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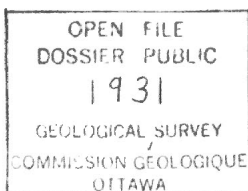
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GEOLOGY SECTION
G. S. G.

BIOSTRATIGRAPHY AND MATURATION OF
17 LABRADOR AND BAFFIN SHELF
WELLS

Volume 3:
Gilbert F-53 & Gjoa G-37

Report No. 86-0058
Bujak Davies Group

Calgary, Alberta



EXPLANATION OF CONTENTS

This volume contains the following results of analyses on Gilbert F-53 and Gjoa G-37.

1. General drilling information

2. Consensus Age

The consensus age based on micropaleontology (M) and palynology (P).

3. Palynological Results

The palynological zones and assigned ages in order of increasing depth within each well. The more important taxa are listed alphabetically, with miospores and fungal spores being denoted by an asterisk (*). Marker species are highlighted in bold type. The degree of confidence is given for each zonal assignment as follows:

"4" The highest degree of confidence regarding both the zonal assignment and the sample level to which the top of the zone is assigned.

"3" A high degree of confidence regarding the zonal assignment, but including the possibility that the zonal assignment may be slightly too low.

"2" Indicates that the zonal assignment is probably correct but that the sample level indicated for the top of the zone is probably too low due to a scarcity of marker species.

"1" A highly tentative zonal assignment due to extreme scarcity of marker species.

4. Micropaleontological Results

The micropaleontological zones and assigned ages in order of increasing depth. Within each zone the more important taxa are listed alphabetically with planktonic foraminiferal species being denoted by an asterisk (*) and diatom species by a cross (+). Marker species are highlighted in bold type. The degree of confidence is given for each zonal assignment as follows:

"4" The highest degree of confidence regarding both the zonal assignment and the sample level to which the top of the zone is assigned. This degree of confidence indicates the presence of planktonic foraminifera together with the main benthonic foraminiferal markers.

"3" A high degree of confidence regarding the zonal assignment. Indicates the presence of the main benthonic foraminiferal markers.

"2" Indicates that the zonal assignment is most probably correct. The assignment is based only on taxa occurring commonly within the zone, due to the scarcity of marker species.

"1" A tentative zonal assignment. Based solely on stratigraphic position due to extreme scarcity of marker species.

5. Paleobathymetric Interpretations

The interpreted paleobathymetries are in order of increasing depth, together with the criteria upon which they are based. The interpreted environments and corresponding paleobathymetries reported are: Non-marine (above sea level), Transitional (approx. 0m), Inner Neritic (approx. 0-20m), Middle Neritic (approx. 20-100m), Outer Neritic (approx. 100-200m), Upper Bathyal (approx. 200-1000m), and Lower Bathyal (>1000m).

6. Kerogen, TAI and Vitrinite Reflectance

Data on kerogen types and TAI are listed in a table, and are then discussed relative to petroleum source rock potential and the consensus ages assigned in this report. Data on vitrinite reflectance are listed and are discussed relative to their degree of reliability and indicated maturation level.

All references are given in Volume 1 of the report.

The following charts are included for each well:

1. A Palynological Summary Chart showing the assigned palynological zones, inferred ages, lithology, formational assignments provided by P.N. Moir, studies in progress, important palynological events (mostly species tops).
2. Sawtooth diagrams showing the relative abundances of the following palynological categories: Apectodinium homomorphum, Areoligera senonensis, marine dinoflagellates, Azolla, Pediastrum, gymnosperm pollen, angiosperm pollen, miospores, Late Cretaceous reworking, Early Cretaceous reworking.
3. A Micropaleontological Summary Chart showing the assigned micropaleontological zones, inferred ages, lithology, important micropaleontological events (mostly species tops), paleobathymetry.
4. A Kerogen Summary Chart showing the consensus ages, levels of Thermal Alteration (TAI), relative abundances of kerogen types.

5. A Vitrinite Summary Chart showing the consensus ages, histograms of the vitrinite reflectance measurements which are divided into three categories: caved (blue), in situ (green) and reworked (red). The in situ category is further subdivided into poor readings (horizontal lines) and good to excellent reading (solid colour). The means of the three main categories are indicated by correspondingly coloured triangles.

BIOSTRATIGRAPHY AND MATURATION OF

GILBERT F-53

PETRO-CANADA et al. GILBERT F-53GSC locality: 58° 52' 26.82"N, 62° 08' 23.04"WKB elevation: 12m Water depth: 183mCasing set at: 233.5m, 508m 1435m, 3178mTotal depth: 3608mInterval studied for palynology: 525-3605mInterval studied for micropaleontology: 525-3340mCONSENSUS AGE

525- 805m	early to middle Miocene (P)
825- 895m	late Oligocene (P)
915-1195m	early Oligocene (P)
1215-1435m	late Eocene (P)
1455-1585m	middle to late Eocene (P)
1605-1735m	middle Eocene (M)
1755-2245m	early Eocene (M,P)
2265-2360m	late Paleocene (M)
2380-2860m	early Paleocene (M)
2880-3250m	Maastrichtian (P)
3270-3520m	late Campanian (P)
3540-3550m	early Campanian (P)
3570-3605m	Santonian (P)

GILBERT F-53PALYNOLOGICAL ZONATION

- 525- 805m Systematophora ancyrea Zone to Cordosphaeridium cantharellum Zone (early to middle Miocene)
- 825- 895m Chiropteridium mespilanum Zone (late Oligocene)
- 915-1195m Areosphaeridium arcuatum Zone (early Oligocene)
- 1215-1435m Deflandrea #LR Zone (late Eocene to early Oligocene)
- 1455-1625m Areosphaeridium fenestratum Zone (middle to late Eocene)
- 1645-1735m Eocladopyxis #LA Zone (middle Eocene)
- 1755-2035m Trinovantedinium #LA Zone (early Eocene)
- 2055-2390m Dracodinium condylos Zone (early Eocene)
- Not observed Ceratiopsis speciosa Zone (late Paleocene)
- Not observed Alisocysta circumtabulata Zone (late Paleocene)
- 2410-2450m Palaeoperidinium pyrophorum Zone (early Paleocene)
- 2470-2860m Spongodinium #LA Zone (early Paleocene)
- 2880-3160m Spongodinium delitiense Zone (Maastrichtian)

- Not observed Impagidinium #LL Zone (Maastrichtian)
- 3180-3250m Isabelidium cooksoniae Zone (Maastrichtian)
- 3270-3520m Chatangiella tripartita Zone (late Campanian)
- Not observed Hystriosphæridium difficile Zone (Campanian)
- 3540-3550m Palæohystriophora infusorioides Zone (early
Campanian)
- 3570-3605m Senoniasphaera rotundata Zone (Santonian)

SELECTED SPECIES525-805m: Systematophora ancyrea Zone to Cordophaeridium cantharellum Zone (early to middle Miocene)

525m	<u>Corsinipollenites subcircularis</u> *
	<u>Lingulodinium machaerophorum</u>
	<u>Osmundacidites claytonites</u> *
	<u>Spiniferites pseudofurcatus</u>
	<u>Tsugaepollenites igniculus</u> *
	<u>Tsugaepollenites viridifluminipites</u> *
555m	<u>Hystrichokolpoma rigaudiae</u>
	<u>Systematophora ancyrea</u>
585m	<u>Dapsilidinium pastielsii</u>
	<u>Laevigatosporites ovatus</u> *
	<u>Spiniferites ramosus</u>

Degree of Confidence: 3

Remarks: Penetration of lower to middle Miocene strata is indicated by the highest occurrences of several dinoflagellate species indicated above in bold text.

825-895m: Chiropteridium mespilanum Zone (late Oligocene)

825m	<u>Achomosphaera ramulifera</u>
	<u>Chiropteridium mespilanum</u>
855m	<u>Rouseiporites #LA</u> *

885m Heteraulacacysta campanula
 Paralecaniella indentata (singleton)

Degree of Confidence: 3

Remarks: The scarcity of dinoflagellates in this section of the well indicates that the top of the upper Oligocene section may occur slightly higher than that indicated in the sample at 825-845m.

915-1195m: Areosphaeridium arcuatum Zone (early Oligocene)

915m Azolla *
 Cyclonephelium sp. A, Williams & Brideaux 1975

1065m Glaphyrocysta intricata

1125m Caryapollenites simplex *

1155m Quercoidites #LA *
 Quercoidites #LV *

Degree of Confidence: 3

Remarks: The top of the lower Oligocene interval may occur slightly higher than the sample at 915-935m due to the scarcity of dinoflagellates in this part of the well.

1215-1435m: Deflandrea #LR Zone (late Eocene to early Oligocene)

1215m Deflandrea #LR
 Quercoidites #LG *

1245m	<u>Retitricolites</u> #LF *
1275m	<u>Pterocaryapollenites stellatus</u> *
1305m	<u>Alnipollenites verus</u> * <u>Corylus</u> #LA * <u>Momipites coryloides</u> * <u>Operculodinium centrocarpum</u>
1335m	<u>Ulmipollenites undulosus</u> *
1395m	<u>Lentinia serrata</u>
1425m	<u>Fagus</u> #LA * <u>Tiliaepollenites vespipites</u>

Degree of Confidence: 1

Remarks: A single specimen of the dinoflagellate marker Deflandrea #LR at 1215-1235m indicates penetration of the Deflandrea #LR Zone. This species is common in the well below 1455m within the interval assigned to the underlying A. fenestratum Zone.

1455-1625m Areosphaeridium fenestratum Zone (middle to late Eocene)

1455m	<u>Betulaceoipollenites betuloides</u> * <u>Carpinipites</u> #LA * <u>Cupaneiidites</u> sp., Fredericksen 1971 * <u>Deflandrea</u> #LR (common) <u>Chiropteridium</u> #LS <u>Hystrichokolpoma salacium</u> <u>Retitricolpites</u> #LA *
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1515m	<u>Lycopodiumsporites annotinioides</u> *
1575m	<u>Araneosphaera araneosa</u> <u>Boisduvalia clavatites</u> *
1605m	<u>Cicatricosisporites dorogensis</u> *

Degree of Confidence: 2

Remarks: Penetration of the A. fenestratum Zone is tentatively indicated by a single specimen of Chiropteridium #LS at 1455-1475m. This species is common and persistent below 1515m where a more confident top for the A. fenestratum Zone is indicated.

1645-1735m: Eocladopyxis #LA Zone (middle Eocene)

1645m	<u>Hystrichosphaeridium patulum</u>
1665m	<u>Cicatricosporites auritus</u> * <u>Momipites tenuipolus</u> * <u>Wetzeliella articulata</u>
1695m	<u>Castanea</u> #LA *

Degree of Confidence: 1

Remarks: Penetration of the Eocladopyxis #LA Zone is tentatively indicated at 1645-1665m by the presence of H. patulum, but is more confidently indicated in the underlying sample at 1665-1685m by the occurrence of the spore C. auritus.

