STATOIL 1/9-3 NORWEGIAN NORTH SEA WELL:

BIOSTRATIGRAPHY OF THE INTERVAL

180m - 2773m

TECHNICAL REPORT

ROBERTSON RESEARCH INTERNATIONAL LIMITED

REPORT NO. 2320

STATOIL 1/9-3 NORWEGIAN NORTH SEA WELL: BIOSTRATIGRAPHY OF THE INTERVAL 180m - 2773m

by

D.J. HARRISON

PROJECT NO. RRI/11A/778/1146

Prepared by:

Robertson Research International Limited,
Ty'n-y-Coed,
Llanrhos,
Llandudno, Gwynedd,
North Wales, LL30 1SA, U.K.

Prepared for:

Statoil,
P.O. Box 300
Lagardsveien 79,
4001 Stavanger,
Norway.

January 1978

I

SUMMARY

1. The youngest deposits in this Well are of Recent - Pleistocene age.

2. A Pliocene to Eocene, Tertiary sequence is present.

3. The Well terminated at 2773m in deposits of Eocene age.

II

INTRODUCTION

The report summarises the results of micropalaeontological and stratigraphical analyses which have been carried out on material received from the interval 180m - 2773m from the Statoil 1/9-3 Norwegian North Sea Well under Project No. IIA/778/1146.

Under this project a total of 372 ditch cuttings samples was analysed utilising standard micropalaeontological techniques.

A summary of the determinations obtained by these analyses has already been communicated by telex and telephone and forms the framework of factual information on which this report is based. A summary of the sequence penetrated in this well can be seen in Table 1.

The prepared samples and recorded information are now filed and curated in the confidential records section of these laboratories.

We wish to acknowledge the continued co-operation and assistance received from the various members of Statoil with whom we have been associated during the course of this work.

The Well Co-ordinator, who was also responsible for the Caenozoic Foraminifera and Lithologies, was D. J. Harrison.

III

SUCCESSION

TABLE 1

System/Subsystem	Stage	Interval
Recent - Pleistocene	-	180m - 460m
Pliocene	-	470m - 690m
?Pliocene - ?Upper Miocene	-	700m - 950m
Upper Miocene	-	960m - 1020m
Middle Miocene	-	1030m - 1720m
Lower Miocene	-	1730m - 1820m
Oligocene	-	1830m - 2515m
Eocene	-	2526m - 2773m

(Based on ditch cuttings samples only).

main forms being Elofsonella concinna and Aurila convexa.

ENVIRONMENT

The dominance of calcareous benthonic foraminifera within the microfaunas and the presence of shallow water species such as Quinqueloculina seminulum and Elphidium spp. suggest an inner shelf environment of deposition for this interval.

INTERVAL 470m - 690m; PLIOCENE

The age of this interval is based upon the following:-

- an increase in the numbers of Cassidulina laevigata and the occurrence of the foraminifera Cibicides lobatulus var. grossa at 470m.

LITHOLOGY

The lithology of this interval continues to be dominated by soft clays and claystones with subsidiary amounts of shell debris and fine to medium, occasionally coarse, subangular sand. The finer fraction of the latter contains greater proportions of yellow coloured quartz grains than in the overlying interval.

Between 530m and 600m light grey to olive-grey, slightly calcareous claystone becomes important. Throughout the remainder of the interval the small size of the washed sample residues indicates that soft clay is the dominant lithology and small amounts of light olive-grey clay are present in the samples.

In the two topmost samples contamination by cement and lost circulation material, in the form of large mica flakes, is evident and cement persists in the samples down to 540m. Traces of pyrite occur in several of the samples.

MICROPALAEONTOLOGY

A Pliocene age for this interval is suggested by a marked increase in

the abundance of the foraminifera Cassidulina laevigata at 470m and the appearance, in the same sample, of Cibicides lobatulus var. grossa.

The microfaunal assemblages are completely dominated by calcareous benthonic foraminifera with planktonic and agglutinating forms being totally absent. The most abundant species are Cassidulina laevigata, which dominates the foraminiferal assemblages, Elphidium clavatum, Elphidium incertum and Protelphidium orbiculare. Species of ostracoda such as Elofsonella concinna and Aurila convexa are present in the faunas.

ENVIRONMENT

The presence of restricted, inner shelf conditions throughout the Pliocene is suggested by the shallow water microfaunas and absence of agglutinating or planktonic foraminifera.

INTERVAL 700m - 950m; ?PLIOCENE - ?UPPER MIOCENE

A tentative age is proposed for this interval on the basis of the occurrence of the agglutinating foraminifera Sigmoilina celata at 700m.

LITHOLOGY

Soft, light olive-grey clay dominates the lithology of this interval with occasional thin beds of slightly harder, light grey, sandy, micaceous, very slightly calcareous claystone, which may be red-stained. Trace amounts of fine sand and pyrite occur in the upper half of the interval.

MICROPALAEONTOLOGY

The presence at 700m of the foraminifera Sigmoilina celata, which usually occurs in the Upper Miocene, suggests that sediments of a possible Upper Miocene age have been penetrated. Regional knowledge of the area indicates, however, that the top of the Upper Miocene occurs at a slightly lower level in the sequence. Therefore, only a tentative Upper Miocene to Pliocene age has been assigned to this interval.

Calcareous benthonic foraminifera continue to dominate the foraminiferal assemblages occurring with small numbers of agglutinating

foraminifera, the most important of which is Sigmoilina celata, and planktonic foraminifera in the form of Globigerina spp. Cibicides lobatulus var. grossa and Cassidulina laevigata continue to be the most abundant species within the faunas.

ENVIRONMENT

The microfaunas of this interval suggest a restricted, inner shelf environment. The more persistent occurrence of planktonic foraminifera may indicate slightly more open marine conditions.

INTERVAL 960m - 1020m; UPPER MIOCENE

The age assigned to this interval is based upon the following:-

- the occurrence of the foraminifera Bolivina beyrichi at 960m.
- the subsequent occurrence within the interval of Cibicides peelensis.

LITHOLOGY

Soft, light olive-grey clay completely dominates the lithology of this short interval with subordinate amounts of fine sand and pyrite.

MICROPALAEONTOLOGY

The occurrence of Bolivina beyrichi at 960m indicates that deposits of a definite Upper Miocene age have been penetrated. This is confirmed by the subsequent occurrence of Cibicides peelensis at and below 990m.

The microfaunas of this interval show a slight increase in diversity of species. They remain dominated by calcareous forms with smaller numbers of both planktonic and agglutinating foraminifera. The dominant species continue to be Cassidulina laevigata, Elphidium incertum and Cibicides lobatulus var. grossa, with a marked increase in the numbers of Bulimina spp.

ENVIRONMENT

Restricted, inner shelf conditions are indicated by the microfaunas with slightly more open marine conditions possibly being indicated by the small numbers of planktonic foraminifera which are present.

INTERVAL 1030m - 1720m; MIDDLE MIOCENE

The age of this interval is based upon the following:-

- the occurrence of the foraminifera Pullenia sphaeroides at 1030m.
- the subsequent occurrence of the foraminifera Loxostomum sinuosum within the interval.
- a marked change in the overall nature of the foraminiferal assemblages throughout the interval.

LITHOLOGY

Down to 1320m the lithology is comprised of soft, light grey clay with very small quantities of sand. Soft, light olive-grey, slightly calcareous claystone is present at 1050m and again below 1280m where thin bands of finely crystalline, pinkish grey, sandy limestone are also present in the lithology.

Between 1320m and 1360m the samples consist essentially of lost circulation material in the form of walnut shells.

Below 1360m claystone dominates the sequence which consists of a mixed argillaceous and calcareous sequence. Thin bands of finely crystalline, pink, dolomitic limestone are present between 1360m and 1460m. Light grey, finely crystalline, slightly sandy limestones are developed between 1440m and 1480m. Pale green, rounded grains of weathered glauconite occur at 1480m.

Between 1520m and 1610m, and again in the basal 30m of the interval fine to coarse, subangular to subrounded sand occurs. The quartz grains are generally clear or opaque,but contain a higher proportion of yellow and orange grains than in overlying units. Glauconite is present at 1530m and pyrite

at 1560m. Light grey, speckled, sandy limestone is developed between 1620m and 1640m with thinner units occurring towards the base of the interval.

