 SAND = 24.35 SILT = 47.81 CLAY = 27.83
```



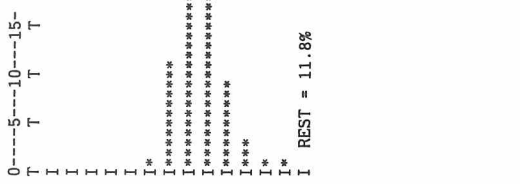

```
544.00 M  Mb
       DATA 0.00 0.00 0.01 0.02 0.04 0.13 0.35 0.48 1.22 1.59 1.64 1.61 0.98 0.83 0.60 0.83 0.82 0.53 0.76 1.27 1.23  3.40
 FREQUENCY % 0.0  0.0  0.1  0.1  0.2  0.8  1.5  3.4  6.5  7.6  8.4 10.0  5.3  4.5  3.3  4.5  4.5  2.9  4.1  6.9  6.7  18.5
CUMULATIVE % 0.0  0.0  0.1  0.2  0.4  1.1  3.0  5.6 12.3 20.9 29.9 38.7 44.0 48.5 51.8 56.3 60.8 63.7 67.8 74.8 81.5 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  1.40  2.37  3.23  3.78  5.72  9.03 10.44 13.29
MOMENT MEASURES MEAN  6.52  STDEV 3.32  SKEW 0.46  KURT  1.93
GRAPHIC (FOLK)  MEAN  6.46  STDEV 3.45  SKEW 0.35  KURT  0.85  GRAVEL =  0.00 SAND = 29.88 SILT = 37.95 CLAY = 32.17
```




```
569.45 M  Mb
       DATA 0.00 0.00 0.00 0.00 0.01 0.02 0.06 0.10 0.23 0.60 1.05 1.23 1.16 0.78 0.87 0.96 0.41 0.41 0.41 0.84 0.84  6.14
 FREQUENCY % 0.0  0.0  0.0  0.0  0.1  0.1  0.3  0.8  1.4  3.3  6.1  8.7  7.2  4.8  5.4  6.0  2.5  2.5  2.5  5.2  5.2  38.1
CUMULATIVE % 0.0  0.0  0.0  0.0  0.1  0.2  0.6  1.2  2.6  6.3 12.8 20.5 27.7 32.5 37.9 43.9 46.4 48.9 51.5 56.7 61.9 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  2.36  3.37  4.26  4.82  7.71 12.76 14.00 14.00
MOMENT MEASURES MEAN  8.10  STDEV 3.43  SKEW-0.02  KURT  1.39
GRAPHIC (FOLK)  MEAN  8.66  STDEV 4.05  SKEW 0.24  KURT  0.55  GRAVEL =  0.00 SAND = 12.84 SILT = 38.65 CLAY = 48.51
```

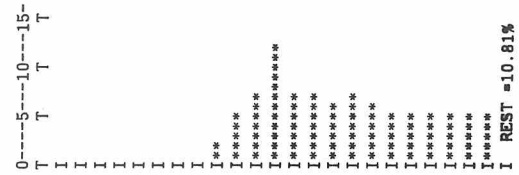



```
584.51 M  Sm
       DATA 0.00 0.00 0.00 0.00 0.01 0.16 2.42 4.92 5.01 1.66 0.55 0.21 0.12                                              2.00
 FREQUENCY % 0.0  0.0  0.0  0.0  0.1  1.0 11.4 36.9 28.8  8.5  3.0  1.4  0.7                                             11.0
CUMULATIVE % 0.0  0.0  0.0  0.0  0.1  1.0 15.2 44.0 73.3 83.0 86.2 87.5 88.2                                            100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  1.44  1.77  2.08  2.22  2.55  3.05  3.68  5.09
MOMENT MEASURES MEAN  2.85  STDEV 1.04  SKEW 1.30  KURT  3.78
GRAPHIC (FOLK)  MEAN  2.77  STDEV 0.91  SKEW 0.47  KURT  1.64  GRAVEL =  0.00 SAND = 86.24 SILT = 13.76 CLAY =  0.00
```

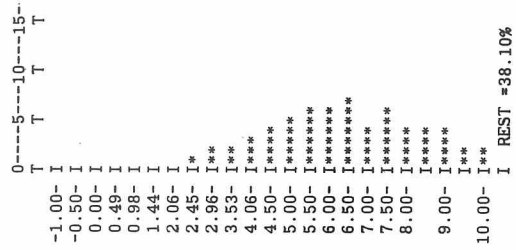