1755-2035m: Trinovantedinium #LA Zone (early Eocene)

1755m Hystrichokolpoma unispinum
Trinovantedinium #LA
Trinovantedinium #LL

1785m Systematophora #LC
Thalassiphora pelagica

1815m Deflandrea phosphoritica
Diphyes colligerum
Systematophora placacantha

1845m Apectodinium homomorphum
Systematophora #LE

1875m Cribroperidinium giuseppei
Trinovantedinium #LS

1935m Homotryblum pallidum
Homotryblum tenuispinosum
Lejeunecysta hyalina
Wetzellfella meckelfeldensis

1965m Ceratiopsis depressa
Kisselovia coleothrypta

1995m Homotryblum abbreviatum

2025m Areoligera senonensis

Degree of Confidence: 4

Remarks: The top of this zone in the sample at 1755-1775m is strongly indicated by the dinoflagellate markers indicated above.

2055-2390m: *Dracodinium condylos* Zone (early Eocene)

2055m	<u><i>Impagidinium californiense</i></u>
2085m	<u><i>Areosphaeridium</i> sp. A, Williams & Bujak 1977</u> <u><i>Azolla</i> (common) *</u>
2145m	<u><i>Isabelidinium</i> #LP</u>
2175m	<u><i>Apectodinium hyperacanthum</i></u> <u><i>Lentinia wetzelii</i></u>
2235m	<u><i>Azolla</i> (abundant) *</u> <u><i>Dinopterygium cladoides</i></u>
2265m	<u><i>Areoligera senonensis</i> (common)</u> <u><i>Hystrichokolpoma cinctum</i></u>
2295m	<u><i>Apectodinium homomorphum</i> (common)</u> <u><i>Areoligera senonensis</i> (abundant)</u> <u><i>Cordosphaeridium gracile</i></u> <u><i>Lejeunecysta</i> #LS</u>
2325m	<u><i>Adnatosphaeridium multispinosum</i></u> <u><i>Cordosphaeridium inodes longipes</i></u>

- 2350m Ceratiopsis pannucea
 Dracodinium simile
- 2380m Tanyosphaeridium variecalamus (?reworked)

Degree of Confidence: 2

Remarks: Penetration of the D. condylos Zone is tentatively indicated at 2055-2075m by the occurrence by I. californiense, and is more strongly indicated at 2145-2165m by the occurrence of the species Isabelidinium #LP.

2410-2450m: Palaeoperidinium pyrophorum Zone (early Paleocene)

- 2410m Ceratiopsis speciosa speciosa
 Ceratiopsis striata
 Deflandrea denticulata
 Palaeoperidinium pyrophorum
 Pervosphaeridium pseudhystrichodinium
 Trithyrodinium evittii (?reworked)
- 2440m Ceratiopsis speciosa glabra

Degree of Confidence: 4

Remarks: Penetration of the P. pyrophorum Zone is strongly indicated at 2410-2430m where the species P. pyrophorum has its highest occurrence and is also frequent. The species is common to frequent and persistent in all samples assigned to this zone in the well.

2470-2860m: Spongodinium #LA Zone (early Paleocene)

2470m	<u>Oligosphaeridium complex</u> <u>Palaeocystodinium australinum</u> <u>Palaeocystoninium lidiae</u> <u>Phelodinium magnificum</u>
2500m	<u>Chatangiella tripartita</u> (?reworked) <u>Phelodinium tricuspe</u> <u>Spongodinium #LA</u>
2590m	<u>Hystrichosphaeridium tubiferum</u>
2620m	<u>Trithyrodinium evittii</u>
2730m	<u>Ceratiopsis diebelii</u>
2760m	<u>Chatangiella decorosa</u> (?reworked) <u>Chatangiella ditissima</u> (?reworked)
2850m	<u>Alisocysta circumtabulata</u> <u>Fromea fragilis</u>

Degree of Confidence: 3

Remarks: The top of the Spongodinium #LA Zone is tentative at 2470-2490m, being based on the occurrence of P. lidiae, but is more strongly indicated at 2500-2520m by the occurrence of Spongodinium #LA.

2880-3160m: Spongodinium delitiense Zone (Maastrichtian)2880m Spongodinium delitiense2910m Oligosphaeridium #LV2940m Trithyrodinium #LBDegree of Confidence: 2

Remarks: The top of the S. delitiense Zone at 2880-2900m is tentatively picked on a single specimen of S. delitiense.

3180-3250m: Isabelidium cooksoniae Zone (Maastrichtian)3180m Chatangiella biapertura3240m Caligodinium acerasDegree of Confidence: 2

Remarks: The top of the I. cooksoniae Zone at 3180-3200m is tentatively picked on a single specimen of the species C. biapertura.

3270-3520m: Chatangiella tripartita Zone (late Campanian)3270m Isabelidium belfastenseOdontochitina operculata

3300m Chatangiella #LP
Laciniadinium biconiculatum

3330m Chatangiella scheifi

3390m Isabelidinium magnum
Hamulatisporites amplus *

Degree of Confidence: 3

3540-3550m: Palaeohystrichophora infusorioides Zone (early Campanian)

3540m Laciniadinium orbiculatum

Degree of Confidence: 2

Remarks: Penetration of the P. infusorioides Zone at 3540-3560m is tentatively picked on a single specimen of the dinoflagellate L. orbiculatum.

3570-3605m Senoniasphaera rotundata Zone (Santonian)

3570m Senoniasphaera protrusa

Degree of Confidence: 2

Remarks: Penetration of the S. rotundata Zone is tentatively picked on a single specimen of the dinoflagellate S. protrusa.

MICROPALEONTOLOGICAL ZONATION

- 525- 535m Cassidulina teretis Zone (late Miocene or younger)
- 555- 865m No zonal assignment (No age assignment)
- Not observed Asterigerina guerichi Zone (early Miocene or older)
- 885-1375m Asterigerina bartoniana Zone (late Oligocene)
- 1395-1525m Ceratobulimina contraria Zone (early Oligocene)
- 1545-1585m Spiroplectamina adamsi Zone (late Eocene)
- Not observed Cyclamina amplexans Zone (late Eocene)
- 1605-1735m Haplophragmoides acutidorsatum Zone (middle Eocene)
- 1755-2035m Bulimina ovata Zone (early Eocene)
- 2055-2125m Karrerella apicularis Zone (early Eocene)
- 2145-2245m Spiroplectamina grzybowski Zone (early Eocene)
- 2265-2360m Glomospira charoides Zone (late Paleocene)
- 2380-2420m Glomospira corona Zone (early Paleocene)
- 2440-3070m Praecystamina globigerinaeformis Zone (early
Paleocene)

3090-3220m Rzehakina epigona Zone (Maastrichtian)

3240-3340m possible Rzehakina epigona Zone (possible
Maastrichtian)

Not observed Arenobulimina dorbigny Zone (?Campanian)

SELECTED FORAMINIFERA525-535m: Cassidulina teretis Zone (late Miocene or younger)

525m Cassidulina teretis
 Melonis affinis
 Elphidium granosum

Degree of Confidence: 2

555-865m: No zonal assignment (No age assignment)885-1375m: Asterigerina bartoniana Zone (late Oligocene)

885m Coscinodiscus # H 1 +

1395m Asterigerina cf. bartoniana
 Cyclammina cf. placenta

1455m Globigerina officinalis *

Degree of Confidence: 2

1545-1585m: Spiroplectammina adamsi Zone (late Eocene)

1545m Cyclammina cancellata

1575m Haplophragmoides walteri
Coscinodiscus #H 2 +

Degree of Confidence: 2

1605-1735m: Haplophragmoides acutidorsatum Zone (middle Eocene)

1605m Haplophragmoides acutidorsatum
Trochammina globigeriniformis
Lenticulina #H 1

1645m Spiroplectammina adamsi
Haplophragmoides eggeri

1665m Cyclogyra involvens
Trochammina inflata
Cribrostomoides cf. scitulus

1725m Globigerina linaperta *

Degree of Confidence: 3

1755-2035m: Bulimina ovata Zone (early Eocene)

1755m Budashevaelia multicamerata
Trochammina collyra
Ammodiscus peruvianus
Saccammina placenta
Spiroplectammina carinata

1785m Bulimina ovata

1845m	<u>Bathysiphon discreta</u>
1875m	<u>Saccamina complanata</u> <u>Recurvooides walteri</u>
1905m	<u>Vaginulinopsis decorata</u>
1935m	<u>Ammosphaeroidina</u> sp. <u>Anomalinoides preacuta</u>
1965m	<u>Haplophragmoides impensus</u>
2025m	<u>Pseudonodosaria discreta</u>

Degree of Confidence: 2

Remarks: The top of this zone could be lowered to 1785m due to the highest occurrence of Bulimina ovata.

2055-2125m: Karreriella apicularis Zone (early Eocene)

2055m	<u>Ammodiscus glabratus</u> <u>Parrella macneilli</u> <u>Siphogenerinoides eleganta</u> <u>Globigerina higginsi</u> *
2175m	<u>Reophax pilulifer</u>

Degree of Confidence: 3

2205-2245m: Spiroplectamina grzybowski zone (early Eocene)

- 2205m Spiroplectamina grzybowskii
 Trochammina cf. ribstonensis
- 2235m Chilostomella cf. cylindroides
 Bulimina cf. quadrata
 Cibicidoides alleni
 Dorothia cf. retusa

Degree of Confidence: 3

2265-2360m: Glomospira charoides Zone (late Paleocene)

- 2265m Bulimina bradbury
 Rhizammina indivisa
- 2295m Trochammina aff. albertense

Degree of Confidence: 3

2380-2420m: Glomospira corona Zone (early Paleocene)

- 2380m Gavelinella becariiformis
- 2410m Glomospira charoides
 Karrerella apicularis
 Glomospira corona
 Ammobaculites cf. polythalamus

Degree of Confidence: 3

2440-3070m: Praecystamina globigerinaeformis Zone (early Paleocene)

2440m	<u>Praecystamina globigerinaeformis</u>
2560m	<u>Cibicides westi</u> <u>Allomorphina paleocenica</u> <u>Spiroplectamina navarroana</u>
2620m	<u>Clavulina parisiensis</u>
2670m	<u>Nonionella cf. austiniana</u>
2880m	<u>Chilostomelloides eocenica</u>
2940m	<u>Globigerina pseudobulloide</u> *

Degree of Confidence: 3

3090-3220m: Rzehakina epigona Zone (Maastrichtian)

3090m	<u>Rzehakina epigona</u> <u>Spirosigmoilinella compressa</u> <u>Glomospira irregularis</u>
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Degree of Confidence: 3

3240-3340m: possible Rzehakina epigona Zone (possible Maastrichtian)

3240m Poor fossil recovery

PALEOBATHYMETRY

525-535m	Inner Neritic to Middle Neritic
<u>Criteria:</u>	<u>Elphidium granosum</u> , <u>Cassidulina teretis</u>
555-855m	Transition to Inner Neritic
<u>Criteria:</u>	Marine dinoflagellates, no foraminifera to 1395
885-1405m	Inner Neritic to Middle Neritic
<u>Criteria:</u>	<u>Coscinodiscus #H1</u> , <u>Cyclammina cf. placenta</u>
1455-1735m	Middle Neritic to Outer Neritic
<u>Criteria:</u>	Planktonic foraminifera, <u>Haplophragmoides acutidorsatum</u> , <u>Trochammina globigeriniformis</u>
1755-1855m	Outer Neritic to Upper Bathyal
<u>Criteria:</u>	<u>Bathysiphon discreta</u> , <u>Saccamina placenta</u> , <u>Budashevaella multicamerata</u> , <u>Ammodiscus peruvianus</u>
1875-2095m	Upper Bathyal
<u>Criteria:</u>	<u>Recurvoides walteri</u> , <u>Saccamina complanata</u> , <u>Haplophragmoides impensus</u> , <u>Ammodiscus glabratus</u>
2115-2215m	Upper Bathyal to Lower Bathyal
<u>Criteria:</u>	<u>Reophax pilulifer</u> , <u>Spiroplectammina grzybowski</u>
2235-2510m	Lower Bathyal
<u>Criteria:</u>	<u>Chilostomella cylindroides</u> , <u>Saccamina sphaerica</u> , <u>Glomospira</u> spp., <u>Karrerella apicularis</u> , <u>Praecystammina globigerinaeformis</u>

