Division of Geological & Geophysical Surveys

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BIOSTRATIGRAPHY REPORT
129 OUTCROP SAMPLES WESTERN DELONG MOUNTAINS (TINGMERKPUK)
NORTH SLOPE, ALASKA

by
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BIOSTRATIGRAPHY REPORT
129 OUTCROP SAMPLES
WESTERN DELONG MOUNTAINS (TINGMERKPUK)
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This report contains analytical data on the micropaleontology of 129 shale samples from the foothills of the northwestern DeLong Mountains of the western Brooks Range, collected as part of a regional study of the hydrocarbon potential of the northwestern Arctic Slope.

This study is one of a series in a project investigating the geology of the western Brooks Range and Arctic Slope of northern Alaska. The objective of the project is to expand the data base for evaluation of potential hydrocarbon exploration objectives of the future on the western part of the Colville basin, including the western part of the National Petroleum Reserve, Alaska (NPRA). The project includes geologic mapping and acquisition of data concerning the stratigraphy, paleontology, organic geochemistry, and tectonic evolution of the foothills of the western DeLong Mountains. Field operations and analytical studies were partially funded by grants from Anadarko Petroleum Corporation, ARCO Alaska, Inc, Arctic Slope Regional Corporation, BP Exploration Inc., North Slope Borough, Phillips Petroleum Company, the U.S. Geological Survey, and Alfred James III.

Additional DGGS reports in this series include:

Crowder, R. K., Adams, K.E., and Mull, C.G., 1994, Measured stratigraphic section of the Tingmerkpuk Sandstone (Neocomian), western Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Public-data file report 94-29, 5 p, 1 sheet..

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Dow, W.G. (DGSI, Inc), 2000, Geochemical analysis of twenty-eight outcrop samples, western Brooks Range, Alaska, 1/3/97: Alaska Division of Geological and Geophysical Surveys Raw data report 2000-3, 62 p.

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Additional background information concerning this project has been presented by:

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C.G. Mull
Project leader
June 2000

January 25, 1999

MICROPALEO CONSULTANTS, INC.

TO: Gil Mull
State of Alaska, Department of Natural Resources
Division of Geological and Geophysical Surveys
794 University Avenue, Suite 200
Fairbanks, Alaska 99709-3645

SUBJECT: Biostratigraphy Report - Western Delong Mountains (Tingmerkpuk) Outcrop Samples from North Slope, Alaska.
Job No. 98-121, January 25, 1999

INTRODUCTORY SUMMARY

A total of 129 outcrop samples from the Western Delong Mountains (Tingmerkpuk) were submitted for biostratigraphic analysis. Ninety-six (96) samples were submitted for analysis of both Foraminifera and palynomorphs. Thirty-three (33) additional samples were submitted for palynomorph analysis only. In general, recoveries were pretty good, but not as good as year before last.

The rock material was crushed prior to processing for microfossil extraction.

The foraminiferal preparation was made with standard procedures. This process involved boiling the material in Quaternary-O and washing over 20 and 200 mesh screens. A representative fauna and washed lithology were then picked into slides for examination.

The palynology preparation was made using hydrochloric and hydrofluoric acid treatments. The resultant organic residues were further concentrated by a heavy liquid separation, sonification and a sieving/panning technique. Permanent slide mounts were made for each sample.

The interpretations for the age, zone and environment of deposition are given for each discipline. A list of the recovered microfossils is provided for each sample. The foraminiferal analysis also includes a washed lithology description.

The palynological analysis also includes the visual estimate of the thermal alteration index (T.A.I.). The relationship of organic alteration parameters to hydrocarbon generation is shown in Figure 1.

The T.A.I. estimations are usually tentative when examining surface sample material. Past studies (Haga, H., unpublished report) have shown that weathered samples taken near the ground surface can contain significantly different organic constituent percentages when compared to unweathered samples taken from the same stratigraphic unit. The weathering can also alter palynomorph coloration through chemical processes. Often the chemical alteration will darken sporomorph walls.

Having stated the above caveats, it appears that most of the T.A.I. values seen in these samples are within the mature range for hydrocarbon generation.

A listing of integrated ages is presented below for the reader's convenience in Table 1.

The foraminiferal abundances represent the following quantities: X = very rare (single specimen), R = rare (2 - 5 specimens), F = frequent (6 - 25 specimens), C = common (26 - 100) specimens), A = abundant (101 - 999 specimens) and P = prolific (1000+ specimens).

The reported palynomorph abundances represent the following quantities: V = very rare (single specimen), R = rare (2 - 5 specimens), F = frequent (6 - 15 specimens), C = common (16 - 30 specimens) and A = abundant (greater than 30 specimens). An asterisk (*****) denotes reworked forms.

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TABLE 1. 1998 TINGMERKPUK FORAM AND PALY PALEO SUMMARY

	SAMPLE #	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.
	KUKPOWRUK REDWUL MEASURED SECTION					
	SEGMENT 1, TOP OF BLUFF					
1	98 Mu 11	Pebble Shale/HRZ	Probable Barremian	Probable Barremian	Cretaceous (Poss. Early)	2.3-2.7
2	98 Mu 11-1	Pebble Shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem - Aptian	2.3-2.7
3	98 Mu 11-2	Pebble Shale/HRZ	Probable Barremian	Probable Barremian	Prob. E Cret (Undiff.)	2.3-2.7
4	98 Mu 11-3	Pebble Shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem - Aptian	2.3-2.7
5	98 Mu 11-4	Pebble Shale/HRZ	Probable Hauterivian	Hauter - Barrem	Probable Hauterivian	2.3-2.6
6	98 Mu 11-5	Pebble Shale/HRZ	Probable Hauterivian	Hauter - Barrem	Probable Hauterivian	3.0
7	98 Mu 11-6	Pebble Shale/HRZ ?	Hauterivian	Prob. Hauterivian	Hauterivian	2.5-2.6
8	98 Mu 11-7	Kingak Shale	Oxfordian or Hauterivian?	Oxfordian	Possible Hauterivian	2.5?-3.0?
9	98 Mu 11-8	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.5-3.0
10	98 Mu 11-9	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
	SEGMENT 2, OFFSET TO EAST IN SMALL GULLY					
11	98 Mu 11-10	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	3.0
12	98 Mu 11-11	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	3.0
13	98 Mu 11-12	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	3.0
14	98 Mu 11-13	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	3.0
	SEGMENT 3, OFFSET TO EAST ON SLOPE FACE					
15	98 Mu 11-14	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
16	98 Mu 11-15	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
17	98 Mu 11-16	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
18	98 Mu 11-17	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
19	98 Mu 11-18	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.7-3.0
20	98 Mu 11-19	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
21	98 Mu 11-19A	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
	SEGMENT 4, OFFSET TO WEST IN BOTTOM OF GULLY					
22	98 MU 11-20	Kingak Shale	Oxfordian	Indeterminate	Oxfordian	2.5-3.0
23	98 Mu 11-21	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
24	98 Mu 11-21A	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0