```
CLASS MIDPTS-1.50-0.75-0.25 0.25 0.73 1.21 1.75 2.26 2.70 3.24 3.80 4.28 4.75 5.25 5.75 6.25 6.75 7.25 7.75 8.50 9.50 12.00
CLASS LIMITS-1.00-0.50 0.00 0.49 0.98 1.44 2.06 2.45 2.96 3.53 4.06 4.50 5.00 5.50 6.00 6.50 7.00 7.50 8.00 9.0010.00 14.00

584.93 M  Sm
      DATA 0.00 0.57 1.32 1.71 3.43 3.93 5.01 2.40 1.49 0.67 0.46 0.24 0.21                                    3.00
 FREQUENCY % 0.0  2.3  5.3  7.0 14.1 17.2 16.3 12.4  5.9  2.4  1.8  1.1  0.8                                   13.0
CUMULATIVE % 0.0  2.3  7.6 14.5 28.4 44.2 64.4 74.1 80.1 82.8 84.7 85.6 86.5                                  100.0

 PERCENTILES (1,5,16,25,50,75,84,95) -0.79 -0.19  0.55  0.88  1.62  2.52  3.86  5.10
MOMENT MEASURES MEAN  1.96  STDEV 1.63  SKEW 0.82  KURT  2.86
GRAPHIC (FOLK)  MEAN  2.01  STDEV 1.63  SKEW 0.34  KURT  1.32  GRAVEL =  0.00 SAND = 84.67 SILT = 15.33 CLAY =  0.00

599.44 M  Mw
      DATA 0.00 0.00 0.01 0.02 0.02 0.12 0.52 0.50 0.71 0.65 0.89 1.37 1.00 1.27 1.11 1.29 0.99 0.84 0.86 1.50 1.34  1.69
 FREQUENCY % 0.0  0.0  0.1  0.1  0.8  2.5  3.8  4.2  3.4  5.0  9.3  6.0  7.6  6.6  7.7  5.9  5.0  5.1  9.0  8.0  10.1
CUMULATIVE % 0.0  0.0  0.1  0.2  0.3  1.0  4.1  7.1 11.4 15.3 20.6 28.8 34.8 42.4 49.0 56.8 62.7 67.7 72.9 81.9 89.9 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  1.43  2.19  3.61  4.31  6.06  8.22  9.23 11.01
MOMENT MEASURES MEAN  6.38  STDEV 2.82  SKEW 0.41  KURT  2.51
GRAPHIC (FOLK)  MEAN  6.30  STDEV 2.74  SKEW 0.13  KURT  0.92  GRAVEL =  0.00 SAND = 20.60 SILT = 52.28 CLAY = 27.13

608.68 M  Sm
      DATA 0.02 0.07 0.07 0.08 0.17 0.32 0.77 1.01 1.98 2.29 1.90 1.23 1.00 0.49 0.54 0.59 0.32 0.32 0.25 0.41 0.12  2.88
 FREQUENCY % 0.1  0.4  0.4  0.5  1.0  2.1  3.7  7.7 11.5 11.9 10.7  8.3  5.9  2.9  3.2  3.5  1.9  1.9  1.5  2.4  0.7  17.1
CUMULATIVE % 0.1  0.5  1.0  1.4  2.4  4.3  8.9 14.9 26.7 40.3 51.6 58.9 64.8 67.7 70.9 74.5 76.4 78.3 79.7 82.2 82.9 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  0.06  1.55  2.51  2.90  3.99  6.64 11.61 14.00
MOMENT MEASURES MEAN  5.29  STDEV 3.48  SKEW 0.98  KURT  2.70
GRAPHIC (FOLK)  MEAN  6.04  STDEV 4.16  SKEW 0.64  KURT  1.36  GRAVEL =  0.12 SAND = 51.46 SILT = 28.16 CLAY = 20.26