- 2530-2570m Upper Bathyal to Lower Bathyal
Criteria: Allomorpha paleocenica, Spiroplectammina navarroana
- 2590-2740m Upper Bathyal
Criteria: Decrease in abundance and diversity, Clavulina parisiensis, Vulvulina haeringensis
- 2760-2920m Outer Neritic to Upper Bathyal
Criteria: Chilostomelloides eocenica, Bathysiphon discreta, low diversity
- 2940-3220m Upper Bathyal
Criteria: Allomorpha eocenica, Glomospira irregularis, Globigerina pseudobulloides.
- Remarks: Paleoenvironments interpreted from 3210m to T.D. are only tentative due to poor fossil recovery and high probability of cavings.
- 3240-3340m Middle Neritic to Outer Neritic
Criteria: Sharp decrease in diversity and abundance

KEROGEN & TAI

Depth	AM	AT	AG	SA	M	BT	ST	I	R	TAI
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565.0	0	0	0	5	10	35	45	5	0	2-
625.0	0	0	0	0	10	30	55	5	0	2-
865.0	0	0	0	5	10	35	40	5	0	2-
925.0	0	0	0	5	10	10	50	5	0	2-
1255.0	0	5	0	0	10	10	50	5	0	2-2
1345.0	0	5	0	0	5	5	50	5	0	2-2
1435.0	0	5	0	0	5	40	40	5	0	2-2
1525.0	0	10	0	0	5	35	35	5	0	2-2
1615.0	5	15	0	0	5	30	30	5	0	2-2
1705.0	10	15	0	0	5	35	35	5	0	2-2
1795.0	5	15	0	0	5	35	35	5	0	2-2
1885.0	5	25	0	0	5	30	30	5	0	2-2
1945.0	10	20	0	0	5	30	30	5	0	2-2
2035.0	10	25	0	0	5	30	25	5	0	2-2
2125.0	10	25	0	0	5	30	25	5	0	2-2
2215.0	10	20	0	0	5	25	35	5	0	2-2
2335.0	15	20	0	0	5	25	30	5	0	2-2
2350.0	10	15	0	0	5	30	35	5	0	
2540.0	15	15	0	0	5	30	35	5	0	2-2
2630.0	10	15	0	0	5	30	35	5	0	2-2
2740.0	10	10	0	0	10	35	30	5	0	2-2
2800.0	5	10	0	0	5	35	40	5	0	2-2
2890.0	5	10	0	0	5	35	40	5	0	2-2
2980.0	5	10	0	0	10	30	30	15	0	2-2
3070.0	0	0	0	0	10	30	35	20	0	2-2
3160.0	0	0	0	0	10	30	45	15	0	2-2
3250.0	0	0	0	0	5	35	40	25	0	2-2
3310.0	0	0	0	5	5	20	40	30	0	2
3340.0	0	0	0	5	5	20	40	30	0	2
3580.0	0	0	0	5	5	20	35	35	0	2

KEROGEN, TAI AND VITRINITE REFLECTANCE

The upper Eocene to lower-middle Miocene section from 525-1435m contains little amorphous kerogen which comprises 5% or less of degraded terrestrial amorphous material. Woody kerogen comprises between 40% and 50%, herbaceous kerogen comprises between 25% and 50%, and inertinitic coaly kerogen comprises 5% of the total kerogen. Amorphous kerogen increases in relative abundance to between 20% and 35% in the lower Paleocene to middle Eocene section, with marine amorphous material being present throughout (5% to 15%). The relative abundance of woody kerogen is less than in the overlying section, comprising 25% to 35%. Herbaceous kerogen comprises 30% to 45% and coaly inertinitic kerogen comprises 5%. The relative abundance of amorphous kerogen decreases in the upper Campanian to Maastrichtian section between 2880-3520m, from 25% in the upper part of this interval down to approximately 3000m below which amorphous kerogen is absent. Herbaceous and woody kerogen types have similar relative abundances to those in the overlying interval, with coaly inertinitic kerogen increasing downhole from 5% to 25% as the amorphous kerogen decreases. The lowest section of the well, of Santonian to lower Campanian age below 3270m, contains no amorphous kerogen, 35% to 40% woody kerogen, 30% herbaceous kerogen, and 30% to 35% coaly inertinitic kerogen.

The level of Thermal Alteration is 2⁻ in the lower Oligocene to lower-middle Miocene section down to 1195m. It has a value of 2⁻ to 2 in the upper Campanian to upper Eocene section, reaching a value of 2 below approximately 3310m in the Santonian to lower part of the upper Campanian interval. This indicates that the marine amorphous kerogen present in the Maastrichtian to middle Eocene section, from approximately 2980m to 1615m, is marginally mature and has some source rock potential for thermogenic liquid hydrocarbons.

The following levels of thermal maturity are indicated by vitrinite reflectance analysis.

1465-2065m: Immature (Ro% = 0.348% to 0.441%)

2215m: Onset of maturity (Ro% = 0.564%)

2390-3160m: Mature (Ro% = 0.619% to 0.885%)

The vitrinite readings for this well were highly reliable with low standard deviations. Reworked vitrinite is prevalent in samples at 2215m and 2390m.

VITRINITE REFLECTANCEKey to Measurement Qualifying Labels

E = Excellent

= Good

P = Poor

C = Caved

R = Reworked

Sample Depth : 1465.0

0.260	P	0.287	E	0.287	0.288	P	0.289	P	0.289	0.295
0.297	E	0.306	P	0.311	0.317	E	0.319	P	0.325	E
0.327	P	0.329		0.332	0.336	E	0.342		0.343	0.347
0.348		0.349	E	0.350	E	0.353	E	0.355	E	0.357
0.362	E	0.367	E	0.369		0.371	E	0.374		0.376
0.377	P	0.379		0.380	E	0.389		0.392	E	0.393
0.396		0.407	E	0.408	E	0.412	E	0.415	E	0.473
0.908	R									0.476

Actual Mean = 0.364 Actual Standard Deviation = 0.091

Edited Mean = 0.348 Edited Standard Deviation = 0.039

Sample Depth : 1555.0

0.249	C	0.249	C	0.281	P	0.282	P	0.295	P	0.299	P	0.301	C
0.306	P	0.308		0.311	P	0.319	P	0.323	C	0.325	C	0.327	
0.344		0.351	P	0.353	P	0.353	P	0.360	P	0.361	P	0.368	
0.370		0.374		0.396		0.396		0.397		0.415		0.418	
0.423		0.426		0.428	E	0.482	R	0.546	R	0.548	R	0.553	R
0.630	R	1.010	R	1.141	R								

Actual Mean = 0.411 Actual Standard Deviation = 0.181

Edited Mean = 0.356 Edited Standard Deviation = 0.047

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Sample Depth : 1705.0

0.281	C	0.288	C	0.288	C	0.291	C	0.293	C	0.301	C	0.319	P
0.321	P	0.322	P	0.327	P	0.332	P	0.337		0.338	E	0.338	E
0.341	E	0.341		0.341	E	0.341		0.342	E	0.343	E	0.344	
0.346	E	0.349	P	0.351		0.352	P	0.353		0.353		0.355	E
0.359		0.359	E	0.360		0.361	E	0.362	E	0.364	P	0.364	
0.366		0.367		0.369	E	0.372	E	0.374	P	0.375		0.376	
0.376	E	0.384	E	0.388	P	0.393	E	0.395	E	0.399	E	0.404	E
0.423	E	0.427	E	0.432	P	0.449	R	0.461	R	0.480	R		

Actual Mean = 0.359 Actual Standard Deviation = 0.042

Edited Mean = 0.362 Edited Standard Deviation = 0.027

Sample Depth : 1825.0

0.286	C	0.308	P	0.309	P	0.316	P	0.320	P	0.330		0.347	P
0.353	P	0.356		0.371	P	0.374	P	0.386	P	0.393		0.399	
0.449		0.937	R										

Actual Mean = 0.390 Actual Standard Deviation = 0.152

Edited Mean = 0.358 Edited Standard Deviation = 0.041

Sample Depth : 1915.0

0.252	C	0.282	C	0.284	C	0.312	C	0.314	C	0.314	C	0.334	P
0.367		0.374		0.381	P	0.381		0.385		0.394		0.404	
0.479	E	0.495		0.524		0.546	R	0.552	R	0.618	R	0.628	R
0.640	R	0.807	R	0.818	R	0.841	R	1.032	R				

Actual Mean = 0.491 Actual Standard Deviation = 0.203

Edited Mean = 0.411 Edited Standard Deviation = 0.060

Sample Depth : 2065.0

0.322	C	0.346	C	0.348	C	0.362	C	0.370	C	0.377	C	0.381	C
0.416		0.428		0.431	P	0.436		0.437		0.459		0.479	E
0.529	R	0.548	R										

Actual Mean = 0.417 Actual Standard Deviation = 0.065

Edited Mean = 0.441 Edited Standard Deviation = 0.021

Sample Depth : 2215.0

0.278	C	0.355	C	0.362	C	0.414	C	0.421	C	0.422	P	0.440	P
0.457	C	0.479		0.479	C	0.507		0.509		0.570		0.571	
0.576	E	0.580		0.625		0.636	P	0.652		0.664	P	0.667	P
0.719	R	0.751	R	0.760	R	0.789	R	0.810	R	0.860	R	0.863	R
0.905	R	0.911	R	0.930	R	0.957	R	0.990	R	0.993	R	1.046	R
1.063	R	1.119	R	1.128	R	1.349	R						

Actual Mean = 0.708 Actual Standard Deviation = 0.257

Edited Mean = 0.564 Edited Standard Deviation = 0.082

Sample Depth : 2390.0

0.335	C	0.374	C	0.404	C	0.430	C	0.445	C	0.483	C	0.513	P
0.570		0.587		0.609		0.651	E	0.652	E	0.652	E	0.666	
0.669		0.724	R	0.729	R	0.750	R	0.761	R	0.789	R	0.837	R
0.850	R	0.862	R	0.881	R	0.934	R	0.970	R	0.974	R	1.010	R
1.027	R	1.038	R	1.067	R	1.102	R	1.113	R	1.162	R	1.175	R
1.197	R	1.233	R	1.349	R								

Actual Mean = 0.805 Actual Standard Deviation = 0.269

Edited Mean = 0.619 Edited Standard Deviation = 0.053

Sample Depth : 2540.0

0.464	C	0.481	C	0.555	C	0.597	C	0.643		0.726	E	0.729	
0.748		0.801	E	0.810		0.834		0.837	E	0.838		0.877	
0.907		0.940	R	0.942	R	0.964	R	0.974	R	0.978	R	1.038	R
1.149	R	1.157	R	1.161	R	1.170	R	1.188	R	1.589			