MICROPALAEONTOLOGY

The top of the interval is marked by the first appearance of the foraminifera Pullenia sphaeroides at 1030m. The age determination is supported by the subsequent occurrence of Loxostomum sinuosum at 1070m.

The microfaunas of this interval are much more diverse and numerous. They show a significant change of character with the appearance of appreciable numbers of planktonic and agglutinating foraminifera producing much more mixed assemblages than in the overlying intervals. Other diagnostic fossils appearing over the interval include Sphaeroidina bulloides and Uvigerina hosiusi. The dominant components of the faunas are Cassidulina laevigata, Elphidium incertum, Nonion affine, Rotalia beccarii var. and Globigerina spp.

Sponge spicules type A and B first appear in this interval at 1190m and 1430m respectively. Below 1610m these become more abundant and there is a marked increase in the numbers of radiolaria present.

ENVIRONMENT

The increased diversity of the mixed microfaunas and presence of planktonic foraminifera and radiolaria in significant numbers suggest that more open marine influences were operating throughout this interval. On this basis an inner to outer shelf environment is proposed.

INTERVAL 1730m - 1820m; LOWER MIOCENE

The age of this interval is based upon the following:-

- an influx of pyritised Globigerinelloides triloba at and below 1730m.
- an increase in the abundance of planktonic foraminifera.
- the subsequent appearance of Asterigerina staeschei within the interval.

LITHOLOGY

The mixed sequence present at the base of the overlying unit continues through this interval with soft, olive-grey/buff shales and claystones dominating. Medium to dark grey, slightly silty limestones occur around 1750m and 1800m. Fine to coarse, subangular to subrounded sand is present between 1780m and 1810m.

MICROPALAEONTOLOGY

The top of this interval is based upon the first appearance of the planktonic foraminifera Globigerinoides triloba at 1730m. The age is supported by the later occurrence of Asterigerina staeschei at 1770m.

The microfaunas of this short interval show an increase in numbers of planktonic foraminifera with Globigerinoides triloba and Globorotalia scitula the dominant forms.

ENVIRONMENT

Inner to outer shelf conditions persist through this interval with strong open marine influences indicated by the abundance of planktonic foraminifera.

INTERVAL 1830m - 2515m; OLIGOCENE

The age of this interval is based upon the following:-

- the appearance of a characteristic form of Coscinodiscus together with radiolaria at 1830m.
- the subsequent occurrence of Asterigerina gürichi at 1840'.
- the increase within and eventual dominance of, the microfaunas by agglutinating foraminifera.

LITHOLOGY

Clays, claystones and shales dominate the mixed lithologies of this interval. The shales are generally reddish grey, micaceous and slightly

calcareous or light to medium grey and poorly calcareous. Softer clays are important between 2060m and 2350m. Limestones and dolomitic limestones are developed sporadically throughout the interval. The limestones are medium to dark grey and contain sand in varying quantities. Minor amounts of fine, subangular sand occur between 1970m and 2180m. Finely crystalline, dark red to buff siderite occurs sporadically below 2030m and this is often very similar to some of the dolomitic limestones in appearance.

MICROPALAEONTOLOGY

At 1830m the occurrence of a Coscinodiscus sp. with 5 projections on the under-surface and very finely pustulate radiolaria, which are both characteristic of the Oligocene, suggests that sediments of this age have been penetrated. This is supported by the occurrence of Asterigerina gürichi at 1840m and below.

Above 1950m the microfaunas continue to be of a mixed type with agglutinating, planktonic and calcareous benthonic forms all well represented. Below this, however, the faunas become dominated by agglutinating foraminifera such as Bathysiphon spp., Cyclammina spp. and Recurvoides spp.

ENVIRONMENT

An inner to outer shelf environment is proposed for the sediments above 1950m. Below this depth the complete dominance of the faunas by agglutinating foraminifera and presence of deep water forms such as Bathysiphon spp. suggest deeper, outer shelf to bathyal conditions.

INTERVAL 2526m - 2773m; EOCENE

The age of this interval is based on the following:-

- the occurrence of the foraminifera Trochammina globigeriniformis at 2526m.

LITHOLOGY

The lithology of this interval is very similar to that of the overlying interval and comprises a predominantly mixed, argillaceous and calcareous

sequence. Clays, shales and claystones are dominant with clay more important than in the overlying unit. Thin limestones and dolomitic limestones are developed throughout most of the interval. In the basal 10m of the interval fine to coarse, subangular sand is apparent. Siderite is abundant between 2560m and 2600m,and below 2700m. Lost circulation material is present in small amounts between 2610m and 2720m, and again in the bottom most sample of the section.

MICROPALAEONTOLOGY

A single specimen of the agglutinating foraminifera Trochammina globigeriniformis at 2526m indicates that deposits of Eocene age are present.

As in the overlying unit the faunas are completely dominated by agglutinating foraminifera with Ammodiscus incertus, Glomospira charoides and Bathysiphon spp. the most abundant forms.

ENVIRONMENT

The preponderance of agglutinating foraminifera within the foraminiferal assemblages suggests an outer shelf to bathyal environment of deposition for this interval.

V

PALAEOENVIRONMENTAL SUMMARY

Throughout the Eocene present and the majority of the Oligocene restricted outer shelf to bathyal conditions operated with shale and clays representing the dominant lithologies. In the upper part of the Oligocene, above 1950m, the microfaunas indicate a transition to slightly shallower, inner to outer shelf conditions which persisted through the Lower and Middle Miocene.

Shales continued to dominate the lithologies of the Oligocene, Lower Miocene and lower part of the Middle Miocene. Above 1310m, however, these are superseded by clays which dominate the lithology to the top of the well. Fine to coarse sand becomes important in the top 175m of the sequence.

In the Upper Miocene shallowing of the environment continued with sediments being deposited under generally restricted inner shelf conditions. Similar conditions prevailed throughout the Pliocene and Pleistocene - Recent intervals.

VI

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LEGEND FOR STRATIGRAPHIC CHARTS

LITHOLOGY COLUMNS

Clay

Shale/claystone/mudstone

Silty/sandy clay

Silty/sandy shale/claystone/mudstone

Silt/siltstone

Sand/sandstone
- very fine to medium
- coarse sand to granules
- pebbles

Argillaceous sandstone

Limestone

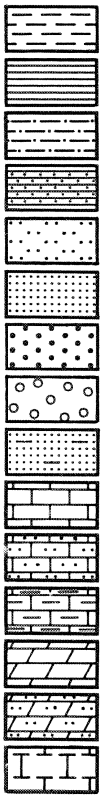
Silty/sandy limestone

Argillaceous limestone

Dolomite

Silty/sandy dolomite

Chalk



Calcareous sediments

Dolomitic sediments

Carbonaceous sediments

Anhydrite

Salt

Coal/lignite

Undifferentiated volcanics

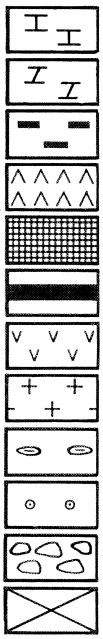
Basement (undifferentiated)

Mudflakes

Ooliths

Concretions

Sample gap



LITHOLOGICAL AND DRILLING ABBREVIATIONS

Red sedimentary rocks	red
Silica	Si
Chert	▼
Pyrite	P
Ironstone	Fe
Glauconite	G
Kaolinite	K
Siderite/sphaerosiderite	S
Shell fragments	~
Cement	cmt
Lost circulation material	lcm
Turbo drilling or diamond drilling (Samples unsuitable for good stratigraphic analysis)	tu