610.89 M  Ss
      DATA 0.00 0.00 0.00 0.01 0.01 0.02 0.03 0.14 0.56 2.09 2.64 2.36 1.28 1.76 0.48 0.53 0.39 0.29 0.35 0.22 0.41 0.22  3.27
 FREQUENCY % 0.0  0.0  0.0  0.1  0.1  0.1  0.2  0.7  4.2 12.0 13.6 13.1  8.5 10.3  2.8  3.1  2.3  1.7  2.1  1.3  2.4  1.3  19.2
CUMULATIVE % 0.0  0.0  0.0  0.1  0.1  0.2  0.4  1.2  4.5 16.8 32.2 46.1 53.6 63.9 66.7 69.8 72.1 73.8 75.8 77.1 79.5 80.8 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  1.94  2.48  2.94  3.29  4.29  7.29 12.65 14.00
MOMENT MEASURES MEAN  5.72  STDEV 3.39  SKEW 1.01  KURT  2.49
GRAPHIC (FOLK)  MEAN  6.63  STDEV 4.17  SKEW 0.70  KURT  1.18  GRAVEL =  0.00 SAND = 46.07 SILT = 31.07 CLAY = 22.86

632.78 M  Sm
      DATA 0.02 0.05 0.18 0.36 1.21 2.27 4.40 2.92 2.08 0.80 0.28 0.09 0.05                                    3.00
 FREQUENCY % 0.1  0.3  1.0  2.0  6.8 13.6 19.5 20.6 11.2  3.9  1.5  0.6  0.3                                   19.0
CUMULATIVE % 0.1  0.4  1.4  3.4 10.0 22.5 46.7 62.8 74.2 78.6 80.2 80.7 81.0                                  100.0

 PERCENTILES (1,5,16,25,50,75,84,95) -0.13  0.66  1.23  1.51  2.14  3.05  5.02  5.14
MOMENT MEASURES MEAN  2.53  STDEV 1.52  SKEW 0.72  KURT  2.53
GRAPHIC (FOLK)  MEAN  2.80  STDEV 1.63  SKEW 0.43  KURT  1.19  GRAVEL =  0.11 SAND = 80.08  MUD = 19.81
```

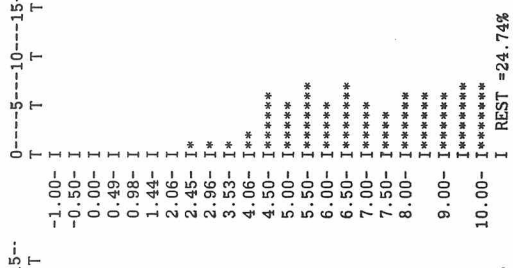
```
CLASS MIDPTS-1.50-0.75-0.25 0.25 0.73 1.21 1.75 2.26 2.70 3.24 3.80 4.28 4.75 5.25 5.75 6.25 6.75 7.25 7.75 8.50 9.50 12.00
CLASS LIMITS-1.00-0.50 0.00 0.49 0.98 1.44 2.06 2.45 2.96 3.53 4.06 4.50 5.00 5.50 6.00 6.50 7.00 7.50 8.00 9.0010.00 14.00