Actual Mean = 0.892 Actual Standard Deviation = 0.250

Edited Mean = 0.862 Edited Standard Deviation = 0.241

Sample Depth : 2660.0

0.535	C	0.535	C	0.537	C	0.560	C	0.590	C	0.592	C	0.624	C
0.682	E	0.693		0.716		0.761	E	0.806	E	0.808		0.814	
0.879	E	0.889		0.893		0.931	R	0.934		0.950		0.951	
1.031	R	1.070	R	1.102	R	1.116	R	1.166	R	1.168	R	1.200	R
1.321	R	1.437	R	1.672	R	1.824	R						

Actual Mean = 0.931 Actual Standard Deviation = 0.322

Edited Mean = 0.829 Edited Standard Deviation = 0.095

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Sample Depth : 2800.0

0.501	C	0.519	C	0.521	C	0.537	C	0.601	C	0.623	C	0.623	C
0.676	P	0.681	P	0.741	E	0.802	E	0.821		0.839	E	0.857	E
0.866		0.891	E	0.916	E	0.928		0.928		0.930		0.971	R
0.990	R	1.070	R	1.296	R	1.311	R						

Actual Mean = 0.818 Actual Standard Deviation = 0.221

Edited Mean = 0.837 Edited Standard Deviation = 0.090

Sample Depth : 2920.0

0.374	C	0.553	C	0.570	C	0.578	C	0.618	C	0.625	C	0.627	C
0.630	C	0.644	C	0.654	C	0.701		0.761	P	0.778		0.788	E
0.825	E	0.889	P	0.891	E	0.924		0.945	P	0.956	E	0.993	R
1.041	R	1.178	R	1.263	R	1.301	R	1.328	R	1.358	R	1.403	R
1.592	R	1.990	R										

Actual Mean = 0.926 Actual Standard Deviation = 0.363

Edited Mean = 0.846 Edited Standard Deviation = 0.087

Sample Depth : 3120.0

0.550	C	0.590	C	0.599	C	0.605	C	0.614	C	0.654	C	0.654	C
0.693		0.697		0.719	P	0.736		0.746		0.770		0.772	
0.779		0.810		0.813	E	0.819		0.847	E	0.875		0.884	
0.936		0.939		0.953		0.970		0.972		0.999	R	1.019	R
1.071	R	1.071	R	1.075	R	1.075	R	1.080	R	1.100	R	1.120	R
1.146	R	1.172	R	1.204	R	1.204	R	1.208	R	1.211	R	1.212	R
1.240	R	1.248	R	1.284	R	1.294	R	1.605	R	1.637	R	1.808	R
1.852	R												

Actual Mean = 0.999 Actual Standard Deviation = 0.305

Edited Mean = 0.828 Edited Standard Deviation = 0.094

Sample Depth : 3160.0

0.619	C	0.687	C	0.699	C	0.714	C	0.717	C	0.719	C	0.729	C
0.740	C	0.770		0.776		0.792		0.805		0.810		0.820	
0.837		0.882		0.882		0.900		0.905		0.909		0.912	
0.922		0.926		0.932		0.936		0.944	P	0.964		0.972	
0.985		1.022	R	1.029	R	1.076	R	1.095	R	1.115	R	1.120	R
1.146	R	1.204	R	1.233	R	1.243	R	1.275	R	1.295	R	1.302	R
1.353	R	1.357	R	1.358	R	1.363	R	1.514	R	1.541	R	1.583	R
1.728	R												

Actual Mean = 1.023 Actual Standard Deviation = 0.266

Edited Mean = 0.885 Edited Standard Deviation = 0.067

BIOSTRATIGRAPHY AND MATURATION OF

GJOA G-37

ESSO H.B. GJOA G-37GSC locality: 62° 56' 27.984"N, 59° 56' 30.707"WKB elevation: 24m Water depth: 1000mCasing set at: 1059m, 1402m, 1852mTotal depth: 3998.5mInterval studied for palynology: 1470-3998.5mInterval studied for micropaleontology: 1445-3990mCONSENSUS AGE

1445-1490m	no age assignment (M,P)
1490-1500m	middle Miocene or older (P)
1510-1520m	early Oligocene (P)
1530-1545m	late Eocene (P)
1565-1580m	middle to late Eocene (P)
1600-1640m	middle Eocene (P)
1660-2360m	early Eocene (P)
2380-3210m	late Paleocene (P)
3230-3998.5m	early Paleocene (M)

GJOA G-37PALYNOLOGICAL ZONATION

- 1445-1490m No zonal assignment (no age assignment)
- 1490-1500m Systematophora ancyrea Zone or older (middle Miocene or older)
- 1510-1520m Areosphaeridium arcuatum Zone (early Oligocene)
- 1530-1545m Deflandrea #LR Zone (late Eocene to early Oligocene)
- 1565-1580m Areosphaeridium fenestratum Zone (middle to late Eocene)
- 1600-1640m Eocladopyxis #LA Zone (middle Eocene)
- 1660-2360m Trinovantedinium #LA Zone to Dracodinium condylos Zone (early Eocene)
- 2380-3370m Ceratiopsis speciosa Zone to Alisocysta circumtabulata Zone (late Paleocene)
- 3390-3520m Palaeoperidinium pyrophorum Zone (early Paleocene)
- 3540-3998.5m Spongodinium #LA Zone (early Paleocene)

SELECTED SPECIES1470-1490m: No zonal assignment (no age assignment)1490-1500m: Systematophora ancyrea Zone or older (middle Miocene or older)

1490m Achomosphaera ramulifera
 Operculodinium centrocarpum
 Osmundacidites claytonites *
 Systematophora ancyrea

Degree of Confidence: 3

Remarks: It is possible that this interval is early Oligocene and that stratigraphic markers for the A. arcuatum Zone were not observed due to the scarcity of palynomorphs in this part of the well.

1510-1520m: Areosphaeridium arcuatum Zone (early Oligocene)

1510m Alnipollenites verus *
 Quercoidites #LA *

Degree of Confidence: 2

Remarks: The sample at 1510-1520m is tentatively assigned to the A. arcuatum Zone based on the occurrence of the pollen Quercoidites #LA. However, the stratigraphic range of this species on the Labrador and Baffin Shelves is imperfectly known.

1530-1545m: Deflandrea #LR Zone (late Eocene to early Oligocene)

- 1530m Quercoidites #LG *
 Rouseisporites #LA *
- 1550m Azolla *

Degree of Confidence: 1

Remarks: Assignment of this interval to the Deflandrea #LR Zone is highly tentative, being based on a single occurrence of the spore Rouseisporites #LA whose stratigraphic range is poorly known on the Labrador and Baffin Shelves. Dinoflagellate markers are absent from this interval.

1565-1580m: Areosphaeridium fenestratum Zone (middle to late Eocene)

- 1565m Cicatricosporites auritus *
 Deflandrea #LR
 Lingulodinium machaerophorum
- 1575m Corylus #LA *
 Hystrichokolpoma rigaudiae
 Spiniferites ramosus
 Wetzeliella articulata

Degree of Confidence: 2

Remarks: Assignment of this interval to the A. fenestratum Zone is based on the occurrence of the spore C. auritus at 1565-1580m and the dinoflagellate W. articulata at 1575-1590m. Also occurring at 1565-1580m is the dinoflagellate Deflandrea #LR which ranges up from

the A. fenestratum Zone into the Deflandrea #LR Zone, and which probably has a depressed top at 1565-1580m.

1600-1640m: Eocladopyxis #LA Zone (middle Eocene)

- 1600m Horologinella #LA
Jusseaia sp., Piel 1971 *
Pistillipollenites mcgregorii *
Tsugaepollenites igniculus *
- 1620m Deflandrea phosphoritica
Glaphyrocysta intricata
Michystridium fragile (common)
- 1640m Deflandrea #LB

Degree of Confidence: 2

1660-2360m: Trinovantedinium #LA Zone to Dracodinium condylos Zone (early Eocene)

- 1660m Cicatricosisporites paradorogensis *
Glaphyrocysta laciniiforme
Polysphaeridium subtile
Quercoidites #LV *
Retitricolpites #LF *
Trudopollis plena *
- 1690m Impagidinium californiense

- 1700m Apectodinium homomorphum (singleton)
Homotryblium pallidum
Hystrichosphaeridium patulum
- 1720m Lentinia serrata
Systematophora placacantha
- 1740m Carpinipites #LT *
Eocladopyxis #LA (singleton)
Fagus #LA *
Thalassiphora pelagica
Tricolpites #LA *
- 1760m Momipites triadiatus *
- 1780m Ceratiopsis depressa
Heteraulacacysta leptalea
Wetziella meckelfeldensis
- 1800m Dapsilidinium pastielsii
Homotryblium tenuispinosum
- 1820m Cicatricosisporites dorogensis *
Cordosphaeridium gracile
Diphyes colligerum
Hystrichokolpoma salacium
Wetziella ovalis
- 1840m Homotryblium abbreviatum
- 1858m Apectodinium homomorphum

- 1950m **Apectodinium homomorphum** (common)
Apectodinium hyperacanthum
Areoligera senonensis (frequent)
Azolla * (abundant)
Cordosphaeridium inodes
Cribroperidinium giusepei
Dinopterygium cladoides
- 2020m Areosphaeridium sp. A, Williams & Bujak 1977
- 2050m **Isabelidinium** #LP
Cordosphaeridium tiara
- 2230m Achomosphaera alvicornu
- 2250m Ceratiopsis speciosa speciosa (?reworked)
- 2290m Pervosphaeridium pseudhystrichodinium (?reworked)
- 2320m Adnatosphaeridium multispinosum
Adnatosphaeridium robustum
Alisocysta margarita (?reworked)
- 2350m **Apectodinium augustum**
Apectodinium homomorphum (abundant)

Degree of Confidence: 2

Remarks: The top of the Trinovantedinium #LA Zone is generally marked on the Labrador and Baffin Shelves by common specimens of Trinovantedinium species. These are absent from the Gjoa G-37 well, and the top of the zone is tentatively indicated at 1660-1680m by the highest occurrence of P. subtile whose stratigraphic range is poorly known in this region. A more definite assignment is at 1700-1720m

based on the dinoflagellate H. pallidum. It was not possible to subdivide the Dracodinium condylos Zone from the overlying Trinovantedinium #LA Zone in this well, although the occurrence of a single specimen of Isabelidinium #LP at 2050-2070m indicates penetration of the D. condylos Zone, providing the single specimen observed is in place. Reworking is common in the lower part of this zone and in the underlying zones, and includes several Paleocene species listed above. These are interpreted as being reworked because of their single occurrences, in contrast to the persistent occurrence of Paleocene markers below 2380m.