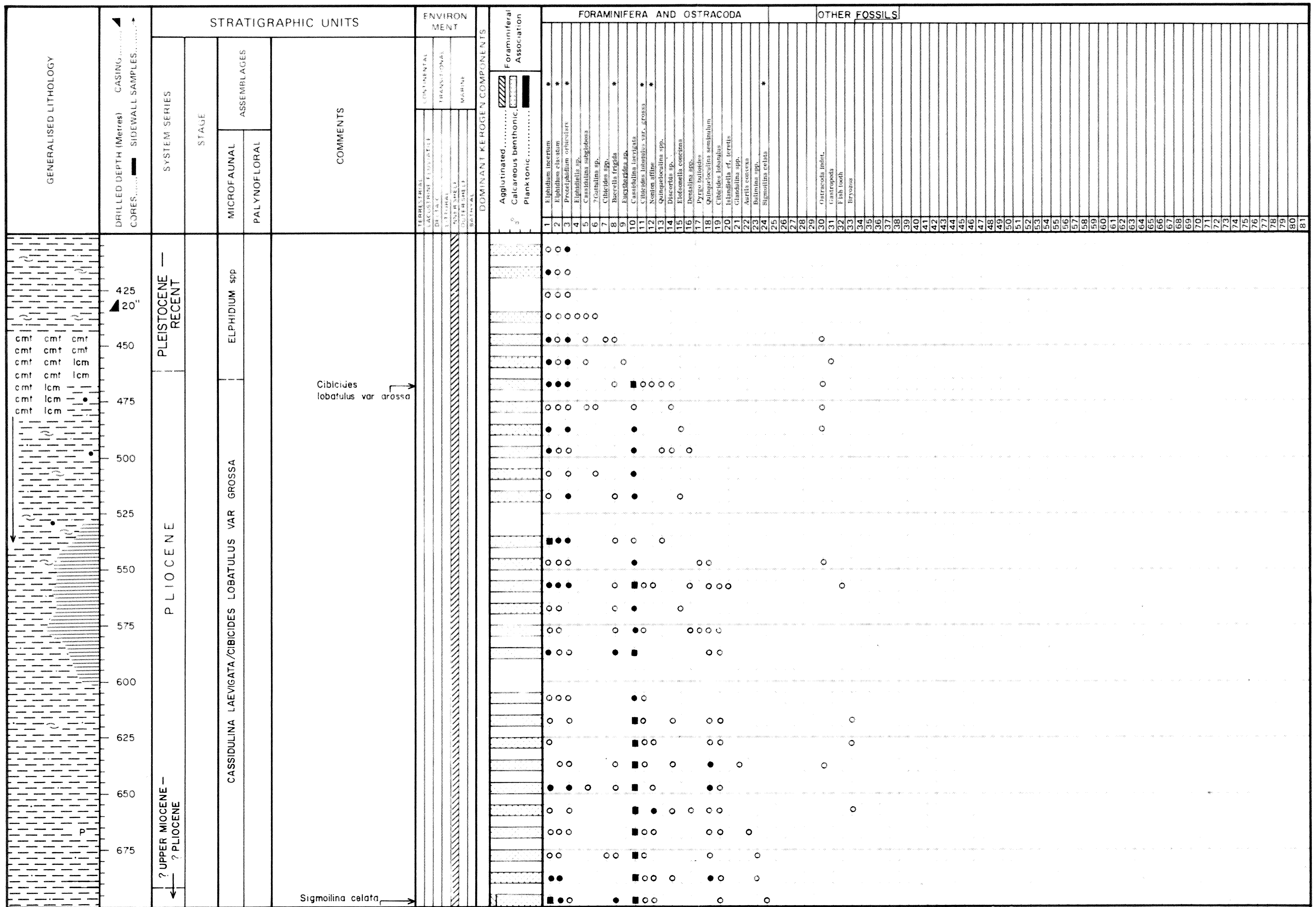
PALAEONTOLOGICAL SYMBOLS

Present	o
Common	●
Abundant	■
Diagnostic forms	*
Caved forms	C
Reworked forms	R
Dominant Kerogen Components: Inertinite	I
Dominant Kerogen Components: Vitrinite	V
Dominant Kerogen Components: Exinite	E
Dominant Kerogen Components: Amorphous sapropel	S
Incoming of	⌐→
Outgoing of	↳

ENCLOSURE 1

CONTENTS

Enclosures


GENERALISED LITHOLOGY
DRILLED DEPTH (Metres) CASING
CORES SIDEWALL SAMPLES
STRATIGRAPHIC UNITS
SYSTEM SERIES
STAGE
ASSEMBLAGES
MICROFAUNAL
PALYNOFLORAL
COMMENTS
ENVIRONMENT
DOMINANT KEROGEN COMPONENTS
Foraminiferal Association
Agglutinated
Calcareous benthonic
Planktonic
FORAMINIFERA AND OSTRACODA
OTHER FOSSILS
Elphidium incertum
Elphidium clavatum
Protelphidium orbiculare
Elphidiella sp.
Cassidulina subglobosa
?Guttulina sp.
Cibicides spp.
Buccella frigida
Eucytheridea sp.
Cassidulina laevigata
Cibicides lobatulus var. grossa
Nonion affine
Quinqueloculina spp.
Discorbis sp.
Elofsonella concinna
Dentalina spp.
Pyrgo bulloides
Quinqueloculina seminulum
Cibicides lobatulus
Islandiella cf. teretis
Glandulina spp.
Aurila convexa
Bulimina spp.
Sigmoilina celata
Ostracoda indet.
Gastropoda
Fish tooth
Bryozoa
425
20"
450
475
500
525
550
575
600
625
650
675
cmt
lcm
PLEISTOCENE — RECENT
PLIOCENE
? UPPER MIOCENE — ? PLIOCENE
ELPHIDIUM spp
CASSIDULINA LAEVIGATA/CIBICIDES LOBATULUS VAR GROSSA
Cibicides lobatulus var grossa
Sigmoilina celata
P