634.54 M  Ms
       DATA 0.00 0.00 0.00 0.00 0.02 0.03 0.07 0.08 0.39 1.16 1.69 2.28 1.47 1.56 1.32 1.55 1.32 1.01 1.17 2.29 2.23  2.38
 FREQUENCY % 0.0  0.0  0.0  0.0  0.1  0.1  0.3  0.5  1.7  4.6  7.2 11.8  6.7  7.1  6.0  7.0  6.0  4.6  5.3 10.4 10.1  10.8
CUMULATIVE % 0.0  0.0  0.0  0.0  0.1  0.2  0.5  0.9  2.7  7.9 15.6 26.0 32.7 39.7 45.7 52.8 58.8 63.4 68.7 79.1 89.2 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  2.49  3.27  4.08  4.46  6.30  8.58  9.43 10.95
MOMENT MEASURES MEAN  6.74  STDEV 2.66  SKEW 0.51  KURT  2.37
GRAPHIC (FOLK)  MEAN  6.61  STDEV 2.50  SKEW 0.19  KURT  0.76  GRAVEL =  0.00 SAND = 15.62 SILT = 53.04 CLAY = 31.34
```



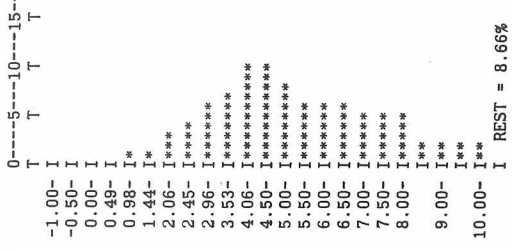

```
654.54 M  Mw
       DATA 0.00 0.00 0.01 0.01 0.01 0.03 0.07 0.08 0.37 0.44 0.52 0.54 0.82 0.97 0.99 1.16 0.75 0.93 0.75 1.19 0.71  6.37
 FREQUENCY % 0.0  0.0  0.1  0.1  0.1  0.2  0.3  0.6  2.2  2.3  2.9  3.7  4.9  5.8  5.9  6.9  4.5  5.6  4.5  7.1  4.2  38.1
CUMULATIVE % 0.0  0.0  0.1  0.1  0.2  0.4  0.8  1.3  3.5  6.1  9.2 12.4 17.3 23.1 29.1 36.0 40.5 46.1 50.5 57.7 61.9 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  2.26  3.32  4.87  5.66  7.94 13.38 14.00 14.00
MOMENT MEASURES MEAN  8.37  STDEV 3.22  SKEW-0.13  KURT  1.63
GRAPHIC (FOLK)  MEAN  8.94  STDEV 3.90  SKEW 0.23  KURT  0.57  GRAVEL =  0.00 SAND =  9.21 SILT = 41.33 CLAY = 49.46
```



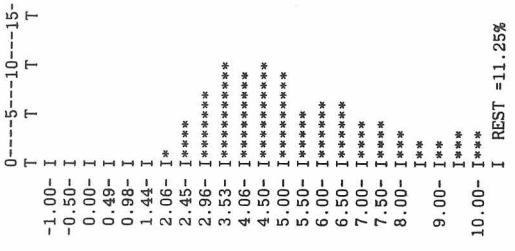

```
674.88 M  Mm
       DATA 0.00 0.00 0.00 0.00 0.05 0.04 0.07 0.08 0.14 0.23 0.40 0.87 0.85 1.22 0.93 1.14 0.93 0.70 0.98 2.02 2.40  4.29
 FREQUENCY % 0.0  0.0  0.0  0.0  0.3  0.3  0.3  0.6  0.8  1.2  2.2  5.7  4.9  7.0  5.4  6.6  5.4  4.0  5.7 11.6 13.8  24.7
CUMULATIVE % 0.0  0.0  0.0  0.0  0.3  0.5  0.9  1.4  2.2  3.5  5.8 10.8 15.7 22.8 28.1 34.7 40.1 44.1 49.8 61.4 75.3 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  2.14  3.89  5.02  5.71  8.02  9.98 10.79 12.45
MOMENT MEASURES MEAN  8.08  STDEV 2.85  SKEW-0.02  KURT  1.96
GRAPHIC (FOLK)  MEAN  7.94  STDEV 2.74  SKEW 0.00  KURT  0.82  GRAVEL =  0.00 SAND =  5.82 SILT = 43.94 CLAY = 50.23
```



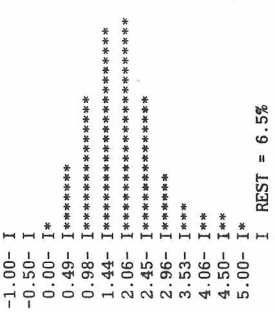