2380-3370m: Ceratiopsis speciosa Zone to Alisocysta circumtabulata Zone
(late Paleocene)

2380m	<u>Apectodinium senonensis</u> (abundant) <u>Ceratiopsis speciosa glabra</u> <u>Lentinia wetzellii</u>
2410m	<u>Deflandrea denticulata</u> <u>Ceratiopsis speciosa glabra</u> (frequent) <u>Phelodinium magnificum</u>
2440m	<u>Lejeunecysta hyalina</u> <u>Alisocysta circumtabulata</u>
2470m	<u>Caligodinium aceras</u> (?reworked)
2530m	<u>Ceratiopsis diebelii</u> (?reworked)
2560m	<u>Hamulatisporites amplus</u> * (?reworked)
3000m	<u>Alisocysta margarita</u>

- 3090m Phelodinium tricuspe (?reworked)
 Surculosphaeridium longifurcatum (?reworked)

Degree of Confidence: 3

Remarks: Assignment of strata at 2380-2400m and below to the Paleocene is fairly confident due to the common and persistent occurrence of late Paleocene markers at and below this sample. This contrasts with the rare occurrences of Paleocene species interpreted as being reworked in the overlying interval. It is not possible to confidently separate the A. circumtabulata Zone from the overlying C. speciosa Zone due to the predominance of reworking in the lower part of this interval. However, the presence of a single specimen of A. circumtabulata at 2440-2460m and a single specimen of A. margarita at 3000-3020m would indicate the presence of the A. circumtabulata Zone, providing the specimens are in place. Late Cretaceous and early Paleocene species occurring in this interval below 2470m are interpreted as being reworked because of their rare occurrences in contrast to the abundant and persistent occurrence of early Paleocene markers below 3390m.

3390-3520m: Palaeoperidinium pyrophorum Zone (early Paleocene)

- 3390m Ceratiopsis striata
 Chatangiella ditissima (?reworked)
 Palaeoperidinium pyrophorum
- 3420m Palaeoperidinium pyrophorum (abundant)
- 3450m Senegalinium laevigatum (?reworked)

Degree of Confidence: 3

Remarks: The early Paleocene marker P. pyrophorum occurs rarely at 3390-3410m where it has its highest occurrence and is abundant at 3420-3440m. Late Cretaceous dinoflagellates interpreted as being reworked occur at 3390-3410m and 3450-3470m and are listed above.

3540-3998.5m: Spongodinium #LA Zone (early Paleocene)

3540m	<u>Oligosphaeridium</u> #LV (?reworked) <u>Spongodinium</u> #LA <u>Trithyrodinium evittii</u>
3620m	<u>Cyclonephelium distinctum</u> (?reworked)
3990m	<u>Palaeocystodinium australinum</u>

Degree of Confidence: 3

Remarks: The top of the Spongodinium #LA Zone is well marked at 3540-3560m by Spongodinium #LA and T. evittii. The Cretaceous species C. distinctum is considered to be reworked at 3620-3640m and the dinoflagellate Oligosphaeridium #LV may be reworked at 3540-3560m, although it may range up from the Cretaceous into the Spongodinium #LA Zone.

MICROPALEONTOLOGICAL ZONATION

- 1445-1500m No zonal assignment (No age assignment)
- Not observed Cassidulina teretis Zone (late Miocene or younger)
- Not observed Asterigerina guerichi Zone (early Miocene or older)
- 1520-1610m Asterigerina bartoniana Zone to Ceratobulimina contraria Zone (Oligocene)
- 1630-1650m Spiroplectammina adamsi Zone (late Eocene)
- Not observed Cyclamina amplexans Zone (late Eocene)
- Not observed Haplophragmoides acutidorsatum Zone (middle Eocene)
- 1670-1940m Bulimina ovata Zone (early Eocene)
- 1960-2590m Karrerella apicularis Zone (early Eocene)
- 2610-3210m Spiroplectammina grzybowski Zone (early Eocene)
- Not observed Glomospira charoides Zone (late Paleocene)
- 3230-3900m Glomospira corona Zone (early Paleocene)
- Not observed Praecystammina globigerinaeformis Zone (early Paleocene)

Not observed Rzehakina epigona Zone (Maastrichtian)

Not observed Arenobulimina dorbigny Zone (?Campanian)

3920-3990m No zonal assignment (No age assignment)

SELECTED FORAMINIFERA1445-1500m: No zonal assignment (No age assignment)

1497m CASING

1520-1610m: Asterigerina bartoniana Zone to Ceratobulimina contraria (Oligocene)1520m Coscinodiscus sp. +
Bolivina cf. brabantica

1540m Poor fossil recovery

1575m Heterolepa tenella
Heterolepa lobatula
Pullenia quintelobaDegree of Confidence: 11630-1660m: Spiroplectamina adamsi Zone (late Eocene)1630m Spiroplectamina adamsi
Trifarina abbreviata
Lenticulina #H 21650m Lenticulina sp.
Nodosaria cf. minorDegree of Confidence: 3

1670-1940m: *Bulimina ovata* Zone (early Eocene)

1670m	<u><i>Bulimina ovata</i></u> <u><i>Vaginulinopsis</i> cf. <i>echinata</i></u> Scaphopods
1810m	<u><i>Haplophragmoides walteri</i></u>
1830m	<u><i>Cyclammina</i> sp.</u>
1850m	<u><i>Cyclammina placenta</i></u> <u><i>Lenticulina midwayensis</i></u>
1868m	CASING

Degree of Confidence: 31960-2590m: *Karrerella apicularis* Zone (early Eocene)

1960m	<u><i>Karrerella apicularis</i></u> <u><i>Trochammina globigeriniformis</i></u> <u><i>Cribrostomoides subglobosus</i></u> <u><i>Recurvooides walteri</i></u> <u><i>Anomalinooides acuta</i></u> <u><i>Turrilina alsatica</i></u>
2040m	<u><i>Alabamina wilcoxensis</i></u>
2210m	<u><i>Amodiscus peruvianus</i></u> <u><i>Dentalina colei</i></u>

2230m	<u>Pseudonodosaria discreta</u> <u>Trochammina cf. inflata</u>
2250m	<u>Melonis affinis</u> Ostracods
2270m	<u>Rotalia cf. audouini</u> Ostracods
2310m	<u>Pseudonodosaria discreta</u>
2330m	<u>Elphidium roemeri</u>
2370m	Ostracods <u>Coscinodiscus</u> sp. +
2390m	<u>Eponides plummerae</u>
2430m	<u>Marginulina glabra</u> <u>Cibicidooides mirificus</u> <u>Bathysiphon discreta</u>
2470m	<u>Haplophragmoides acutidorsatum</u>
2490m	<u>Bullimina truncana</u>
2550m	<u>Hoeglundina eocenica</u>

Degree of Confidence: 3

2410m	<u>Bulimina trigonalis</u> <u>Ceratobulimina contraria</u> <u>Gyroidina girardana</u>
3170m	<u>Bulimina bradbury</u> <u>Gyroidinoides aequilateralis</u>

Degree of Confidence: 3

3230-3900m: Glomospira corona Zone (early Paleocene)

3230m	<u>Gavelinella becariformis</u> <u>Epistominella oveyi</u>
3270m	<u>Haplophragmoides impensus</u>
3410m	<u>Eponides lotus</u>
3430m	<u>Heterolepa cf. howelli</u> <u>Gavelinella aff. micra</u> <u>Anomalinoides praespissiformis</u>
3450m	<u>Cibicidoides cf. tuxpamensis</u> <u>Eponides elevatus</u>
3490m	<u>Gavelinella aff. capitata</u>

2610-3210m: Spiroplectammina grzybowski Zone (early Eocene)

- 2610m Bulimina quadrata
 Cyclammina cancellata
- 2670m Saccamina placenta
 Anomalinoidea preacuta
 Textularia midwayana
 Budashevaella multicamerata
- 2980m Haplophragmoides walteri
- 3550m Heterolepa cf. ungeriana

Degree of Confidence: 3

3920-3990m: No zonal assignment (No age assignment)

- 3960m Bulimina quadrata (one specimen)

PALEOBATHYMETRY

- 1445-1510m Transitional to Inner Neritic
Criteria: Marine dinoflagellates, no foraminifera
- 1520-1620m Inner Neritic
Criteria: Pullenia quinqueloba, Heterolepa lobatula,
Coscinodiscus sp.
- 1630-1800m Inner Neritic to Middle Neritic
Criteria: Lenticulina sp., Bulimina ovata, scaphopods
- 1810-1870m Middle Neritic to Outer Neritic
Criteria: Haplophragmoides walteri, Cyclammina placenta,
Lenticulina midwayensis
- 1960-2050m Outer Neritic to Upper Bathyal
Criteria: Karrerella apicularis, Trochammina
globigeriniformis, Cribrostomoides subglobosus,
Recurvoides walteri
- 2210-2240m Middle Neritic to Outer Neritic
Criteria: Anmodiscus peruvianus, Pseudonodosaria discreta,
Trochammina cf. inflata.
- 2250-2260m Transitional to Inner Neritic
Criteria: Melonis affinis, Schuleridae sp (ostracod)
- 2270-2300m Transitional
Criteria: Rotalia cf. audouini, Schuleridae sp.

- 2310-2360m Transitional to Inner Neritic
Criteria: Pseudonodosaria discreta (one specimen), Elphidium roemeri
- 2370-2420m Inner Neritic to Middle Neritic
Criteria: Coscinodiscus sp, Bulimina trigonalis,
Gyroidinoides girardana
- 2430-2480m Middle Neritic to Outer Neritic
Criteria: Bathysiphon discreta, Haplophragmoides acutidorsatum
- 2490-2560m Outer Neritic to Upper Bathyal
Criteria: Bulimina truncana, Hoeglundina eocenica
- 2610-2700m Upper Bathyal
Criteria: Cyclammina cancellata, Saccamina placenta,
Budashevaella multicamerata
- 2710-2760m Outer Neritic to Upper Bathyal
Criteria: Poor fossil recovery, marine dinoflagellates
- 2770-3120m Middle Neritic to Outer Neritic
Criteria: Haplophragmoides walteri (one specimen)
- 3170-3280m Outer Neritic to Upper Bathyal
Criteria: Gavelinella becariformis, Haplophragmoides impensus
- 3310-3400m Outer Neritic
Criteria: No foraminifera, marine dinoflagellates

KEROGEN & TAI

Depth	AM	AT	AG	SA	M	BT	ST	I	R	TAI
*****	---	---	---	---	---	---	---	---	---	---
1500.0	0	5	0	0	15	25	50	5	0	2-2
1610.0	0	0	0	0	5	35	50	10	0	2-2
1710.0	0	0	0	0	10	25	55	10	0	2-2
1810.0	0	0	0	0	20	30	45	5	0	2-2
1868.0	0	0	0	0	15	25	55	5	0	2-2
1960.0	0	0	0	0	20	20	55	5	0	2-2
2060.0	0	0	0	0	20	25	50	5	0	2-2
2210.0	0	0	0	0	25	25	45	5	0	2
2300.0	0	0	0	0	20	25	50	5	0	2
2390.0	0	0	0	10	15	20	45	10	0	2
2480.0	0	0	0	5	15	20	50	10	0	2
2570.0	0	0	0	0	15	15	50	20	0	2
2660.0	0	0	0	10	10	15	40	25	0	2
2750.0	0	0	0	10	5	20	40	25	0	2
2880.0	0	0	0	10	10	20	40	20	0	2
2930.0	0	0	0	10	5	20	45	20	0	2
3070.0	0	0	0	10	10	20	40	20	0	2
3160.0	0	5	0	0	5	25	45	20	0	2
3250.0	0	5	0	0	5	25	50	15	0	2
3370.0	0	5	0	0	10	20	45	20	0	2
3460.0	0	0	0	0	15	10	50	15	0	2+
3570.0	0	0	0	0	10	15	55	20	0	2+
3660.0	0	0	0	0	10	20	45	20	0	2+
3810.0	0	0	0	0	10	20	55	20	0	2+
3900.0	0	0	0	10	5	10	55	20	0	2+
3998.0	0	0	0	0	0	20	50	30	0	2+

KEROGEN, TAI AND VITRINITE REFLECTANCE

The relative abundances of all kerogen types remain fairly constant throughout the examined lower Paleocene to middle Miocene or older section. Amorphous kerogen is absent throughout, except for rare (5%) amounts of terrestrial amorphous kerogen between 3160-3370m. Woody kerogen generally comprises 40% to 50%, and herbaceous kerogen comprises 25% to 40% through most of the section. Coaly inertinitic kerogen is more common below approximately 2390m, reaching a peak of 25% at 2660m and 2750m. It generally comprises only 5% in the section from 1500-2300m.