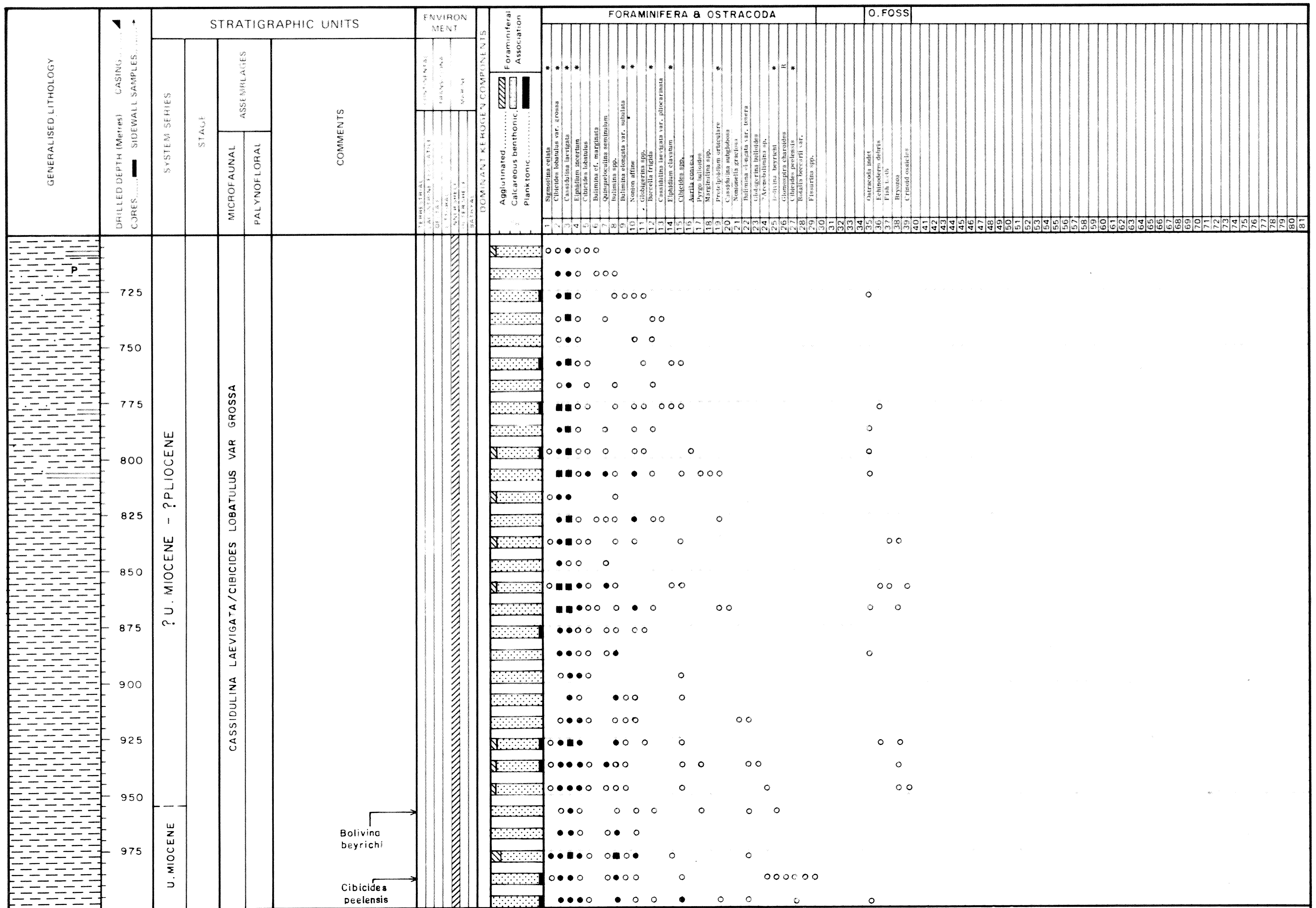
ROBERTSON RESEARCH INTERNATIONAL

WELL 1/9-3
LOCATION NORWEGIAN NORTH SEA
CLIENT STATOIL

DEPTH 400m–700m
SHEET 2 OF 9
ANALYST DJH

DRAWING NO 320/1146/4062
DATE JANUARY 1978
SCALE 1 : 2,000
ENCLOSURE 3
For legend see Enclosure 1

BIOSTRATIGRAPHICAL ANALYSIS CHART



GENERALISED LITHOLOGY
DRILLED DEPTH (Metres) CASING
CORES SIDEWALL SAMPLES
STRATIGRAPHIC UNITS
SYSTEM SERIES
STAGE
ASSEMBLAGES
MICROFAUNAL
PALYNOFLORAL
COMMENTS
ENVIRONMENT
DOMINANT KEROGEN COMPONENTS
Foraminiferal Association
Agglutinated
Calcareous benthonic
Planktonic
FORAMINIFERA & OSTRACODA
O.FOSS
1 Sigmoilina celata
2 Cibicides lobatulus var. grossa
3 Cassidulina laevigata
4 Elphidium incertum
5 Cibicides lobatulus
6 Bulimina cf. marginata
7 Quinqueloculina seminulum
8 Bulimina spp.
9 Bulimina elongata var. subulata
10 Nonion affine
11 Globigerina spp.
12 Buccella frigida
13 Cassidulina laevigata var. pliocarinata
14 Elphidium clavatum
15 Cibicides spp.
16 Aurila convexa
17 Pyrgo bulloides
18 Marginulina spp.
19 Protelphidium orbiculare
20 Cassidulina subglobosa
21 Nonionella gracilis
22 Bulimina ? aculeata var. tenera
23 Globigerina bulloides
24 ?Arenobulimina sp.
25 Bolivina beyrichi
26 Glomospira charoides
27 Cibicides peelensis
28 Rotalia beccarii var.
29 Fissurina spp.
35 Ostracoda indet
36 Echinoderm debris
37 Fish bits
38 Bryozoa
39 Crinoid ossicles
P
725
750
775
800
825
850
875
900
925
950
975
? U. MIOCENE - ? PLIOCENE
U. MIOCENE
CASSIDULINA LAEVIGATA/CIBICIDES LOBATULUS VAR GROSSA
Bolivina beyrichi
Cibicides peelensis