```
685.67 M  Mm
       DATA 0.00 0.04 0.04 0.06 0.15 0.18 0.41 0.43 0.75 0.98 1.35 1.18 1.09 0.83 0.74 0.77 0.66 0.60 0.60 0.50 0.56  1.13
 FREQUENCY % 0.0  0.3  0.3  0.5  1.2  1.5  2.5  4.2  5.6  6.6  9.8 10.3  8.4  6.4  5.7  5.9  5.1  4.6  4.6  3.8  4.3  8.7
CUMULATIVE % 0.0  0.3  0.6  1.1  2.2  3.6  6.7 10.0 15.8 23.3 33.6 42.7 51.0 57.4 63.1 69.0 74.0 78.6 83.2 87.0 91.3 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  0.43  1.75  2.98  3.62  4.94  7.10  8.19 11.21
MOMENT MEASURES MEAN  5.56  STDEV 2.85  SKEW 0.73  KURT  3.09
GRAPHIC (FOLK)  MEAN  5.37  STDEV 2.74  SKEW 0.29  KURT  1.11  GRAVEL =  0.00 SAND = 33.64 SILT = 49.58 CLAY = 16.78
```




```
692.58 M  Mw
       DATA 0.00 0.00 0.00 0.00 0.00 0.05 0.29 0.53 1.14 1.79 1.51 1.43 1.38 0.88 0.98 1.04 0.57 0.62 0.41 0.78 0.88  1.81
 FREQUENCY % 0.0  0.0  0.0  0.0  0.0  0.0  0.3  1.5  4.2  6.9  9.8  8.9 10.1  8.6  5.5  6.1  6.5  3.5  3.9  2.5  4.8  5.5  11.2
CUMULATIVE % 0.0  0.0  0.0  0.0  0.0  0.0  0.3  2.1  5.4 12.5 23.6 33.0 41.9 50.5 55.9 62.0 68.5 72.0 75.9 78.4 83.3 88.8 100.0

 PERCENTILES (1,5,16,25,50,75,84,95)  1.80  2.41  3.17  3.61  4.97  7.38  9.12 11.74
MOMENT MEASURES MEAN  5.85  STDEV 2.92  SKEW 0.87  KURT  2.76
GRAPHIC (FOLK)  MEAN  5.75  STDEV 2.90  SKEW 0.42  KURT  1.01  GRAVEL =  0.00 SAND = 33.00 SILT = 45.43 CLAY = 21.57
```



```
CLASS MIDPTS-1.50-0.75-0.25 0.25 0.73 1.21 1.75 2.26 2.70 3.24 3.80 4.28 4.75  12.00
CLASS LIMITS-1.00-0.50 0.00 0.49 0.98 1.44 2.06 2.45 2.96 3.53 4.06 4.50 5.00  14.00

701.95 M  Sm
      DATA 0.00 0.05 0.18 0.79 1.64 2.36 3.35 1.34 0.72 0.41 0.26 0.18 0.16   0.00
 FREQUENCY % 0.0  0.4  1.5  6.6 13.7 21.0 22.1 14.0  5.8  2.9  2.0  1.7  1.3    6.0
CUMULATIVE % 0.0  0.4  1.9  8.3 21.7 41.0 68.4 79.3 85.2 88.6 90.7 92.2 93.5  100.0