The level of Thermal Alteration increases from a value of 2⁻ to 2 at 1500m, to a value of 2 below 2210m in strata of early Eocene age, to a value of 2+ at 3460m in strata of early Paleocene age. The level of Thermal Alteration and the observed kerogen types indicates some source rock potential for predominantly gaseous hydrocarbons from the herbaceous and woody kerogen below 3460m.

The following levels of thermal maturity are indicated by vitrinite reflectance analysis.

1500-1960m: Immature (Ro% = 0.328% to 0.407%)

2050-2230m: Onset of maturity (Ro% = 0.518% to 0.551%)

2450-3998m: Mature to highly mature (Ro% = 0.677% to 0.830%)

The vitrinite reflectance quickly rises from the onset of maturity at 2230m (Ro% = 0.551%) and at 2450m (Ro% = 0.83%). This increase is also reflected in the increase in TAI at the same level. The interval between 2740m and 3080m contains abundant vitrinite particles with low values which are considered to be caved. The various populations within this and the lower part of the well may reflect the thick sequence of volcanic rocks and intercalated shales.

VITRINITE REFLECTANCEKey to Measurement Qualifying Labels

E = Excellent
 = Good
 P = Poor
 C = Caved
 R = Reworked

Sample Depth : 1500.0

0.198	C	0.210	C	0.224	C	0.225	C	0.227	C	0.240	C	0.254	P
0.257		0.262		0.265		0.265		0.266	P	0.267		0.268	
0.268		0.278		0.278		0.279	E	0.297		0.302		0.305	
0.310		0.311		0.315		0.320		0.324		0.331		0.332	
0.337		0.348	P	0.348	P	0.350		0.353		0.356		0.365	
0.366		0.374	E	0.377		0.386	P	0.389		0.390		0.397	
0.399	P	0.410		0.412		0.414	P	0.448	R	0.522	R	0.582	R
0.710	R	0.841	R										

Actual Mean = 0.344 Actual Standard Deviation = 0.117

Edited Mean = 0.328 Edited Standard Deviation = 0.051

Sample Depth : 1630.0

0.247		0.259	P	0.261		0.268		0.292		0.304		0.305	
0.310		0.316		0.321		0.326		0.327		0.330		0.332	
0.342		0.350		0.350		0.353		0.355		0.355		0.356	
0.356		0.364		0.367		0.368		0.372		0.393		0.400	
0.401		0.419		0.433	R	0.510	R	0.524	R	0.600	R	0.978	R

Actual Mean = 0.376 Actual Standard Deviation = 0.128

Edited Mean = 0.337 Edited Standard Deviation = 0.043

Sample Depth : 1710.0

0.167	C	0.218	C	0.226	C	0.259	C	0.301	P	0.303	0.306
0.322	P	0.324		0.326		0.327		0.333		0.334	0.335
0.338	P	0.344		0.346		0.346		0.350		0.351	0.354
0.361		0.369	P	0.369		0.373		0.376		0.377	0.380
0.388		0.388		0.389		0.390		0.390		0.390	0.399
0.402		0.403	E	0.406		0.409		0.418	E	0.421	0.423
0.424		0.425		0.430		0.441		0.446		0.448	0.458
0.618	R										P

Actual Mean = 0.368 Actual Standard Deviation = 0.070

Edited Mean = 0.376 Edited Standard Deviation = 0.042

Sample Depth : 1830.0

0.281	P	0.290	P	0.293		0.310	P	0.310	P	0.321	P	0.321	P
0.323	P	0.329		0.338		0.343	P	0.350	P	0.350		0.353	
0.359	P	0.359		0.359		0.362	P	0.363	P	0.365	P	0.369	
0.372		0.377		0.378		0.378		0.379		0.379		0.380	
0.389		0.391		0.393		0.396		0.400		0.400		0.402	
0.411		0.422		0.431	E	0.437	P	0.442		0.444		0.446	
0.450		0.471	R	0.481	R	0.485	R	0.540	R	0.940	R	1.153	R
1.425	R												

Actual Mean = 0.429 Actual Standard Deviation = 0.203

Edited Mean = 0.371 Edited Standard Deviation = 0.044

Sample Depth : 1960.0

0.203	C	0.258	C	0.267	C	0.281	C	0.292	C	0.292	C	0.296	C
0.319		0.324	P	0.325	C	0.328		0.330	C	0.332		0.339	P
0.342		0.351		0.354	P	0.358	P	0.362		0.373	P	0.383	
0.388		0.389		0.401		0.405		0.412	P	0.428		0.435	P
0.453	E	0.461		0.535		0.535		0.568		0.581	R	0.605	
0.608	R	0.659	R	0.689	R	0.787	R	0.823	R	0.852	R		

Actual Mean = 0.432 Actual Standard Deviation = 0.159

Edited Mean = 0.407 Edited Standard Deviation = 0.080

Sample Depth : 2050.0

0.216	C	0.249	C	0.282	C	0.286	C	0.314	C	0.346	C	0.371	C
0.373	C	0.392		0.406		0.408		0.421		0.424		0.461	
0.465		0.481		0.488		0.489		0.505		0.536		0.539	
0.550		0.569		0.574		0.577		0.581		0.618		0.638	
0.639		0.641		0.681	R	0.689	R	0.754	R	0.780	R	0.786	R
0.786	R	0.801	R	0.823	R	0.834	R	0.841	R	0.856	R	0.880	R
0.883	R	0.902	R	1.032	R	1.033	R	1.051	R	1.132	R	1.194	R
1.196	R	1.237	R	1.296	R	1.301	R	1.324	R	1.346	R	1.541	R
1.639	R	1.935	R										

Actual Mean = 0.750 Actual Standard Deviation = 0.379

Edited Mean = 0.518 Edited Standard Deviation = 0.081

Sample Depth : 2230.0

0.291	C	0.335	C	0.388	C	0.399	C	0.495		0.499		0.502	
0.538		0.636		0.638		0.698	R	0.716	R	0.754	R	0.818	R
0.852	R	0.880	R	1.205	R	1.448	R						

Actual Mean = 0.672 Actual Standard Deviation = 0.299

Edited Mean = 0.551 Edited Standard Deviation = 0.068

Sample Depth : 2450.0

0.375	C	0.453	C	0.518	C	0.520	C	0.527	C	0.532	C	0.587	C
0.616	C	0.625	C	0.656		0.664		0.670		0.674		0.703	E
0.708	E	0.769		0.785		0.791		0.830		0.832		0.835	
0.845		0.859		0.866		0.868		0.871		0.872		0.874	
0.876		0.891		0.894		0.894		0.895		0.902		0.908	
0.911		0.914		0.917		0.922		0.937	R	0.943	R	0.945	R
0.951	R	0.961	R	0.987	R	1.073	R	1.162	R	1.202	R	1.219	R
1.363	R	1.674	R	1.679	R	1.831	R						

Actual Mean = 0.879 Actual Standard Deviation = 0.285

Edited Mean = 0.830 Edited Standard Deviation = 0.086

Sample Depth : 2740.0

0.212	C	0.256	C	0.308	C	0.329	C	0.341	C	0.345	C	0.351	C
0.352	C	0.352	C	0.379	C	0.388	C	0.404	C	0.405	C	0.409	C
0.423	C	0.431	C	0.438	C	0.449	C	0.457	C	0.469	C	0.478	C
0.479	C	0.483	C	0.484	C	0.485	C	0.490	C	0.502	C	0.514	C
0.522	C	0.527	C	0.527	C	0.533	C	0.540	C	0.550	P	0.551	
0.560		0.562		0.579		0.593	P	0.598	P	0.599	P	0.607	
0.610	P	0.611	P	0.620	P	0.650		0.652	P	0.673		0.677	
0.679		0.685		0.686		0.705		0.717		0.745		0.746	
0.755		0.785		0.847		0.849		0.873		0.874		0.902	R
0.987	R	0.988	R	1.021	R	1.051	R	1.146	R	1.159	R	1.188	R
1.206	R	1.241	R	1.264	R	1.455	R	1.492	R	1.521	R	1.548	R
1.759	R												

Actual Mean = 0.688 Actual Standard Deviation = 0.335

Edited Mean = 0.677 Edited Standard Deviation = 0.098

Sample Depth : 2890.0

0.282	C	0.289	C	0.290	C	0.298	C	0.309	C	0.321	C	0.323	C
0.325	C	0.330	C	0.336	C	0.337	C	0.342	C	0.345	C	0.353	C
0.357	C	0.362	C	0.366	C	0.370	C	0.375	C	0.375	C	0.383	C
0.386	C	0.388	C	0.388	C	0.401	C	0.401	C	0.405	C	0.408	C
0.413	C	0.418	C	0.423	C	0.426	C	0.427	C	0.433	C	0.437	C
0.438	C	0.440	C	0.445	C	0.450	C	0.453	C	0.453	C	0.458	C
0.465	C	0.473	C	0.476	C	0.480	C	0.480	C	0.485	C	0.488	C
0.489	C	0.496	C	0.501	C	0.502	C	0.507	C	0.508	C	0.515	C
0.522	P	0.538	R	0.538	P	0.540		0.543		0.547		0.547	
0.550		0.551		0.563	C	0.570	R	0.575	R	0.576	R	0.590	
0.593	P	0.598		0.599		0.601	R	0.614		0.636	P	0.639	R
0.653	R	0.665		0.669	R	0.669		0.715		0.749		0.770	P
0.810		0.827	P	0.828		0.870		0.872	P	0.878		0.897	P
0.968	R	1.030	R	1.034	R	1.105	R	1.182	R	1.555	R		

Actual Mean = 0.542 Actual Standard Deviation = 0.218

Edited Mean = 0.674 Edited Standard Deviation = 0.130

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Sample Depth : 3080.0

0.209	C	0.213	C	0.215	C	0.223	C	0.248		0.252	C	0.266	C
0.268	C	0.270	C	0.276	C	0.283	C	0.286	C	0.294	C	0.296	C
0.300	C	0.322	C	0.323	C	0.328	C	0.333	C	0.342	C	0.352	C
0.364	C	0.371	C	0.375	C	0.375	C	0.380	C	0.383	C	0.384	C
0.387	C	0.390	C	0.394	C	0.400	C	0.405	C	0.422	C	0.426	C
0.426	C	0.436	C	0.441	C	0.444	C	0.449	C	0.452	C	0.470	C
0.470	C	0.474	C	0.475	C	0.480	C	0.488	C	0.489	C	0.491	C
0.491	C	0.491	C	0.494	C	0.503	C	0.510	C	0.514	C	0.515	C
0.515		0.533		0.545		0.557		0.567		0.588		0.593	
0.603		0.604		0.608		0.616		0.630		0.647		0.653	
0.683		0.685		0.688		0.701		0.704		0.705		0.736	
0.749		0.782		0.801		0.823		0.833		0.839		0.880	
0.892		0.921		0.970		0.989		1.006		1.096	R	1.157	R
1.183	R	1.263	R										