TABLE 1. 1998 TINGMERKPUK FORAM AND PALY PALEO SUMMARY

	SAMPLE #	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.
25	98 Mu 11-22	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.7-3.0
26	98 Mu 11-23	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.7-3.0
27	98 Mu 11-24	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
28	98 Mu 11-25	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
29	98 Mu 11-26	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0
30	98 Mu 11-27	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-2.7
	HORSESHOE BEND MEASURED SECTION					
31	98 Mu 19-11	Pebble Shale	Indeterminate	Indeterminate	Indeterminate	2.3
	SEGMENT 2, measured 100 m up gully					
32	98 Mu 19-10	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.3-2.5
33	98 Mu 19-9	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.3-2.5
34	98 Mu 19-8	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.5-3.0
35	98 Mu 19-7	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.5
	SEGMENT 1, measured at mouth of gully off Ipewik River					
36	98 Mu 19-6	Kingak Shale	Oxfordian	Oxfordian	Indeterminate	3.0
37	98 Mu 19-5	Kingak Shale	Probable Oxfordian	Probable Oxfordian	Norian? (Poss. reworked)	2.5-3.0
38	98 Mu 19-4	Kingak Shale	Probable E - M Jurassic	Probable E - M Jurassic	Poss. E - M Jur w/rewrk Norian	2.5-3.0
39	98 Mu 19-3	Kingak Shale	Probable E - M Jurassic	Probable E - M Jurassic	Poss. E - M Jur w/rewrk Norian	2.5-3.0
40	98 Mu 19-2	Kingak Shale	Probable E - M Jurassic	Probable E - M Jurassic	Probable E - M Jurassic	2.5-3.0
41	98 Mu 19-1	Kingak Shale	E - M Jurassic	Probable E - M Jurassic	E - M Jurassic	2.5-3.0
42	98 Mu 19		Probable E - M Jurassic	Probable E - M Jurassic	Probable E - M Jurassic	2.5-3.0
	IPEWIK TRIBUTARY MEASURED SECTION					
43	98 Mu 33-7	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Barrem-Aptian	2.3-2.5
44	98 Mu 33-6	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5
45	98 Mu 33-5	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5
46	98 Mu 33-4	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5
47	98 Mu 33-3	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5
48	98 Mu 33-2	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5
49	98 Mu 33-1	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5

TABLE 1. 1998 TINGMERKPUK FORAM AND PALY PALEO SUMMARY

	SAMPLE #	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.
	TOP OF TIMGMERKPUK MOUNTAIN MEASURED SECTION					
50	98 DL 120-27	Tingmerkpuk	Possible Aptian (w/rewrk Valanginian)	Possible Aptian	Valanginian	2.5
51	98 DL 120-25	Tingmerkpuk	Possible Aptian (w/rewrk Valanginian)	Possible Aptian	Valanginian	2.5
	SURPRISE CREEK MEASURED SECTION					
52	98 RK1-91	Kingak	Possible Aptian-Albian	Indeterminate	Possible Aptian-Albian	2.5
53	98 RK1-84	Kingak	Oxfordian-Albian?	Oxfordian-Barrem	Possible Aptian-Albian	2.5
54	98 RK1-78	Kingak	Oxfordian-Albian?	Oxfordian-Barrem	Possible Aptian-Albian	2.3-2.5
55	98 RK1-65	Kingak	Oxfordian-Albian?	Oxfordian-Barrem	Possible Aptian-Albian	2.5-2.7
56	98 RK1-57	Kingak	Possible Oxfordian-Albian	Possible Oxfordian	Possible Aptian-Albian	2.5-3.0
57	98 RK1-43	Kingak	Oxfordian-Albian?	Oxfordian	Possible Aptian-Albian	2.5-3.0
	SOUTH TINGMERKPUK MEASURED SECTION					
58	98 JC 302-1	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5
59	98 JC 302-2	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5
60	98 JC 302-3	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5
61	98 JC 302-4	Kingak	Valanginian	Valanginian	Valanginian	3.0
62	98 JC 302-5	Kingak	Valanginian	Valanginian	Valanginian	3.0
63	98 JC 302-6	Kingak	Valanginian	Valanginian	Valanginian	3.0
64	98 JC 302-7	Kingak	Probable Valanginian	Probable Valanginian	Probable Valanginian	3.0-3.5
65	98 JC 302-8	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5
66	98 JC 302-9	Kingak	Valanginian	Valanginian	Probable Valanginian	3.0-3.2
67	98 JC 302-10	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5
68	98 JC 302-11	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5
69	98 JC 302-12	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5
	MISCELLANEOUS GRAB SAMPLES					
70	98 Mu 7-1	KJk	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5
71	98 Mu 7-3	KJK	Oxf-Kimm	Indeterminate	Oxf-Kimm	2.3-2.5
72	98 Mu 8	KJk	Valang-Haut	Valang-Haut	Prob. E Cret (Undiff.)	2.5-3.0
73	98 Mu 8-1	KJk	Probable Oxfordian	Probable Oxfordian	Indeterminate	2.5?