 PERCENTILES (1,5,16,25,50,75,84,95) -0.22  0.31  0.81  1.07  1.64  2.29  2.85  5.03
MOMENT MEASURES MEAN  1.88  STDEV 1.29  SKEW 1.17  KURT  4.12
GRAPHIC (FOLK)  MEAN  1.76  STDEV 1.23  SKEW 0.31  KURT  1.59  SAND = 90.69  MUD =  6.5
```



			PERCENTILES								FOLK MEASURES				MOMENT MEASURES				PERCENT			
			1	5	16	25	50	75	84	95	MEAN	SDEV	SKEW	KURT	MEAN	SDEV	SKEW	KURT	GRVL	SAND	SILT	CLAY
26.80	M	Dw	0.4	1.3	2.3	3.5	6.2	10.8	14.0	14.0	7.50	4.85	0.28	0.72	6.70	3.85	0.16	1.73	0.3	29.1	36.0	34.7
32.06	M	Ms	1.8	3.1	3.9	4.3	5.4	6.9	8.0	10.7	5.77	2.18	0.31	1.18	5.91	2.34	1.03	3.89	0.0	20.4	63.7	15.9
59.35	M	Bm	1.7	3.7	5.0	5.6	6.7	9.1	11.7	14.0	7.80	3.26	0.45	1.21	7.44	2.82	0.41	2.31	0.0	7.3	60.6	32.2
64.11	M	Bw	2.3	3.3	3.8	4.0	5.1	7.4	9.1	12.8	6.00	2.77	0.58	1.14	6.11	2.79	0.97	2.99	0.2	25.9	52.9	21.1
83.46	M	Dw	-0.6	1.0	2.8	3.8	5.5	7.9	9.6	13.3	5.96	3.53	0.25	1.23	5.97	3.31	0.38	2.47	0.4	29.3	46.5	23.8
98.98	M	Mw	1.7	3.6	4.8	5.3	6.6	9.0	10.6	13.8	7.31	3.00	0.38	1.14	7.29	2.79	0.43	2.34	0.0	8.7	58.7	32.6
125.72	M	Dw	-7.5	0.5	2.9	3.7	5.1	7.4	8.7	11.5	5.57	3.13	0.20	1.22	5.58	3.20	0.26	2.99	3.6	26.8	49.1	20.5
133.82	M	BM	2.6	3.8	4.6	5.1	6.6	9.0	10.5	13.6	7.24	2.97	0.38	1.03	7.26	2.79	0.50	2.23	0.0	7.6	59.1	33.3
142.31	M	Sw	1.4	2.6	3.5	3.8	4.5	5.9	6.9	9.0	4.94	1.81	0.43	1.25	4.99	1.96	1.16	4.63	0.0	32.9	57.9	9.2
153.23	M	Ss	1.3	2.0	3.2	3.6	4.5	7.1	8.6	11.6	5.42	2.81	0.51	1.12	5.52	2.88	0.99	3.08	0.0	39.0	41.8	19.1
157.98	M	Sw	1.5	2.3	3.3	3.7	4.5	6.9	8.7	12.0	5.50	2.82	0.56	1.24	5.57	2.87	1.07	3.19	0.0	36.0	44.8	19.2
164.67	M	Dw	-0.5	2.1	3.9	4.4	6.1	8.7	10.4	14.0	6.83	3.43	0.32	1.15	6.70	3.18	0.26	2.46	0.7	17.1	51.9	30.2
173.26	M	Mw	1.3	3.4	4.2	4.5	5.6	7.6	9.2	13.3	6.31	2.75	0.49	1.31	6.37	2.73	0.80	3.12	0.4	12.9	64.9	21.7
185.78	M	Dw	1.7	3.6	4.2	4.6	5.8	8.1	9.8	13.2	6.60	2.85	0.49	1.15	6.63	2.77	0.77	2.68	0.0	12.7	61.9	25.4