Actual Mean = 0.534 Actual Standard Deviation = 0.236

Edited Mean = 0.703 Edited Standard Deviation = 0.159

Sample Depth : 3220.0

0.476	C	0.510	C	0.522	C	0.527	C	0.527	C	0.529	C	0.534	C
0.536	C	0.557	C	0.563	C	0.571	C	0.579	C	0.604		0.613	
0.622		0.630		0.649	R	0.670		0.672		0.726		0.758	
0.778		0.801		0.804	P	0.806		0.837		0.956		0.980	
1.010	R	1.060	R	1.085	R	1.111	R	1.116	R	1.165	R	1.277	R
1.498	R	1.507	R	1.689	R								

Actual Mean = 0.812 Actual Standard Deviation = 0.313

Edited Mean = 0.750 Edited Standard Deviation = 0.118

Sample Depth : 3430.0

0.521	C	0.565	C	0.600		0.650		0.661		0.691	P	0.704	
0.705		0.711		0.749		0.757		0.759	P	0.776		0.832	
0.923		0.977		1.033	R	1.039	R	1.051	R	1.054	R	1.264	R
1.382	R												

Actual Mean = 0.837 Actual Standard Deviation = 0.225

Edited Mean = 0.750 Edited Standard Deviation = 0.102

Sample Depth : 3610.0

0.335 C 0.412 C 0.438 C 0.501 C 0.551 0.954

Actual Mean = 0.532 Actual Standard Deviation = 0.220

Edited Mean = 0.753 Edited Standard Deviation = 0.285

Sample Depth : 3780.0

0.141	C	0.164	C	0.205	C	0.210	C	0.261	C	0.262	C	0.284	C
0.313	C	0.338	C	0.342	C	0.356	C	0.365	C	0.375	C	0.389	C
0.393	C	0.398	C	0.417	C	0.455	C	0.471	C	0.471	C	0.518	P
0.535	P	0.579	P	0.611	P	0.673	P						

Actual Mean = 0.381 Actual Standard Deviation = 0.138

Edited Mean = 0.583 Edited Standard Deviation = 0.062

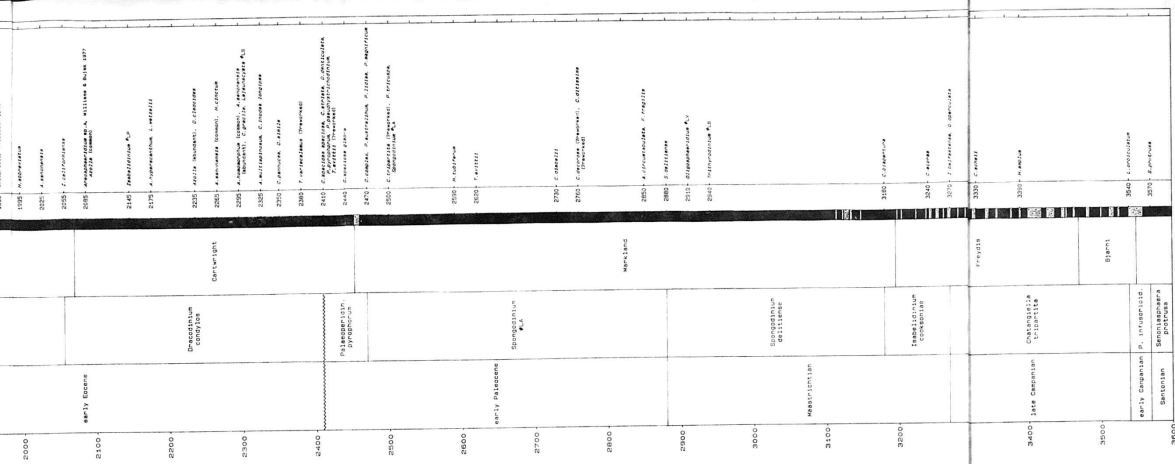
Sample Depth : 3998.0

0.214	C	0.304	C	0.307	C	0.308	C	0.321	C	0.325	C	0.352	C
0.364	C	0.365	C	0.376	C	0.384	C	0.388	C	0.389	C	0.392	C
0.392	C	0.399	C	0.401	C	0.406	C	0.419	C	0.427	C	0.433	C
0.443	C	0.444	C	0.450	C	0.453	C	0.464	C	0.466	C	0.481	C
0.483	C	0.494	C	0.501	C	0.511	C	0.525	P	0.535	P	0.540	P
0.554	P	0.558		0.559	P	0.560	P	0.565	P	0.577	P	0.581	
0.591	P	0.594	P	0.602	P	0.607	P	0.608		0.613		0.613	
0.623		0.624		0.625	P	0.629		0.630		0.637		0.644	
0.645		0.646	P	0.655	P	0.655	P	0.657	P	0.658		0.670	P
0.687	P	0.697		0.701		0.707		0.707		0.710		0.728	P
0.738		0.748	P	0.755	P	0.771		0.774	P	0.777		0.802	
0.804	P	0.907	R	0.956	R	0.961	R	0.984	R	1.005	R	1.023	R
1.053	R	1.056		1.058	R	1.078	R	1.090	R	1.111	R	1.168	R
1.169	R	1.226	R	1.228	R	1.240	R	1.297	R	1.642	R	1.716	R
1.848	R	1.940	R										

Actual Mean = 0.695 Actual Standard Deviation = 0.334

Edited Mean = 0.650 Edited Standard Deviation = 0.075

DEPTH (m)	AGE	THERMAL ALTERATION INDEX					R ₁	R ₂	R ₃	R ₄	R ₅
		1+	2-	2	2+3	3					
500											
600	early to middle Miocene (P)			*							
700				*							
800											
900	late Oligocene (P)			*							
1000											
1100	early Oligocene (P)										
1200											
1300	late Eocene (P)			*							
1400				*							
1500											
1600	middle to late Eocene (P)			*							
1700											
1800	middle Eocene (M)			*							
1900											
2000	early Eocene (M, P)			*							
2100				*							
2200											
2300	late Paleocene (M)			*							
2400											
2500											
2600	early Paleocene (M)			*							
2700				*							
2800											
2900											
3000											
3100	Maastrichtian (P)			*							
3200				*							
3300											
3400	late Campanian (P)			*							
3500				*							
3600	early Campanian (P)										
3600	Santonian (P)										



early Eocene

Dredosinium concylos

Centuright

Paleodinium pyrochrous

early Paleocene

Spongodinium #A

Markland

Spongodinium delitense

Neotrichtian

Isabellidium cooksoniae

late Caspian

Chatangiella bipartita

early Caspian

P. infusoides

Santonian

Senoniaschaera protrusa

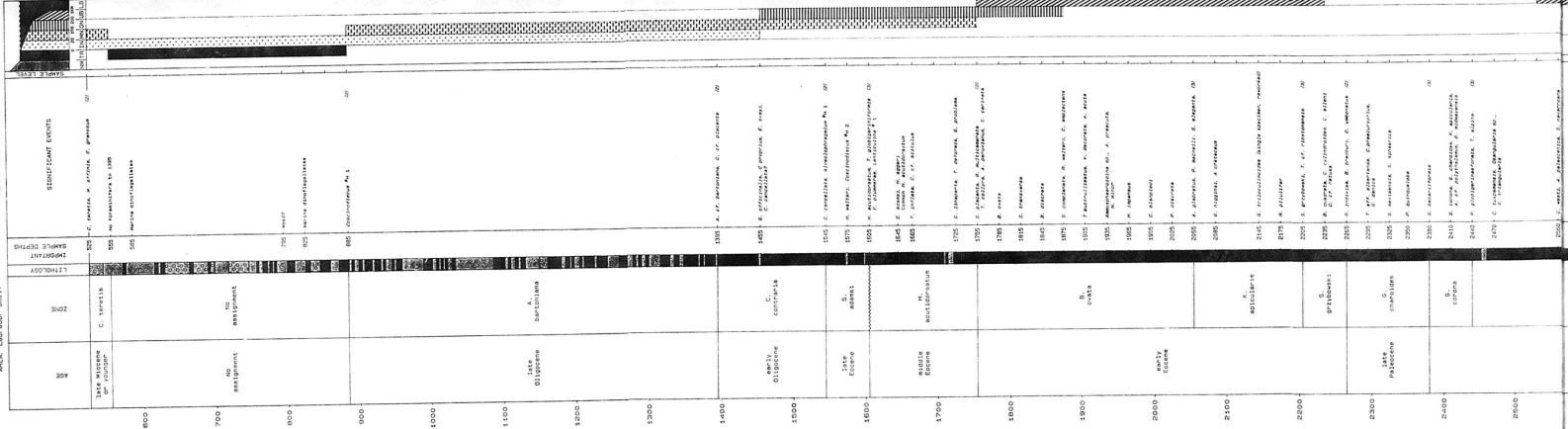
3600

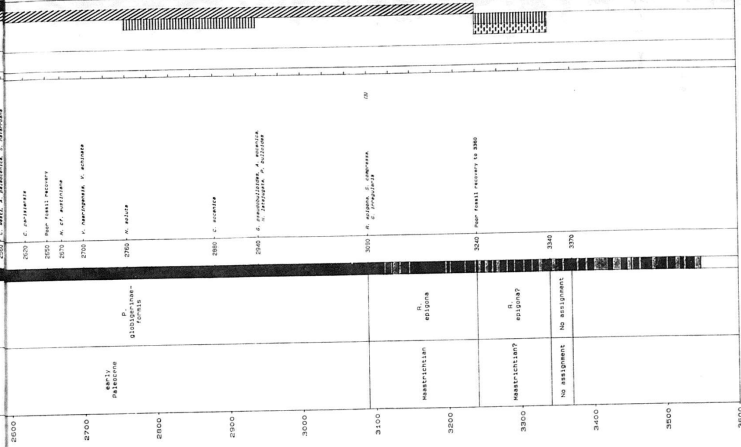
MICROPALAEONTOLOGICAL ANALYSIS CHART

BUJAK DAVIES GROUP

CLIENT: G.S.C.
WELL: Gilbert F-53
AREA: Labrador Shelf

SCIENTIST: Bujak Davies Group
DATE: April 1987
SCALE: 1 cm = 25 metres





2600

2700

2800

2900

3000

3100

3200

3300

3400

3500

3600

early
Paleocene

P.
glaucopterinae-
formis

R.
epigona

R.
epigona?

Maastrichtian?