TABLE 1. 1998 TINGMERKPUK FORAM AND PALY PALEO SUMMARY

	SAMPLE #	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.
74	98Mu 8-2	KJk	Probable Oxfordian	Probable Oxfordian	Possible Oxf-Kimm	3.0
75	98Mu 8-3	KJk	Possible Valanginian	Late Jurassic-E. Cret (Undiff.)	Possible Valanginian	3.0
76	98Mu 8-4	KJk	Probable Oxfordian	Probable Oxfordian	Oxf-Kimm	3.0
77	98 Mu 8-5	KJk	Probable Oxfordian	Probable Oxfordian	Oxf-Kimm	2.8-3.0
78	98 Mu 9	KJk	Valang-Hauter	Valang-Hauter	Neocomian	3.0-3.5
79	98Mu 9-1	KJk	Oxf-Barrem	Oxf-Barrem	Indeterminate	3.0+
80	98 Mu 12	Pebble Shale	Possible Hauterivian	Oxf-Barrem	Early Cretaceous (Hauterivian?)	2.3-2.5
81	98 Mu 14-1	Upper Kingak?	Indeterminate	Indeterminate	Indeterminate	3.0
82	98 Mu 24	Kingak	Probable Hauter-Barrem	Possible Hauter-Aptian	Neocomian	2.5-3.0
83	98 Mu 24-1	Kingak	Possible Hauter-Barrem	Possible Hauter-Barrem	Probable Neocomian	2.5
84	98 Mu 34	Lower Brookian	Possible Hauter-Barrem	Possible Hauter-Barrem	Cretaceous (undiff)	2.3-2.5
85	98 Mu 38	Lower Brookian ?	Probable Barrem-Aptian	Indeterminate	Probable Barrem-Aptian	3.0+
86	98 Mu 39	Lower Brookian ?	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.5-3.0
87	98 Mu 39-1	Pebble Shale ?	Indeterminate	Indeterminate	Indeterminate	3.0-3.5
88	98 Ha126	Kk	Probable Oxf-Kimm	Probable Oxf-Kimm	Indeterminate	3.5?
89	98 Ha129	JKk	Probable Oxf-Kimm	Probable Oxf-Kimm	Indeterminate	3.5
90	98 RR 185B	Torok	Probable Aptian	Possible Barrem-Aptian	Probable Aptian-Albian	2.5+
91	98 RR 186B	Torok	Probable Aptian-Albian	Indeterminate	Probable Aptian-Albian	2.5+
92	98 RR 197C	Torok	Indeterminate	Indeterminate	Indeterminate	2.5?
93	98 RR 240B	Torok	Possible Barrem-Aptian	Possible Barrem-Aptian	Indeterminate	3.0-3.5
94	98 RR 250	Torok	Possible Barrem-Aptian	Possible Barrem-Aptian	Indeterminate	3.0-3.5
95	98 RR 251A	Torok	Possible Barrem-Aptian	Possible Barrem-Aptian	Indeterminate	2.5-3.0
96	98 DL 137-4	Shale Wall	Probable Cenomanian	Probable Cenomanian	Late Cretaceous (undiff)	2.3-2.5

TABLE 2. 1998 TINGMERKPUK PALY PALEO SUMMARY

	SAMPLE #	FIELD FORMATION	PALY AGE	TAI
	MT KELLY GRAYWACKE MEASURED SECTION			
97	98 JC 300-21	Kmk	Indeterminate	2.5+
98	98 JC 300-13	Kmk	Late Jurassic-Early Cretaceous	2.5-3.0+
99	98 JC 300-3	Kmk	Probable Jur-Cretaceous	2.5-3.0
	CASTLE SYNCLINE MEASURED SECTION			
100	98 JC 301-13	Kfm/Kmk	Cretaceous (undiff)	2.3
101	98 JC 301-11	Kfm/Kmk	Probable Aptian-Albian	2.3-2.5+
102	98 JC 301-9	Kfm/Kmk	Aptian-Albian	2.3-2.5
103	98 JC 301-4	Kfm/Kmk	Probable Aptian-Albian	2.3-2.5
104	98 JC 301-3	Kfm/Kmk	Probable Aptian-Albian	2.3-2.5
	MISCELLANEOUS GRAB SAMPLES			
105	98 Mu 3	Torok Sh	Aptian-Albian	2.3-2.5
106	98 Mu 4	Torok Sh	Aptian-Albian	2.3-2.5
107	98 Mu 4-1	Torok Sh	Probable Aptian-Albian	2.3-2.5
108	98 Mu 10	Torok Sh	Indeterminate	2.5?
109	98 Mu 17	Basal Brookian	Cretaceous (undiff)	2.5?-3.5
110	98 Mu 21	Lower Brookian	Cretaceous (undiff)	3.0-3.5
111	98 Mu 29	Lower Brookian	Probable Aptian-Albian	2.3-2.5
112	98Ha106	Klb	Possible Aptian-Albian	2.5
113	98Ha145	Klb/Kmk	Possible Aptian-Albian	2.3-2.5
114	98Ha146	Klb	Probable Aptian-Albian	2.3-2.5
115	98 RR 103A	Nanushuk	Aptian-Albian	2.3-2.5
116	98 RR106B	Nanushuk	Probable Aptian-Albian	2.3-2.5
117	98 RR 139D	Nanushuk	Aptian-Albian	2.3-2.5
118	98 RR 182C	Nanushuk	Aptian-Albian	2.3-2.5
119	98 RR204C	Nanushuk	Indeterminate	2.5?

TABLE 2. 1998 TINGMERKPUK PALY PALEO SUMMARY

	SAMPLE #	FORMATION	PALY AGE	TAI
120	98 RR 253C	Nanushuk	Probable Aptian-Albian	2.3-2.5
121	98 RR 265A	Nanushuk	Cretaceous (undiff)	2.3-2.5
122	98 RR 266B	Nanushuk	Probable Aptian-Albian	2.3-2.5
	UMIAT-CHANDLER RIVER REGION			
123	98 DL131-2	Schrader Bluff	Late Cretaceous Poss Campanian	2.3
124	98 DL131-23	Schrader Bluff	Late Cretaceous Prob Senonian	2.3
125	98 DL134-3	Ninuluk	Poss E Cretaceous (undiff)	2.3-2.5
126	98 DL137-1	Shale Wall	Cretaceous (undiff)	2.3-2.5
127	98 DL137-7	Shale Wall	Late Cretaceous Prob Senonian	2.3
128	98 DL141-1	Torok Shale	Aptian-Albian	2.3-2.5
129	98 DL143-	Torok Shale	Aptian-Albian	2.3-2.5

FORAMINIFERA AND PALYNOMORPHS RESULTS
(96 Samples)

01) 98 MU 11

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Marine (Undiff.)
Fauna.	*Ammodiscus* sp. (X) Fish debris (R) Paper shale (F) Rounded frosted quartz floaters (C)
Washed Lithology.	Dark gray to black slightly sandy slightly paper shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Cretaceous (possibly Early Cretaceous) Undifferentiated
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (R) *Cribroperidinium edwardsi* (F) *Cyclonephelium distinctum* (F) ?*Gardodinium deflandrei* (frag) (V) ?*Odontochitina operculata* (frag) (R) *Oligosphaeridium complex* (R) *Pterospermopsis* sp. (R)
Remarks.	Recovery consists mainly of dinocysts and amorphous organics. All poorly preserved.
T.A.I.	2.3 - 2.7

02) 98 MU 11-1

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Probable Marine (Undiff.)