ROBERTSON RESEARCH INTERNATIONAL

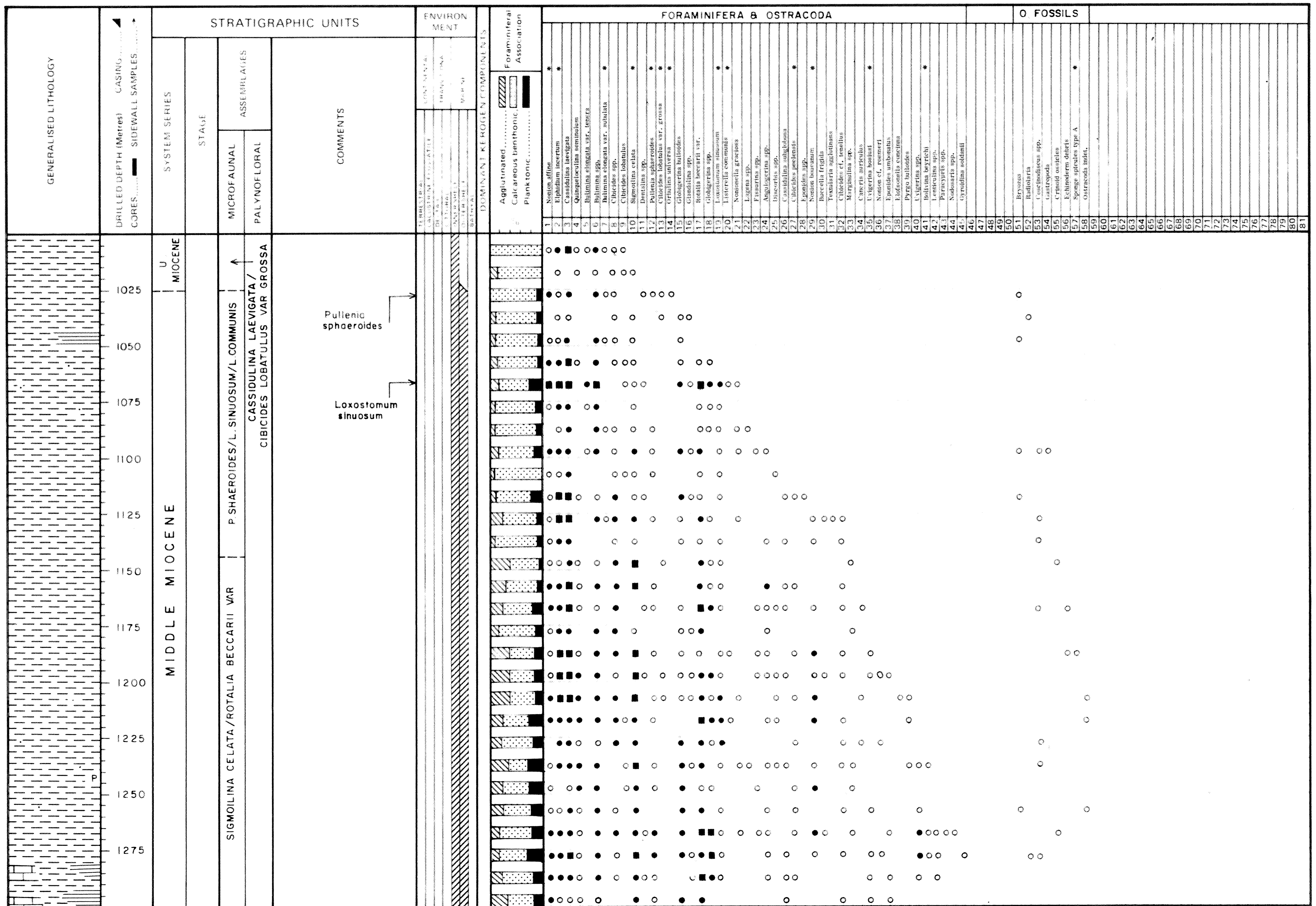
WELL 1/9-3
LOCATION NORWEGIAN NORTH SEA
CLIENT STATOIL

DEPTH 700m - 1000m
SHEET 3 OF 9
ANALYST DJH

DRAWING NO 320/1146/4062
DATE JANUARY 1978

SCALE 1 : 2,000
ENCLOSURE 4
For legend see Enclosure 1

BIOSTRATIGRAPHICAL ANALYSIS CHART


GENERALISED LITHOLOGY
DRILLED DEPTH (Metres) CASING
CORES SIDEWALL SAMPLES
STRATIGRAPHIC UNITS
SYSTEM SERIES
STAGE
ASSEMBLAGES
MICROFAUNAL
PALYNOFLORAL
COMMENTS
ENVIRONMENT
DOMINANT KEROGEN COMPONENTS
Foraminiferal Association
Agglutinated
Calcareous benthonic
Planktonic
FORAMINIFERA & OSTRACODA
O FOSSILS
1 Nonion affine
2 Elphidium incertum
3 Cassidulina laevigata
4 Quinqueloculina seminulum
5 Bulimina elongata var. tenera
6 Bulimina spp.
7 Bulimina elongata var. subulata
8 Cibicides spp.
9 Cibicides lobatulus
10 Sigmoilina celata
11 Dentalina spp.
12 Pullenia sphaeroides
13 Cibicides lobatulus var. grossa
14 Orbulina universa
15 Globigerina bulloides
16 Glandulina spp.
17 Rotalia beccarii var.
18 Globigerina spp.
19 Loxostomum sinuosum
20 Listerella communis
21 Nonionella gracilis
22 Lagena spp.
23 Fissurina spp.
24 Angulogerina spp.
25 Discorbis spp.
26 Cassidulina subglobosa
27 Cibicides pealensis
28 Eponides spp.
29 Nonion boueanum
30 Buccella frigida
31 Textularia agglutinans
32 Cibicides cf. tenellus
33 Marginulina spp.
34 Cancris auriculus
35 Uvigerina hosiusi
36 Nonion cf. roemeri
37 Eponides umbonatus
38 Elphidiella concinna
39 Pyrgo bulloides
40 Uvigerina spp.
41 Bolivina beyrichi
42 Lenticulina spp.
43 Paracypris spp.
44 Nodosaria spp.
45 Gyroidina soldanii
51 Bryozoa
52 Radiolaria
53 Coscinodiscus spp.
54 Gastropoda
55 Crinoid ossicles
56 Echinoderm debris
57 Sponge spicules type A
58 Ostracoda indet.
1025
1050
1075
1100
1125
1150
1175
1200
1225
1250
1275
P
U MIOCENE
MIDDLE MIOCENE
SIGMOILINA CELATA/ROTALIA BECCARII VAR
P SHAEROIDES/L. SINUOSUM/L. COMMUNIS
CASSIDULINA LAEVIGATA / CIBICIDES LOBATULUS VAR GROSSA
Pullenia sphaeroides
Loxostomum sinuosum

ROBERTSON RESEARCH INTERNATIONAL	WELL 1/9-3 LOCATION NORWEGIAN NORTH SEA CLIENT STATOIL	DEPTH 1000m - 1300m SHEET 4 OF 9 ANALYST DJH	DRAW No. NO 320/1146/4062 DATE JANUARY 1978 SCALE 1 : 2,000 ENCLOSURE 5 *For legend see Enclosure 1*

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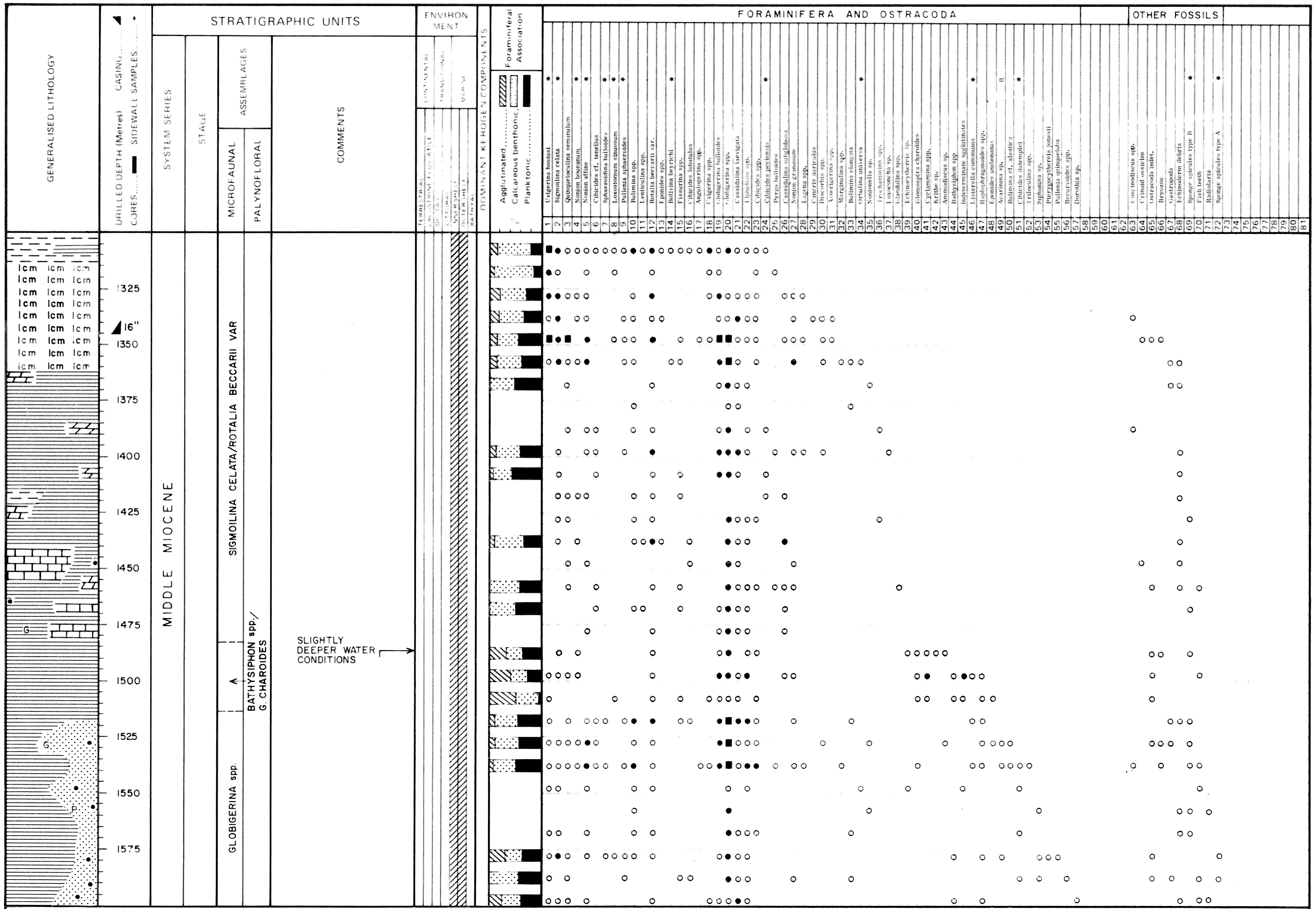