202.15	M	Ds	-6.2	0.9	2.1	2.6	4.2	7.7	9.9	14.0	5.38	3.94	0.49	1.05	5.25	3.74	0.57	2.38	3.8	44.7	27.8	23.7
206.95	M	Dm	-1.5	0.8	2.6	3.5	5.0	7.9	9.0	11.0	5.52	3.15	0.23	0.97	5.63	3.22	0.33	2.60	1.4	32.2	42.6	23.8
213.63	M	Mw	2.2	3.5	4.8	5.4	7.4	9.5	10.4	12.1	7.52	2.71	0.06	0.87	7.65	2.79	0.16	2.07	0.0	9.0	47.9	43.1
224.91	M	Mw	3.3	4.2	5.2	5.8	8.0	10.1	10.9	12.7	8.05	2.72	0.06	0.82	8.20	2.75	0.08	1.81	0.0	3.9	45.9	50.2
231.49	M	Dm	-2.8	0.7	2.2	2.8	4.3	6.9	9.0	12.8	5.14	3.53	0.40	1.21	5.12	3.43	0.66	2.78	2.4	44.1	34.1	19.4
240.96	M	Ss	2.3	3.3	3.7	3.9	4.4	6.5	8.0	9.5	5.34	2.02	0.67	1.00	5.32	2.19	1.25	3.79	0.0	36.5	47.7	15.8
277.81	M	Dw	-7.7	-0.6	1.9	2.5	4.1	6.3	7.8	10.0	4.60	3.10	0.17	1.15	4.58	3.12	0.45	3.07	4.6	44.4	36.1	14.9
288.35	M	Ss	-2.6	1.1	2.3	2.8	3.9	7.2	9.6	14.0	5.28	3.78	0.55	1.19	5.17	3.56	0.77	2.61	1.9	50.3	26.1	21.6
309.38	M	Dm	0.2	1.8	3.2	4.2	7.2	10.6	12.2	14.0	7.57	4.09	0.12	0.78	7.30	3.68	-0.05	1.73	0.2	23.4	31.4	44.9
335.17	M	Dw	-0.1	0.6	1.9	2.6	4.5	7.5	8.9	11.1	5.10	3.35	0.27	0.88	5.16	3.35	0.59	2.44	0.0	46.5	31.4	22.1
354.02	M	Sm	0.6	2.0	2.9	3.1	3.5	3.9	4.1	7.0	3.51	1.05	0.24	2.67	3.74	1.71	2.86	14.27	0.1	82.9	13.4	3.6
362.48	M	Sm	-0.3	0.2	0.7	0.9	1.3	1.8	2.1	4.9	1.35	1.06	0.32	2.13	1.50	1.12	1.84	7.10	0.0	94.2		5.8
366.99	M	Dw	1.5	2.4	2.9	3.1	4.2	6.1	8.5	14.0	5.16	3.15	0.62	1.61	5.19	3.02	1.29	3.45	0.0	46.4	35.8	17.7
386.08	M	Dw	2.4	3.0	3.5	3.9	5.2	7.9	9.2	11.1	5.97	2.66	0.45	0.83	6.06	2.81	0.85	2.63	0.0	31.8	44.4	23.8
389.53	M	Mw	2.6	3.2	3.9	4.2	5.5	8.2	9.9	13.5	6.43	3.06	0.50	1.05	6.49	2.91	0.80	2.42	0.0	20.7	52.8	26.6
398.45	M	Dm	0.6	1.8	2.6	2.9	3.5	4.3	5.4	10.1	3.83	1.98	0.47	2.42	4.17	2.46	1.90	6.43	0.2	70.1	20.2	9.5
421.38	M	Mw	2.5	3.3	4.1	4.5	6.8	9.7	11.0	13.5	7.28	3.28	0.27	0.79	7.34	3.14	0.29	1.74	0.0	15.8	44.0	40.2
438.20	M	Dm	0.9	2.0	2.8	3.1	3.7	4.8	7.5	11.3	4.66	2.60	0.61	2.26	4.69	2.82	1.51	4.35	0.0	62.6	23.0	14.5
452.25	M	Mw	1.0	2.9	3.7	4.1	5.1	7.4	9.0	12.9	5.92	2.84	0.52	1.22	6.02	2.85	0.85	3.09	0.5	24.2	54.1	21.1