Fauna.	Barren of Foraminifera. Fish debris (R) Paper shale (R) Rounded frosted quartz floaters (F)
Washed Lithology.	Dark gray to black slightly sandy shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Barremian to Aptian
Zone.	Probable P-M18a
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (R) *Cicatricosisporites* sp. (V) ?*Classopollis classoides* (V) *Klukisporites sp.* (V) *Cribroperidinium edwardsi* (V) *Cyclonephelium distinctum* (F) ?*Gardodinium deflandrei* (frag) (R) *Odontochitina operculata* (F) *Oligosphaeridium complex* (A) *Spiniferites ramosus* (R)
Remarks.	Recovery consists mainly of dinocysts and amorphous organics. All poorly preserved.
T.A.I.	2.3 - 2.7

03) 98 MU 11-2

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Probable Marine (Undiff.)
Fauna.	Barren of Foraminifera. Paper shale (R) Rounded frosted quartz floaters (F)
Washed Lithology.	Dark gray to black slightly sandy shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Undifferentiated
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (R) ?*Gleicheniidites senonicus* (V) ?*Gardodinium deflandrei* (V) *Odontochitina operculata* (R) *Pterospermopsis* sp. (V) *Spiniferites ramosus* (R)
Remarks.	Recovery consists mainly of amorphous organics, some dinocysts. All poorly preserved.
T.A.I.	2.3 - 2.7

04) 98 MU 11-3

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Probable Marine (Undiff.)
Fauna.	Barren of Foraminifera. Fish debris (R) Paper shale (F) Rounded frosted quartz floaters (F)
Washed Lithology.	Dark gray to black slightly sandy slightly paper shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Barremian to Aptian
Zone.	Probable P-M18a
Environment.	Marine
Palynomorphs.	*Cyclonephelium distinctum* (C) ?*Gardodinium deflandrei* (frag) (V) *Odontochitina operculata* (R) *Oligosphaeridium complex* (F) *Pseudoceratium polymorphum* (V) ?*Senoniasphaera microreticulata* (V)

Remarks. Recovery consists mainly of dinocysts and amorphous organics. All very poorly preserved.

T.A.I. 2.3 - 2.7

05) 98 MU 11-4

FORAMINIFERA

Age. Early Cretaceous
Hauterivian to Barremian

Zones. F-12 to F-13a

Environment. Probable Marine (Undiff.)

Fauna. Barren of Foraminifera.
Paper shale (R)
Rounded frosted quartz floaters (F)

Washed Lithology. Dark gray to black slightly sandy paper shale.

Discussion. Age based on lithology only.

PALYNOLOGY

Age. Early Cretaceous
Probable Hauterivian

Zone. Probable P-M19

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Cicatricosisporites australiensis (V)
Taeniaesporites sp. (V) *****
Cribroperidinium edwardsi (R)
Cyclonephelium distinctum (A)
Fromea amphora (V)
Gardodinium deflandrei (R)
Imbatodinium jaegeri (V)
Odontochitina operculata (R)
Oligosphaeridium complex (F)
Oligosphaeridium complex (thick-wall) (F)
Pterospermopsis sp. (R)

Remarks. Recovery consists mainly of dinocysts and amorphous organics. Some increase in coaly fragments. All poorly preserved.

T.A.I. 2.3 - 2.6

06) 98 MU 11-5

FORAMINIFERA

Age.	Early Cretaceous Hauterivian to Barremian
Zones.	F-12 to F-13a
Environment.	Probable Marine (Undiff.)
Fauna.	Barren of Foraminifera. Rounded frosted quartz floaters (F)
Washed Lithology.	Dark brownish-gray slightly sandy sideritic? shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Early Cretaceous Probable Hauterivian
Zone.	Probable P-M19
Environment.	Marine
Palynomorphs.	*Oligosphaeridium complex* (R) *Oligosphaeridium complex* (thick-wall) (A) ?*Sentusidinium rioultii* (R)
Remarks.	Organic recovery consists mainly of dinocysts.
T.A.I.	3.0

07) 98 MU 11-6

FORAMINIFERA

Age.	Early Cretaceous Probable Hauterivian
Zone.	Probable F-13a
Environment.	Marine (Undiff.)
Fauna.	arenaceous spp. (large-coarse) (R) *Haplophragmoides duoflatis* (X) Paper shale (F) Rounded frosted quartz floaters (C)
Washed Lithology.	Dark gray to black sandy shale.

PALYNOLOGY

Age.	Early Cretaceous

	Hauterivian
Zone.	P-M19
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Cleistosphaeridium* sp. (R) *Cyclonephelium cuculliforme* (A) *Herendeenia alaskaensis* (R) *Herendeenia alaskaensis* var. F (C) *Sentusidinium rioultii* (F) *Nannoceratopsis pellucida* (V) ***** *Tubotuberella uncinatum* (A)
Remarks.	Recovery consists mainly of dinocysts. A single Oxfordian dinocyst specimen was recovered in the abundant Hauterivian assemblage.
T.A.I.	2.5 - 2.6

08) 98 MU 11-7

FORAMINIFERA

Age.	Late Jurassic Oxfordian
Zone.	F-16b
Environment.	Outer Neritic to Middle Bathyal (Outer Shelf to Middle Slope)
Fauna.	*Ammobaculites alaskensis* (X) *Bathysiphon anomalocoelia* (F) *Glomospira pattoni* (A) *Glomospirella arctica* (C) Rounded frosted quartz floaters (A)
Washed Lithology.	Dark brownish-gray sandy shale.

PALYNOLOGY

Age.	Probable Early Cretaceous Possible Hauterivian
Zone.	P-M19?
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (F) ?*Callialasporites trilobatus* (V) ?*Gleicheniidites senonicus* (V) *Cleistosphaeridium* sp. (R)

Cyclonephelium distinctum (R)
Gardodinium trabeculosum (V)
Odontochitina operculata (V)
Oligosphaeridium complex (V)
Rigaudella aemula (V) *****
Sirmiodinium grossi (R) *****
Pterospermopsis sp. (V)

Remarks. Relatively small recovery consists mainly of highly corroded amorphous organics.

Some reworked, possibly Oxfordian, dinocysts were recorded.

T.A.I. 2.5? - 3.0?

09) 98 MU 11-8

FORAMINIFERA

Age. Late Jurassic
Oxfordian

Zone. F-16b

Environment. Inner to Middle Neritic
(Inner to Middle Shelf)

Fauna. *Ammodiscus orbis* (X)
Haplophragmoides spp. (R)
Pyrite (R)
Rounded frosted quartz floaters (R)

Washed Lithology. Dark brownish-gray iron-stained shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Densosporites spp. (R) *****
?*Chytroeisphaeridia pericompsa* (R)
?*Endoscrinium galeritum* (R)
Leiofusa sp. (F)
?*Meiourogonyaulax* sp. (R)
Sirmiodinium grossi (R)
Ternia cf. *T. balmei* (C)

Remarks. Organic recovery consists mainly of highly corroded palynomorphs.