ROBERTSON RESEARCH INTERNATIONAL

WELL 1/9-3
LOCATION NORWEGIAN NORTH SEA
CLIENT STATOIL

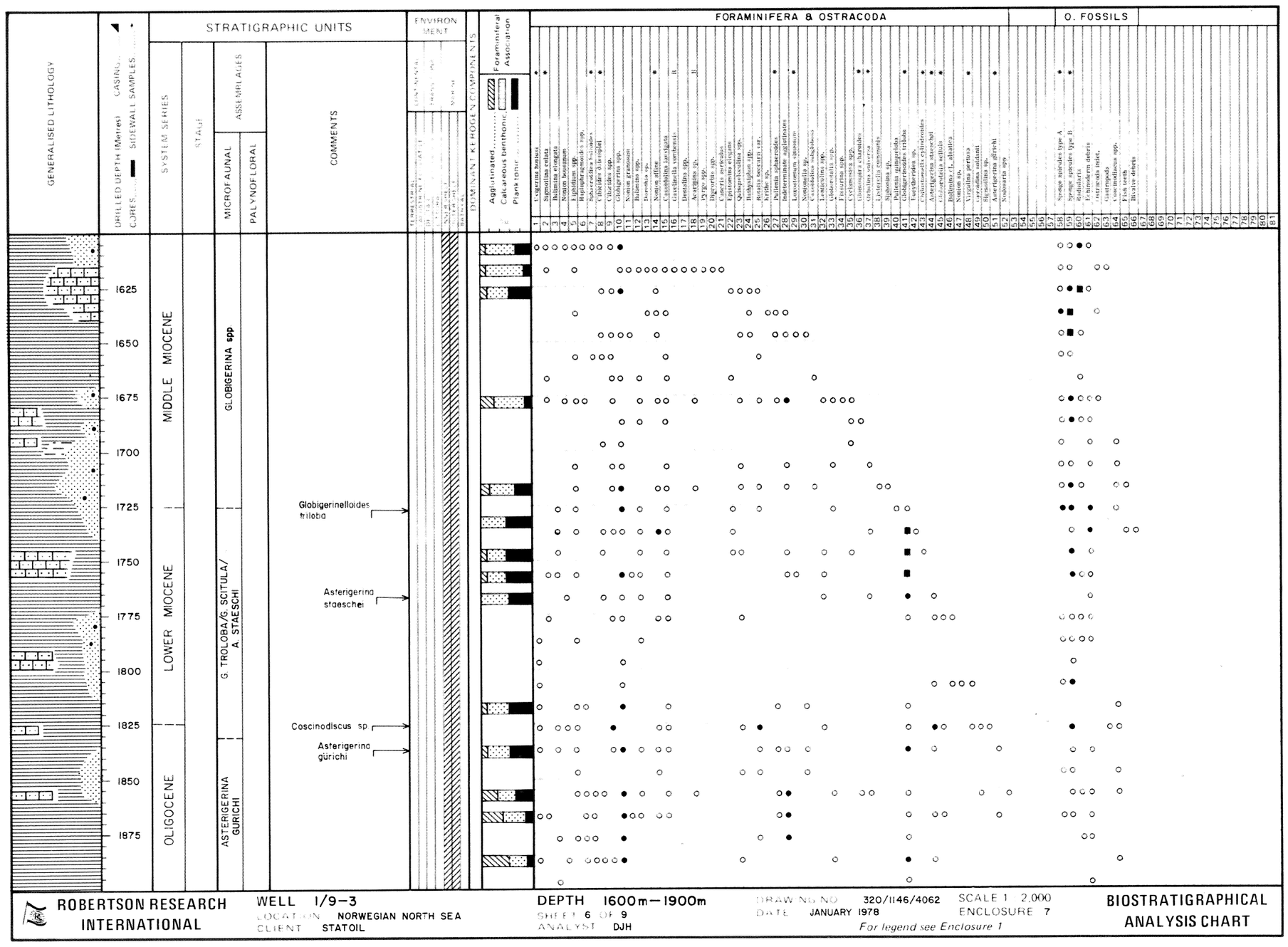
DEPTH 1300m - 1600m
SHEET 5 OF 9
ANALYST DJH