No assignment

2620 C. arvensis

2650 Pteropoda

2670 V. acinosa

2700 V. acinosa

2760 V. acinosa

2880 C. sicaria

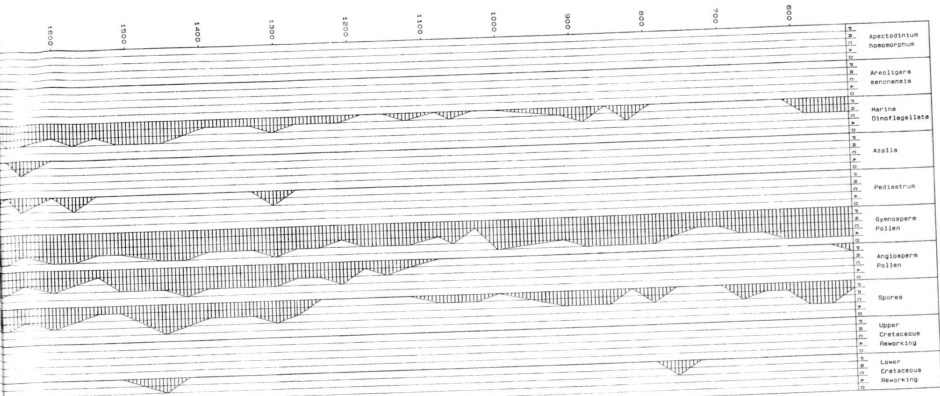
2940 S. carolinensis, P. palustris, S. carolinensis

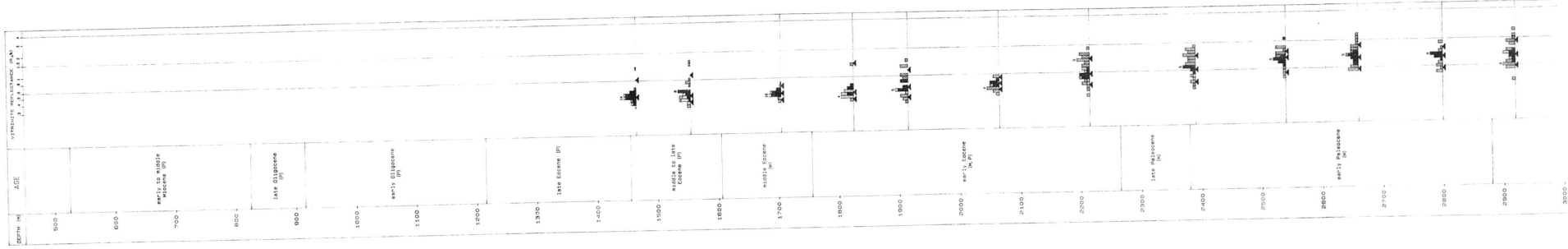
3080 R. epigona, S. carolinensis, P. palustris

3240 Pteropoda recovery to 3380

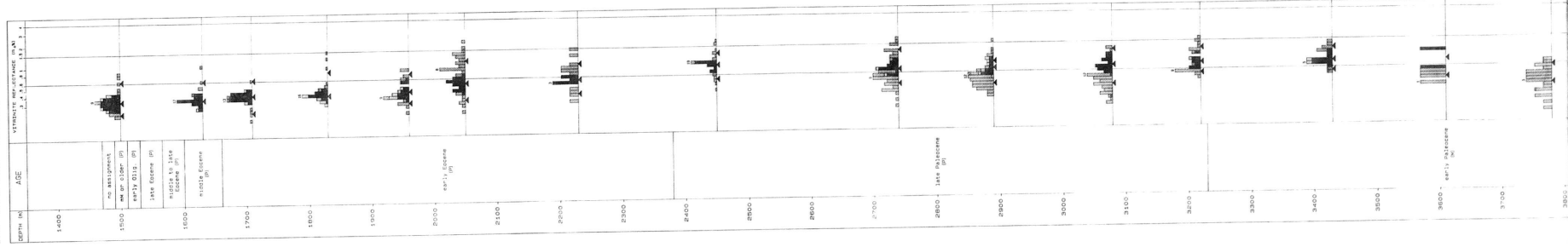
3340

3370





BUJAK DAVIES GROUP VITRINITE G10a G-37



3000

3900

4000

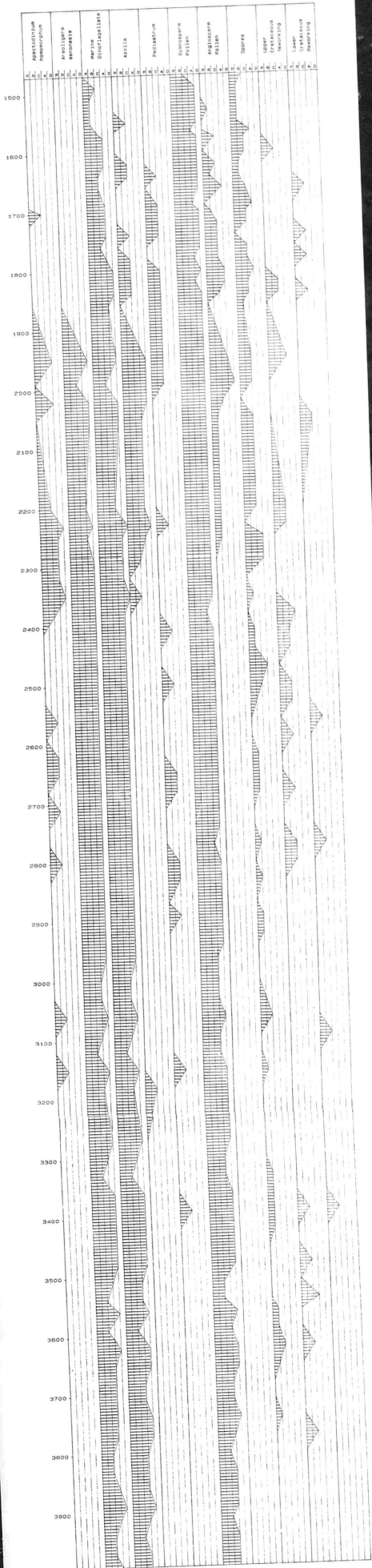


Count

Count In Bins

0 1 2 3 4 5 6 7 8 9

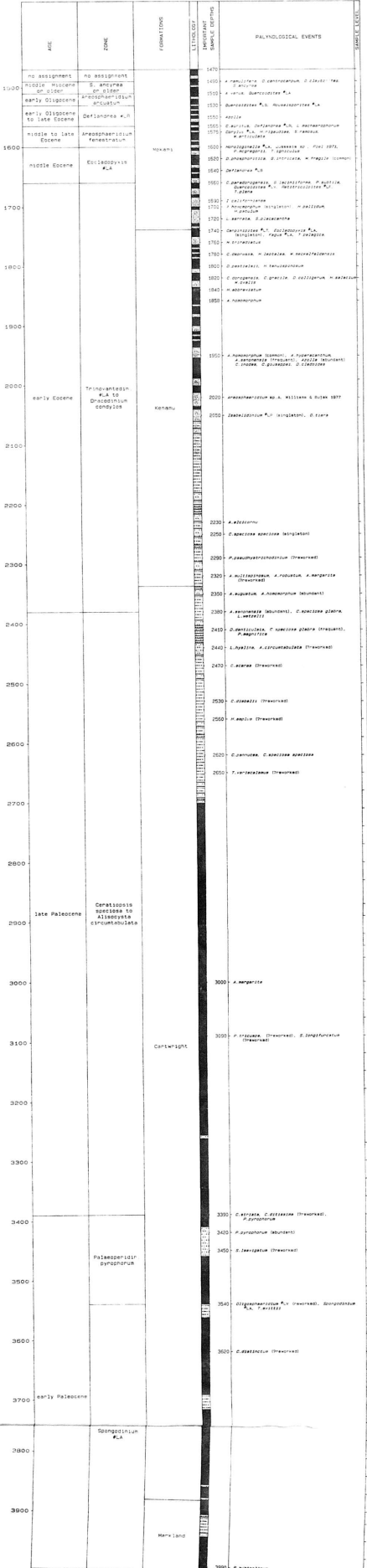
Normalized



PALYNOLOGICAL ANALYSIS CHART
BUJAK DAVIES GROUP

CLIENT: G.S.C.
WELL: Gjoa G-37
AREA: Baffin Shelf

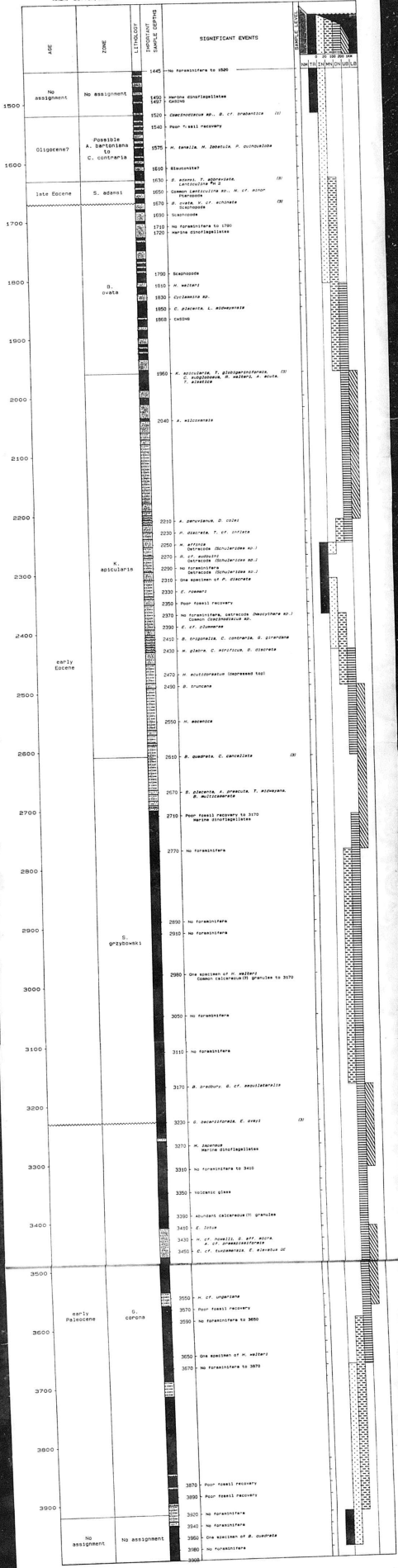
SCIENTIST: Bujak Davies Group
DATE: April 1987
SCALE: 1 cm = 25 metres



MICROPALAEONTOLOGICAL ANALYSIS CHART
BUJAK DAVIES GROUP

CLIENT: G.S.C.
WELL: Gjoa G-37
AREA: Baffin Shelf

SCIENTIST: Bujak Davies Group
DATE: April 1987
SCALE: 1 cm = 25 metres



DEPTH (m)	AGE	THERMAL ALTERATION INDEX					RMTGAPBCI							
		1+	2-	2	2+3-	3	3+4-	4	5	1	2	3	4	5
1400														
1500	no assignment ms or older (P) early Olig. (P) late Eocene (P)			•										
1600	middle to late Eocene (P) middle Eocene (P)			•										
1700				•										
1800				•										
1900				•										
2000	early Eocene (P)			•										
2100				•										
2200				•										
2300				•										
2400				•										
2500				•										
2600				•										
2700				•										
2800	late Paleocene (P)			•										
2900				•										
3000				•										
3100				•										
3200				•										
3300				•										
3400				•										
3500				•										
3600	early Paleocene (M)			•										
3700				•										
3800				•										
3900				•										
4000				•										