T.A.I. 2.5 - 3.0

10) 98 MU 11-9

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (F)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (F)
Deltoidospora spp. (R)
Densosporites spp. (R) *****
Exesipollenites tumulus (R)
Raistrickia sp. (V) *****
Vitreisporites pallidus (R)
Chytroeisphaeridia pericompsa (A)
Chytroeisphaeridia "granulosa" (R)
Gonyaulacysta cladophora (F)
Meiourogonyaulax stoveri (F)
Nannoceratopsis pellucida (A)
Sirmiodinium grossi (V)

Remarks. Organic recovery consists mainly of palynomorphs.

T.A.I. 2.5 - 3.0

11) 98 MU 11-10

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Bathysiphon anomalocoelia* (R) *Tasmanites* spp. (R)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian
Zone.	P-M22
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Classopollis classoides* (R) *Deltoidospora* spp. (R) *Densosporites* spp. (F) ***** *Exesipollenites tumulus* (R) *Taeniaesporites* sp. (V) ***** *Chytroeisphaeridia pericompsa* (F) *Gonyaulacysta cladophora* (V) *Meiourogonyaulax stoveri* (R) *Nannoceratopsis pellucida* (C) *Pareodinia ceratophora* (R) *Pareodinia osmingtonensis* (R) *Sirmiodinium grossi* (V) *Veryhachium* sp. (V)
Remarks.	Organic recovery consists mainly of palynomorphs. All poorly preserved.
T.A.I.	3.0

12) 98 MU 11-11

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Bathysiphon anomalocoelia* (R) *Glomospira pattoni* (X) *Tasmanites* spp. (R)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (R)
Densosporites spp. (F) *****
Vitreisporites pallidus (R)
Chytroeisphaeridia pericompsa (C)
Gonyaulacysta cladophora (R)
Nannoceratopsis pellucida (A)
Pareodinia ceratophora (F)
Pareodinia osmingtonensis (F)
Sirmiodinium grossi (F)
Pterospermopsis sp. (V)

Remarks. Organic recovery consists mainly of palynomorphs. All poorly preserved.

T.A.I. 3.0

13) 98 MU 11-12

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (R)
Gypsum (C)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)

Classopollis classoides (R)
Densosporites spp. (F) *****
Gleicheniidites senonicus (F)
Taeniaesporites sp. (R) *****
Vitreisporites pallidus (V)
Chytroeisphaeridia pericompsa (F)
Gonyaulacysta cladophora (R)
Micrhystridium spp. (R)
Nannoceratopsis pellucida (A)
Pareodinia ceratophora (R)
Sirmiodinium grossi (R)

Remarks. Organic recovery consists mainly of palynomorphs. All poorly preserved.

T.A.I. 3.0

14) 98 MU 11-13

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (C)
Trochamminoides sp. (small, thin) (R)
Gypsum (F)

Washed Lithology. Dark brownish-gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (R)
Densosporites spp. (F) *****
Exesipollenites tumulus (V)
Gleicheniidites senonicus (R)
Lycopodiumsporites sp. (V)
Chytroeisphaeridia pericompsa (A)

Gonyaulacysta cladophora (R)
Nannoceratopsis pellucida (A)
Pareodinia ceratophora (F)
Sirmiodinium grossi (R)

Remarks. Organic recovery consists mainly of palynomorphs. All poorly preserved.

T.A.I. 3.0

15) 98 MU 11-14

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (F)
Tasmanites spp. (R)
Trochamminoides sp. (small, thin) (X)

Washed Lithology. Dark brownish-gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (R)
Densosporites spp. (R) *****
Gleicheniidites senonicus (V)
Chytroeisphaeridia pericompsa (C)
Gonyaulacysta cladophora (R)
Micrhystridium sp. (R)
Nannoceratopsis pellucida (A)
Pareodinia ceratophora (R)
Sirmiodinium grossi (R)

Remarks. Organic recovery consists mainly of palynomorphs. All poorly preserved.

T.A.I. 2.5 - 3.0

16) 98 MU 11-15

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Bathysiphon anomalocoelia* (C) *Haplophragmoides* spp. (R) *Tasmanites* spp. (F) Gypsum (R)
Washed Lithology.	Dark brownish-gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian
Zone.	P-M22
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) *Densosporites* spp. (F) ***** *Exesipollenites tumulus* (V) *Lycospora* spp. (R) ***** *Chytroeisphaeridia pericompsa* (A) *Gonyaulacysta cladophora* (R) *Nannoceratopsis pellucida* (A) *Sirmiodinium grossi* (R)
Remarks.	Organic recovery consists mainly of palynomorphs. All poorly preserved.
T.A.I.	2.5 - 3.0

17) 98 MU 11-16

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Probable Bathyal

(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (C)
Haplophragmoides spp. (R)
Tasmanites spp. (F)
Gypsum (R)

Washed Lithology. Dark brownish-gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (C)
Deltoidospora spp. (R)
Exesipollenites tumulus (V)
Gleicheniidites senonicus (R)
Chytroeisphaeridia pericompsa (A)
Micrhystridium sp. (R)
Nannoceratopsis pellucida (A)
Pareodinia ceratophora (R)
Pareodinia osmingtonensis (V)
Sirmiodinium grossi (R)

Remarks. Organic recovery consists mainly of palynomorphs. All poorly preserved.

T.A.I. 2.5 - 3.0

18) 98 MU 11-17

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (C)
Tasmanites spp. (F)
Gypsum (F)

Washed Lithology. Dark brownish-gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian
Zone.	P-M22
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Classopollis classoides* (R) *Densosporites* spp. (F) ***** *Endosporites* sp. (V) ***** *Exesipollenites tumulus* (R) *Lycospora* spp. (R) ***** *Taeniaesporites* sp. (V) ***** *Chytroeisphaeridia pericompsa* (C) *Gonyaulacysta cladophora* (R) *Micrhystridium* sp. (R) *Nannoceratopsis pellucida* (C) *Scriniodinium crystallinum* (V) *Sirmiodinium grossi* (R)
Remarks.	Organic recovery consists mainly of palynomorphs. All poorly preserved.
T.A.I.	2.5 - 3.0

19) 98 MU 11-18

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Bathysiphon anomalocoelia* (R) *Tasmanites* spp. (R) Gypsum (F)
Washed Lithology.	Dark brownish-gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian
Zone.	P-M22
Environment.	Marine