DRAWING NO 320/1146/4062
DATE JANUARY 1978

SCALE 1 : 2,000
ENCLOSURE 6

For legend see Enclosure 1

BIOSTRATIGRAPHICAL ANALYSIS CHART



ROBERTSON RESEARCH INTERNATIONAL

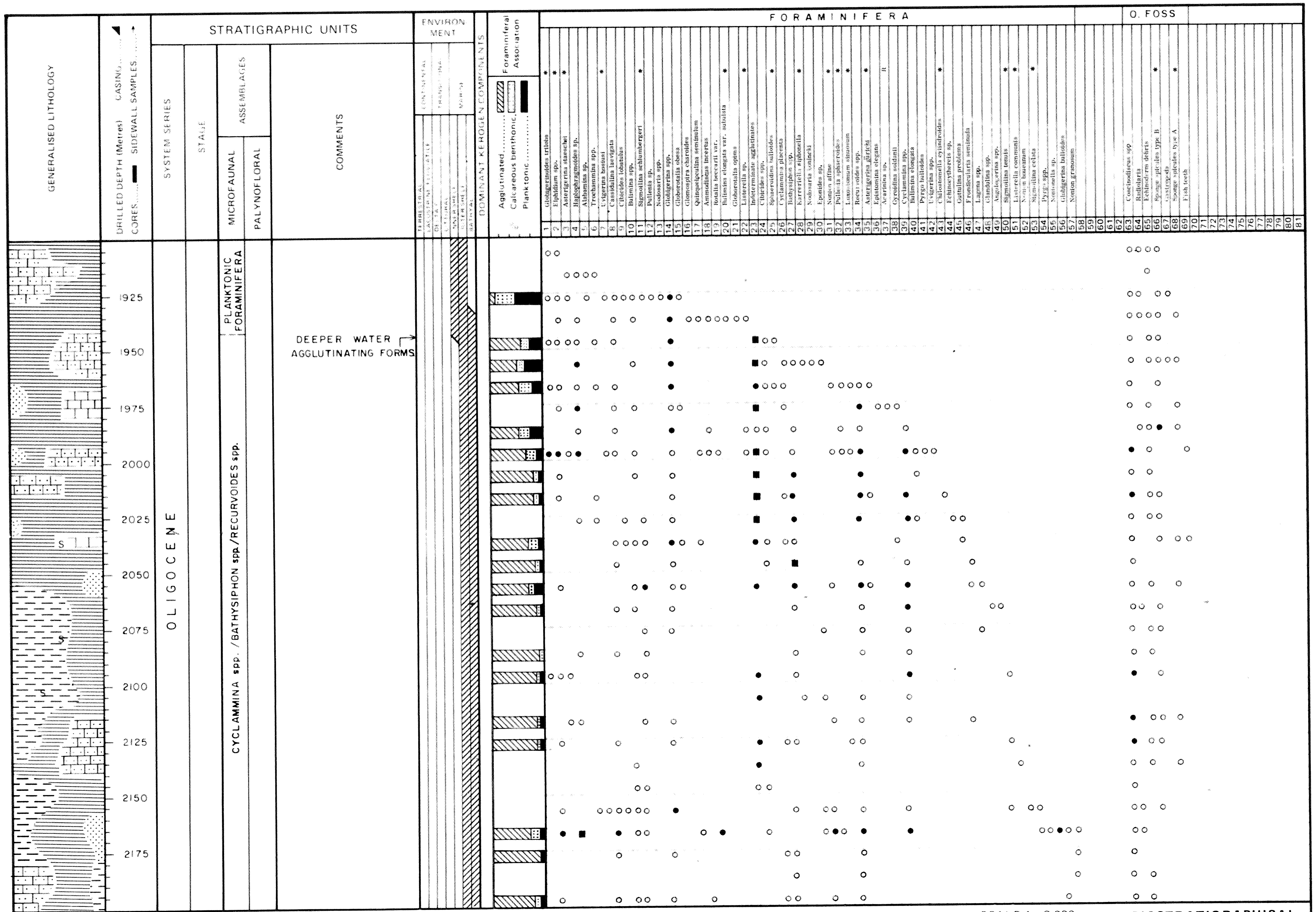
WELL 1/9-3
LOCATION NORWEGIAN NORTH SEA
CLIENT STATOIL

DEPTH 1600m—1900m
SHEET 6 OF 9
ANALYST DJH

DRAWING NO. 320/1146/4062
DATE JANUARY 1978
SCALE 1 2,000
ENCLOSURE 7

For legend see Enclosure 1

BIOSTRATIGRAPHICAL ANALYSIS CHART



ROBERTSON RESEARCH INTERNATIONAL

WELL 1/9-3
LOCATION NORWEGIAN NORTH SEA
CLIENT STATOIL

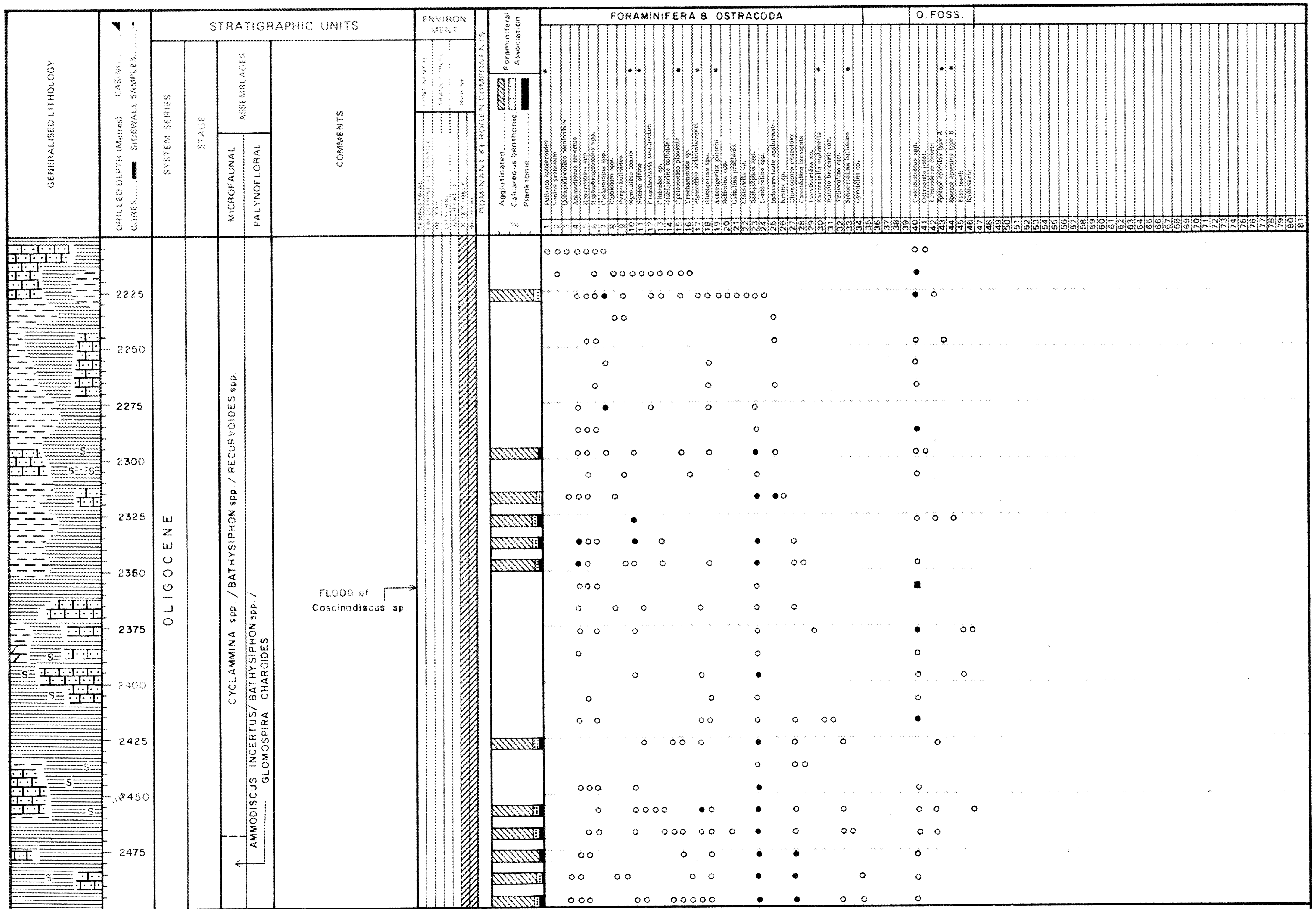
DEPTH 1900m - 2200m
SHEET 7 OF 9
ANALYST DJH

DRAWING NO 320/II46/4062
DATE JANUARY 1978

SCALE 1 : 2,000
ENCLOSURE 8

For legend see Enclosure 1

BIOSTRATIGRAPHICAL ANALYSIS CHART



GENERALISED LITHOLOGY
DRILLED DEPTH (Metres)
CORES
SIDEWALL SAMPLES
CASING
STRATIGRAPHIC UNITS
SYSTEM SERIES
STAGE
ASSEMBLAGES
MICROFAUNAL
PALYNOFLORAL
COMMENTS
ENVIRONMENT
DOMINANT KEROGEN COMPONENTS
Foraminiferal Association
Agglutinated
Calcareous benthonic
Planktonic
FORAMINIFERA & OSTRACODA
O. FOSS.
Pullenia sphaeroides
Nonion granosum
Quinqueloculina seminulum
Ammodiscus incertus
Recurvoides spp.
Haplophragmoides spp.
Cyclammina spp.
Elphidium spp.
Pyrgo bulloides
Sigmoilina tenuis
Nonion affine
Frondicularia seminudum
Cibicides sp.
Globigerina bulloides
Cyclammina placenta
Trochammina sp.
Sigmoilina schlumbergeri
Globigerina spp.
Asterigerina gürichi
Bulimina spp.
Guttulina problema
Eilohedra sp.
Bathysiphon spp.
Lenticulina spp.
Indeterminate agglutinates
Krithe sp.
Glomospira charoides
Cassidulina laevigata
Eucytheridea sp.
Karreriella siphonella
Rotalia beccarii var.
Triloculina sp.
Sphaeroidina bulloides
Gyroidina sp.
Coscinodiscus spp.
Ostracoda indet.
Echinoderm debris
Sponge spicules type A
Sponge spicules type B
Fish teeth
Radiolaria
2225
2250
2275
2300
2325
2350
2375
2400
2425
2450
2475
OLIGOCENE
CYCLAMMINA spp. / BATHYSIPHON spp / RECURVOIDES spp.
AMMODISCUS INCERTUS / BATHYSIPHON spp. / GLOMOSPIRA CHAROIDES
FLOOD of Coscinodiscus sp.

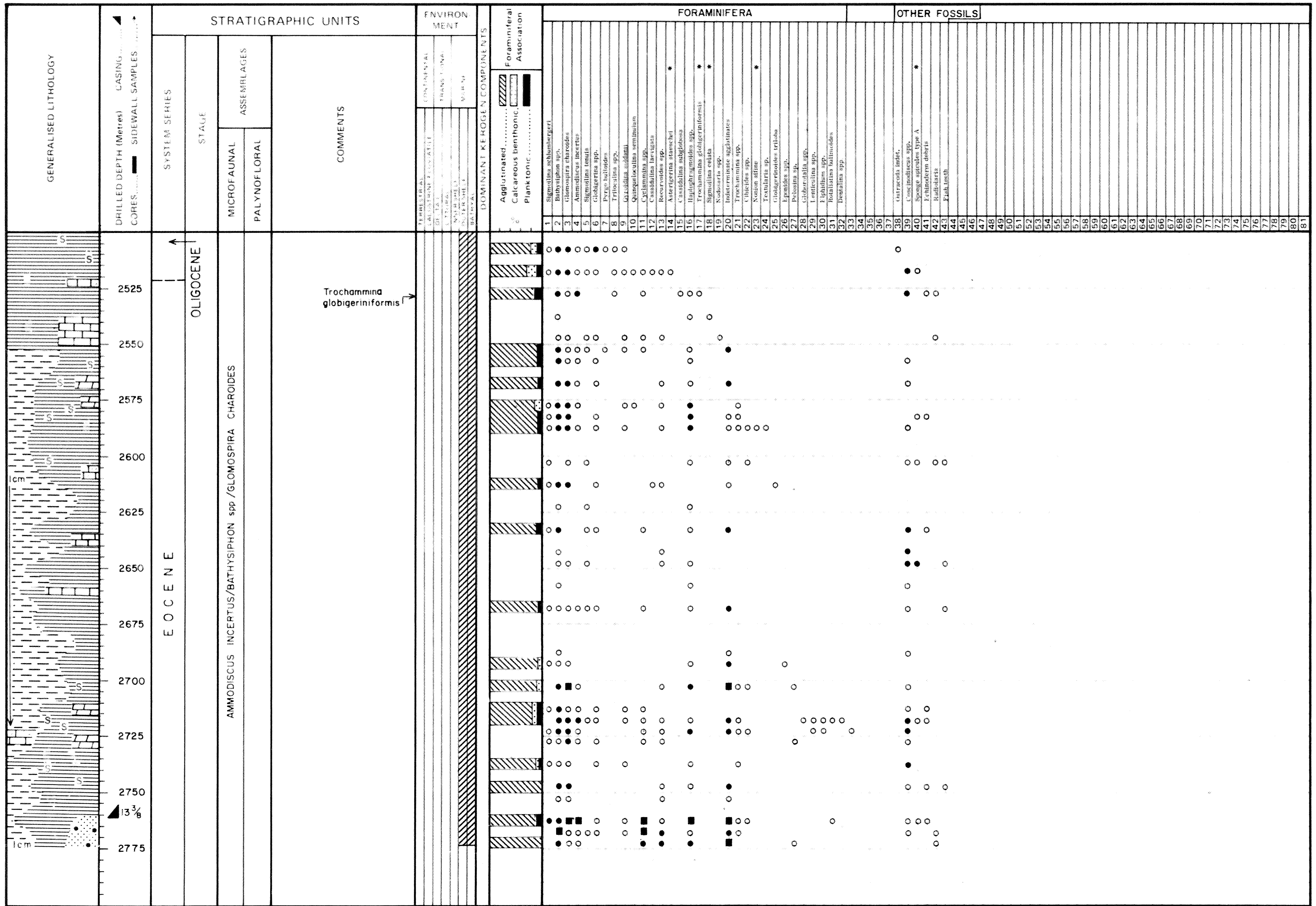
ROBERTSON RESEARCH INTERNATIONAL

WELL 1/9-3
LOCATION NORWEGIAN NORTH SEA
CLIENT STATOIL

DEPTH 2200m - 2500m
SHEET 8 OF 9
ANALYST DJH

DRAWING NO 320/1146/4062
DATE JANUARY 1978
SCALE 1 : 2,000
ENCLOSURE 9
For legend see Enclosure 1