466.51	M	Sw	1.6	2.7	3.4	3.9	5.5	10.2	12.3	14.0	7.10	3.93	0.51	0.73	6.86	3.54	0.40	1.63	0.0	29.1	34.4	36.6
485.03	M	Mw	2.2	2.9	3.5	3.9	5.7	9.0	10.1	12.5	6.47	3.11	0.37	0.78	6.60	3.14	0.54	1.98	0.0	28.1	39.4	32.5
505.52	M	Sw	1.7	2.9	3.7	4.2	6.0	9.1	10.3	12.6	6.67	3.10	0.33	0.80	6.75	3.13	0.48	1.97	0.0	22.5	43.8	33.7
525.52	M	Mw	2.2	3.1	3.8	4.1	5.2	8.4	9.6	11.8	6.18	2.77	0.50	0.83	6.32	2.90	0.76	2.43	0.0	24.4	47.8	27.8
544.00	M	Mb	1.4	2.4	3.2	3.8	5.7	9.0	10.4	13.3	6.46	3.45	0.35	0.85	6.52	3.32	0.46	1.93	0.0	29.9	37.9	32.2
569.45	M	Mb	2.4	3.4	4.3	4.8	7.7	12.8	14.0	14.0	8.66	4.05	0.24	0.55	8.10	3.43	-0.02	1.39	0.0	12.8	38.6	48.5
584.51	M	Sm	1.4	1.8	2.1	2.2	2.6	3.0	3.7	5.1	2.77	0.91	0.47	1.64	2.85	1.04	1.30	3.78	0.0	86.2		13.8
584.93	M	Sm	-0.8	-0.2	0.6	0.9	1.6	2.5	3.9	5.1	2.01	1.63	0.34	1.32	1.96	1.63	0.82	2.86	0.0	84.7		15.3
599.44	M	Mw	1.4	2.2	3.6	4.3	6.1	8.2	9.2	11.0	6.30	2.74	0.13	0.92	6.38	2.82	0.41	2.51	0.0	20.6	52.3	27.1
608.68	M	Sm	0.1	1.6	2.5	2.9	4.0	6.6	11.6	14.0	6.04	4.16	0.64	1.36	5.29	3.48	0.98	2.70	0.1	51.5	28.2	20.3
610.89	M	Ss	1.9	2.5	2.9	3.3	4.3	7.3	12.6	14.0	6.63	4.17	0.70	1.18	5.72	3.39	1.01	2.49	0.0	46.1	31.1	22.9
632.78	M	Sm	-0.1	0.7	1.2	1.5	2.1	3.1	5.0	5.1	2.80	1.63	0.43	1.19	2.53	1.52	0.72	2.53	0.1	80.1		19.8
634.54	M	Ms	2.5	3.3	4.1	4.5	6.3	8.6	9.4	11.0	6.61	2.50	0.19	0.76	6.74	2.66	0.51	2.37	0.0	15.6	53.0	31.3
654.54	M	Mw	2.3	3.3	4.9	5.7	7.9	13.4	14.0	14.0	8.94	3.90	0.23	0.57	8.37	3.22	-0.13	1.63	0.0	9.2	41.3	49.5
674.88	M	Mm	2.1	3.9	5.0	5.7	8.0	10.0	10.8	12.5	7.94	2.74	0.00	0.82	8.08	2.85	-0.02	1.96	0.0	5.8	43.9	50.2
685.67	M	Mm	0.4	1.8	3.0	3.6	4.9	7.1	8.2	11.2	5.37	2.74	0.29	1.11	5.56	2.85	0.73	3.09	0.0	33.6	49.6	16.8
692.58	M	Mw	1.8	2.4	3.2	3.6	5.0	7.4	9.1	11.7	5.75	2.90	0.42	1.01	5.85	2.92	0.87	2.76	0.0	33.0	45.4	21.6
701.95	M	Sm	-0.2	0.3	0.8	1.1	1.6	2.3	2.8	5.0	1.76	1.23	0.31	1.59	1.88	1.29	1.17	4.12	0.0	90.7		9.3