Palynomorphs.	Undifferentiated bisaccates (A) *Densosporites* spp. (R) ***** *Gleicheniidites senonicus* (R) *Kraeuselisporites* sp. (V) ***** *Taeniaesporites* sp. (R) ***** *Chytroeisphaeridia pericompsa* (C) *Nannoceratopsis pellucida* (A) *Pareodinia ceratophora* (R) *Pareodinia osmingtonensis* (V) *Sirmiodinium grossi* (R) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists mainly of palynomorphs. All poorly preserved.
T.A.I.	2.7 - 3.0

20) 98 MU 11-19

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Bathysiphon anomalocoelia* (C) *Tasmanites* spp. (R) *Trochamminoides* sp. (small, thin) (X) Gypsum (F)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian
Zone.	P-M22
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Classopollis classoides* (F) *Exesipollenites tumulus* (R) *Gleicheniidites senonicus* (R) *Lycospora* spp. (R) ***** *Taeniaesporites* sp. (V) ***** *Chytroeisphaeridia pericompsa* (F)

Gonyaulacysta cladophora (R)
Micrhystridium sp. (R)
Nannoceratopsis pellucida (A)
Pareodinia ceratophora (R)
Sirmiodinium grossi (R)

Remarks. Organic recovery consists mainly of palynomorphs. All very poorly preserved.

T.A.I. 2.5 - 3.0

21) 98 MU 11-19A

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (C)
Tasmanites spp. (R)
Gypsum (F)
Pyrite (R)

Washed Lithology. Dark brownish-gray to black slightly silty shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (R)
Deltoidospora spp. (R)
Densosporites spp. (R) *****
Lycopodiumsporites spp. (F)
Taeniaesporites sp. (V) *****
Tripartites sp. (V) *****
Chytroeisphaeridia pericompsa (C)
Gonyaulacysta cladophora (F)
Micrhystridium sp. (R)
Nannoceratopsis pellucida (A)
?*Omatidium amphiacanthum* (V)
Pareodinia ceratophora (R)

Pareodinia osmingtonensis (V)
Sirmiodinium grossi (R)

Remarks. Organic recovery consists mainly of palynomorphs. Slight increase in woody-fusinitic material. All very poorly preserved.

T.A.I. 2.5 - 3.0

22) 98 MU 11-20

FORAMINIFERA

Age. Indeterminate

Environment. Indeterminate

Fauna. Barren of Foraminifera.

Washed Lithology. Dark brownish-gray to black sideritic? shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (R)
Densosporites spp. (R) *****
Gleicheniidites senonicus (R)
Lycospora sp. (V) *****
Vitreisporites pallidus (V)
Chytroeisphaeridia pericompsa (F)
Gonyaulacysta cladophora (R)
Micrhystridium sp. (R)
Nannoceratopsis pellucida (A)
Pareodinia ceratophora (R)
Pareodinia spp. (R)
?*Scriniodinium crystallinum* (V)

Remarks. Organic recovery consists mainly of palynomorphs. Minor amounts of woody-fusinitic material. All very poorly preserved.

T.A.I. 2.5 - 3.0

23) 98 MU 11-21

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	Barren of Foraminifera. *Tasmanites* spp. (F) Echinoid spines (X) Gypsum (C)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian
Zone.	P-M22
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Classopollis classoides* (F) *Deltoidospora* spp. (R) *Densosporites* spp. (F) ***** *Endosporites* sp. (V) ***** *Lycopodiumsporites* spp. (R) *Lycospora* spp. (R) ***** *Taeniaesporites* sp. (V) ***** *Chytroeisphaeridia pericompsa* (F) *Gonyaulacysta cladophora* (R) *Micrhystridium* sp. (R) *Nannoceratopsis pellucida* (C) *Pareodinia ceratophora* (R) *Sirmiodinium grossi* (R)
Remarks.	Organic recovery consists mainly of palynomorphs. All very poorly preserved.
T.A.I.	2.5 - 3.0

24) 98 MU 11-21A

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian

Zone.	Probable F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Bathysiphon anomalocoelia* (A) *Haplophragmoides* spp. (R) *Trochamminoides* sp. (small, thin) (R) Gypsum (F)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian
Zone.	P-M22
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Classopollis classoides* (F) *Deltoidospora* spp. (F) *Densosporites* spp. (F) ***** *Exesipollenites tumulus* (R) *Gleicheniidites senonicus* (R) *Rogalskaisporites cicatricosus* (V) *Chytroeisphaeridia pericompsa* (F) *Gonyaulacysta cladophora* (R) *Micrhystridium* spp. (F) *Nannoceratopsis pellucida* (C) *Pareodinia ceratophora* (R) *Pareodinia osmingtonensis* (V)
Remarks.	Organic recovery consists mainly of palynomorphs. All very poorly preserved.
T.A.I.	2.5 - 3.0

25) 98 MU 11-22

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Bathysiphon anomalocoelia* (X)

Tasmanites spp. (F)
Gypsum (C)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (R)
Densosporites spp. (R) *****
Exesipollenites tumulus (R)
Gleicheniidites senonicus (R)
Vitreisporites pallidus (R)
Chytroeisphaeridia pericompsa (F)
Endoscrinium galeritum (R)
Micrhystridium spp. (R)
Nannoceratopsis pellucida (A)
Pareodinia ceratophora (R)
Sirmiodinium grossi (R)

Remarks. Organic recovery consists mainly of palynomorphs. All poorly preserved.

T.A.I. 2.7 - 3.0

26) 98 MU 11-23

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (C)
Cenosphaera spp. (pyritized) (F)
Dentalina spp. (R)
Stichomitra sp. (pyritized) (X)
Tasmanites spp. (F)
Gypsum (R)
Inoceramus prisms (F)
Pyrite (R)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (F)
Exesipollenites tumulus (R)
Gleicheniidites senonicus (R)
Taeniaesporites spp. (R) *****
Vitreisporites pallidus (R)
Chytroeisphaeridia pericompsa (A)
Gonyaulacysta cladophora (R)
Micrhystridium spp. (R)
Nannoceratopsis pellucida (A)
Pareodinia ceratophora (R)
Pareodinia osmingtonensis (R)
Sirmiodinium grossi (R)
Tubotuberella apatela (V)

Remarks. Organic recovery consists mainly of palynomorphs. All poorly preserved.