BIOSTRATIGRAPHICAL ANALYSIS CHART


GENERALISED LITHOLOGY
DRILLED DEPTH (Metres)
CORES
SIDEWALL SAMPLES
CASING
STRATIGRAPHIC UNITS
SYSTEM SERIES
STAGE
ASSEMBLAGES
MICROFAUNAL
PALYNOFLORAL
COMMENTS
ENVIRONMENT
DOMINANT KEROGEN COMPONENTS
Foraminiferal Association
Agglutinated
Calcareous benthonic
Planktonic
FORAMINIFERA
OTHER FOSSILS
1 Sigmoilina schlumbergeri
2 Bathysiphon spp.
3 Glomospira charoides
4 Ammodiscus incertus
5 Sigmoilina tenuis
6 Globigerina spp.
7 Pyrgo bulloides
8 Triloculina spp.
10 Quinqueloculina seminulum
11 Cyclammina spp.
12 Cassidulina laevigata
13 Recurvoides spp.
14 Asterigerina staeschei
15 Cassidulina subglobosa
16 Haplophragmoides spp.
17 Trochammina globigeriniformis
18 Sigmoilina celata
19 Nodosaria spp.
20 Indeterminate agglutinates
21 Trochammina spp.
22 Cibicides spp.
23 Nonion affine
24 Textularia sp.
25 Globigerinoides triloba
27 Pelosina sp.
28 Globorotalia spp.
29 Lenticulina spp.
30 Elphidium spp.
32 Dentalina spp.
38 Ostracoda indet.
39 Coscinodiscus spp.
40 Sponge spicules type A
41 Echinoderm debris
42 Radiolaria
43 Fish teeth
2525
2550
2575
2600
2625
2650
2675
2700
2725
2750
2775
13 3/8
1cm
OLIGOCENE
EOCENE
AMMODISCUS INCERTUS/BATHYSIPHON spp./GLOMOSPIRA CHAROIDES
Trochammina globigeriniformis

ROBERTSON RESEARCH INTERNATIONAL

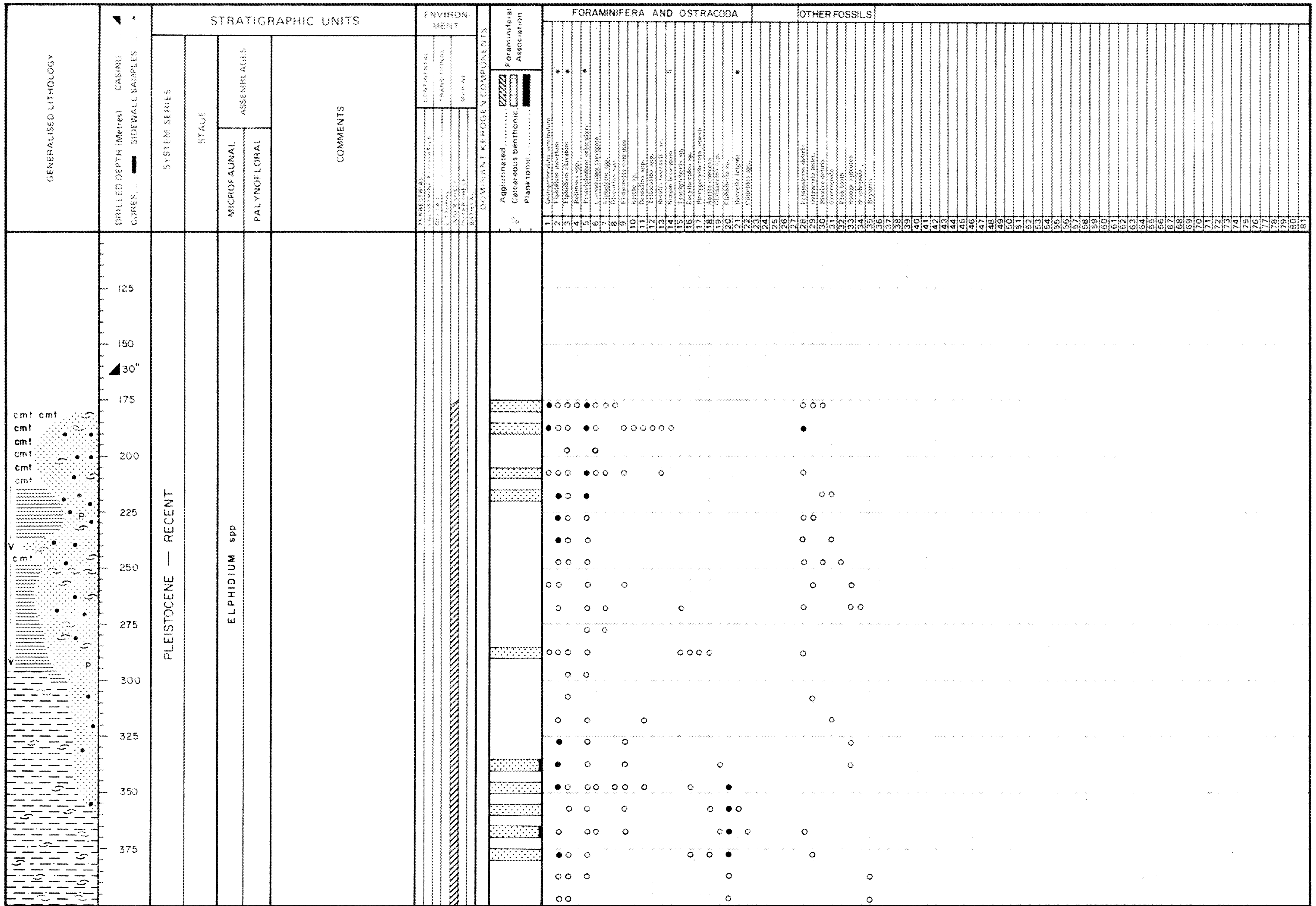
WELL 1/9-3
LOCATION NORWEGIAN NORTH SEA
CLIENT STATOIL

DEPTH 2500m–2773m
SHEET 9 OF 9
ANALYST DJH

DRAWING NO 320/1146/4062
DATE JANUARY 1978

SCALE 1 : 2,000
ENCLOSURE 10
For legend see Enclosure 1

BIOSTRATIGRAPHICAL ANALYSIS CHART



ROBERTSON RESEARCH INTERNATIONAL	WELL 1/9-3 LOCATION NORWEGIAN NORTH SEA CLIENT STATOIL	DEPTH 180m-400m SHEET 1 OF 9 ANALYST DJH	DRAWING NO 320/1146/4062 SCALE 1 : 2,000 DATE JANUARY 1978 ENCLOSURE 2 *For legend see Enclosure 1*	**BIOSTRATIGRAPHICAL ANALYSIS CHART**

ROBERTSON RESEARCH INTERNATIONAL LIMITED

SUMMARY LOG 1/9-3

AREA : NORWEGIAN NORTH SEA — SPUD DATE : 13 AUG. 1977

COMPANY : STATOIL — COMPLETION DATE : 27 NOV. 1977 (PREL. ABAND)

INTERVAL STUDIED : 180m - 2773m — T. D. 2773 m

Dr. No. 320/1146/4062 — SCALE 1 : 5000 — Date : JANUARY 1978

▌ Cored Interval — ◣ Casing Shoe

ENCLOSURE II