T.A.I. 2.7 - 3.0

27) 98 MU 11-24

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (R)
Tasmanites spp. (F)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone.	P-M22
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Classopollis classoides* (F) *Densosporites* spp. (R) ***** *Lycopodiumsporites* spp. (R) *Taeniaesporites* spp. (R) ***** *Chytroeisphaeridia pericompsa* (F) *Gonyaulacysta cladophora* (F) *Micrhystridium* spp. (R) *Nannoceratopsis pellucida* (A) *Pareodinia ceratophora* (R) *Pareodinia osmingtonensis* (V) *Pareodinia* sp. B Wiggins (F) *Sirmiodinium grossi* (F)
Remarks.	Organic recovery consists mainly of palynomorphs. All poorly preserved.
T.A.I.	2.5 - 3.0

28) 98 MU 11-25

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Bathysiphon anomalocoelia* (F) *Haplophragmoides* spp. (R) *Tasmanites* spp. (F) Echinoid spines (R) *Inoceramus* prisms (C)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian
Zone.	P-M22
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A)

Classopollis classoides (R)
Densosporites spp. (R) *****
Lycopodiumsporites spp. (R)
Taeniaesporites spp. (R) *****
Chytroeisphaeridia pericompsa (F)
Gonyaulacysta cladophora (F)
Micrhystridium spp. (R)
Nannoceratopsis pellucida (F)
Pareodinia sp. B Wiggins (F)
Pareodinia spp. (R)

Remarks. Organic recovery consists mainly of palynomorphs. All very poorly preserved.

T.A.I. 2.5 - 3.0

29) 98 MU 11-26

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. Barren of Foraminifera.
Tasmanites spp. (R)
Gypsum (F)
Pyrite (R)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (R)
Densosporites spp. (R) *****
Gleicheniidites senonicus (R)
Lycopodiumsporites spp. (R)
Chytroeisphaeridia pericompsa (F)
Gonyaulacysta cladophora (F)
Micrhystridium spp. (F)
Nannoceratopsis pellucida (C)

Pareodinia sp. B Wiggins (F)
Sirmiodinium grossi (R)

Remarks. Organic recovery consists mainly of palynomorphs. All very poorly preserved.

T.A.I. 2.5 - 3.0

30) 98 MU 11-27

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Bathysiphon anomalocoelia* (A)
Gaudryina dyscrita (R)
Haplophragmoides spp. (R)
Trochamminoides sp. (small, thin) (R)
Gypsum (C)

Washed Lithology. Dark brownish-gray iron-stained shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (R)
Densosporites spp. (R) *****
Kraeuselisporites spp. (R) *****
Lycopodiumsporites spp. (R)
Taeniaesporites sp. (V) *****
Tripartites spp. (R) *****
?*Atopodinium prostatum* (V)
Chytroeisphaeridia pericompsa (A)
Gonyaulacysta cladophora (R)
Micrhystridium spp. (F)
Nannoceratopsis pellucida (C)
Pareodinia osmingtonensis (R)
Pareodinia sp. B Wiggins (F)
Sirmiodinium grossi (F)

Remarks.	Organic recovery consists mainly of palynomorphs. All very poorly preserved.
T.A.I.	2.5 - 2.7

31) 98 MU 19-11

FORAMINIFERA

Age.	Indeterminate
Environment.	Indeterminate
Fauna.	Barren of Foraminifera. Paper shale (C)
Washed Lithology.	Dark brownish-gray to black paper shale.

PALYNOLOGY

Age.	Indeterminate
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (R) Indeterminate dinocyst operculum (V) *Micrhystridium* spp. (F) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists mainly of amorphous material. All very poorly preserved.
T.A.I.	2.3

32) 98 MU 19-10

FORAMINIFERA

Age.	Late Jurassic Oxfordian
Zone.	F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Ammobaculites alaskensis* (F) *Bathysiphon anomalocoelia* (R) *Gaudryina milleri* (R) *Glomospirella arctica* (R) *Haplophragmoides canui* (R) *Haplophragmoides* spp. (C) *Trochammina instowensis* (F) *Inoceramus* prisms (F)

Pyrite sticks (C)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22a

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (F)
Densosporites spp. (F) *****
Endosporites spp. (R) *****
Gleicheniidites senonicus (R)
Kraeuselisporites spp. (R) *****
Lycopodiumsporites spp. (F)
Chytroeisphaeridia pericompsa (F)
Fromea amphora (F)
Gonyaulacysta jurassica (A)
Kalyptea diceras (R)
Nannoceratopsis pellucida (R)
Pareodinia osmingtonensis (C)
Sirmiodinium grossi (F)
Stephanelytron redcliffense (R)

Remarks. The presence of *Stephanelytron redcliffense* suggests a slightly older age than the usual Oxfordian assemblage encountered. This assemblage probably ranges into the late Callovian.

Organic recovery consists mainly of palynomorphs. The woody-fusinitic component presence has increased to about 40%.

T.A.I. 2.3 - 2.5

33) 98 MU 19-9

FORAMINIFERA

Age. Late Jurassic
Oxfordian

Zone. F-16b

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Ammobaculites alaskensis* (R)
Ammodiscus orbis (R)
Bathysiphon anomalocoelia (R)

Gaudryina dyscrita (X)
Haplophragmium sp. (X)
Haplophragmoides canui (X)
Haplophragmoides spp. (C)
Trochammina instowensis (R)
Trochammina rostovzevi (X)
Pyrite sticks (C)

Washed Lithology. Dark gray to black slightly silty shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (F)
Classopollis classoides (R)
Densosporites spp. (F) *****
Hymenozonotriletes lepidophytus (R) *****
Lophozonotriletes rarituberculatus (R) *****
Lycospora spp. (R) *****
Taeniaesporites sp. (V) *****
Tripartites incisotrilobus (R) *****
Acanthaulax senta (C)
Ctenidodinium ornatum (R)
Gonyaulacysta cladophora (A)
Micrhystridium spp. (R)
Nannoceratopsis pellucida (F)
Pareodinia ceratophora (F)
Pareodinia osmingtonensis (R)
Sirmiodinium grossi (F)

Remarks. Organic recovery consists mainly of palynomorphs with about 40% woody-fusinitic material.

T.A.I. 2.3 - 2.5

34) 98 MU 19-8

FORAMINIFERA

Age. Late Jurassic
Oxfordian

Zone. F-16b

Environment. Probable Bathyal

(Probable Slope)

Fauna.
Ammobaculites alaskensis (X)
Ammobaculites vetusta (R)
Gaudryina dyscrita (X)
Haplophragmoides spp. (F)
Trochammina instowensis (R)
Fish debris (R)
Glauconite (F)
Pyrite (F)
Pyrite sticks (F)

Washed Lithology. Dark gray to black slightly sandy shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian

Zone. P-M22

Environment Marine

Palynomorphs.
Undifferentiated bisaccates (A)
Classopollis classoides (F)
Densosporites spp. (F) *****
Endosporites spp. (R) *****
Lophozonotriletes rarituberculatus (R) *****
Lundbladispora sp. (V) *****
Lycopodiumsporites spp. (R)
Tripartites sp. (V) *****
Acanthaulax senta (R)
Chytroeisphaeridia pericompsa (C)
Gonyaulacysta cladophora (F)
Gonyaulacysta jurassica (R)
Micrhystridium spp. (F)
Nannoceratopsis pellucida (C)
Pareodinia alaskensis (R)
Sirmiodinium grossi (F)
Tubotuberella apatela (R)

Remarks. Organic recovery consists mainly of palynomorphs with about 40% woody-fusinitic material.

T.A.I. 2.5 - 3.0

35) 98 MU 19-7

FORAMINIFERA

Age.	Late Jurassic Oxfordian
Zone.	F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Ammobaculites alaskensis* (R) *Haplophragmoides* spp. (F) *Trochammina instowensis* (X) Pyrite (R) Pyrite sticks (F)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian
Zone.	P-M22
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Densosporites* spp. (F) ***** *Hymenozonotriletes lepidophytus* (V) ***** *Lophozonotriletes rarituberculatus* (R) ***** *Lycopodiumsporites* spp. (R) *Taeniaesporites* sp. (V) ***** *Acanthaulax senta* (F) *Chytroeisphaeridia pericompsa* (C) *Gonyaulacysta cladophora* (C) *Gonyaulacysta jurassica* (R) *Kalyptea diceras* (R) *Meiourogonyaulax* sp. (R) *Micrhystridium* spp. (F) *Nannoceratopsis pellucida* (F) *Pareodinia ceratophora* (R) *Sirmiodinium grossi* (R)
Remarks.	Organic recovery consists mainly of palynomorphs.
T.A.I.	2.5

36) 98 MU 19-6

FORAMINIFERA

Age.	Late Jurassic Oxfordian

Zone.	F-16b
Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Ammobaculites alaskensis* (R) *Ammobaculites vetusta* (F) *Bathysiphon anomalocoelia* (A) *Haplophragmoides* spp. (R) *Trochamminoides* sp. (small, thin) (C) *Verneuilinoides graciosus* (X) Gypsum (F) Paper shale (F) Pyrite (R)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Indeterminate
Environment.	No evidence of marine.
Palynomorphs.	Undifferentiated bisaccates (F) *Lycopodiumsporites* sp. (V) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists mainly of amorphous material. Extremely poor preservation.
T.A.I.	3.0

37) 98 MU 19-5

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Middle Neritic to Upper Bathyal (Middle Shelf to Upper Slope)
Fauna.	*Ammobaculites alaskensis* (C) *Ammobaculites vetusta* (F) *Frondicularia lustrata* (X) *Haplophragmoides* spp. (R) *Marginulina prima* (X) *Trochamminoides* sp. (small, thin) (R) Gypsum (C)
Washed Lithology.	Dark gray to black siltstone or silty shale.

PALYNOLOGY

Age.	Possible Late Triassic Possible Norian
Zone.	P-M26?
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Taeniaesporites* sp. (V) *Micrhystridium* spp. (C) *Sverdrupiella* spp. (R) *Sverdrupiella usitata* (V) *Veryhachium* sp. (R)
Remarks.	The age restrictive palynomorphs are sparse, however they do indicate a late Triassic age for this sample. The foraminiferal analysis suggests that these Triassic forms are reworked. Organic recovery consists mainly of palynomorphs and amorphous material. All are very poorly preserved.
T.A.I.	2.5 - 3.0

38) 98 MU 19-4

FORAMINIFERA

Age.	Probable Early to Middle Jurassic Undifferentiated
Zones.	Probable F-17 to F-18
Environment.	Middle Neritic to Upper Bathyal (Middle Shelf to Upper Slope)
Fauna.	*Ammobaculites alaskensis* (R) *Ammobaculites vetusta* (F) *Bathysiphon anomalocoelia* (R) *Nodosaria detruncata* (X) *Trochamminoides* sp. (small, thin) (F) Gypsum (F) Megaspores (R)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Possible Early to Middle Jurassic Undifferentiated
Environment.	Marine

Palynomorphs. Undifferentiated bisaccates (A)
?*Gleicheniidites senonicus* (R)
Taeniaesporites sp. (V) *****
?*Mancodinium semitabulatum* (R)
Micrhystridium spp. (R)
Sverdrupiella sp. (V) *****
Sverdrupiella usitata (R) *****
Tasmanaceae (R)

Remarks. The presence of two forms, although questionable, suggests an Early Jurassic age. The late Triassic forms are probably reworked into this sample. The foraminiferal analysis appears to corroborate this interpretation.
Organic recovery consists mainly of amorphous material and palynomorphs. All are very poorly preserved.

T.A.I. 2.5 - 3.0

39) 98 MU 19-3

FORAMINIFERA

Age. Probable Early to Middle Jurassic
Undifferentiated

Zones. Probable F-17 to F-18

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Ammobaculites alaskensis* (R)
Ammobaculites vetusta (R)
Tasmanites spp. (R)
Trochamminoides sp. (small, thin) (F)
Verneuilinoides graciosus (X)
Gypsum (F)
Pyrite (R)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Possible Early to Middle Jurassic
Undifferentiated

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Deltoidospora sp. (V)
Taeniaesporites sp. (R) *****
Micrhystridium spp. (R)

Sverdrupiella sp. (V) *****
Sverdrupiella usitata (R) *****
Veryhachium sp. (V)
Tasmanaceae (F)

Remarks. Age restrictive palynomorphs are sparse. The foraminiferal analysis indicates a Jurassic age for the sample. The late Triassic dinocysts are probably reworked in this sample.
Organic recovery consists mainly of amorphous material and palynomorphs. All are very poorly preserved.

T.A.I. 2.5 - 3.0

40) 98 MU 19-2

FORAMINIFERA

Age. Probable Early to Middle Jurassic
Undifferentiated

Zones. Probable F-17 to F-18

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Ammobaculites alaskensis* (R)
Ammobaculites vetusta (F)
Trochamminoides sp. (small, thin) (R)
Gypsum (F)
Megaspores (X)
Pyrite (R)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Probable Early to Middle Jurassic
Undifferentiated

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (C)
Taeniaesporites sp. (R) *****
Trilobosporites sp. (V)
Vitreisporites pallidus (V)
Micrhystridium spp. (R)
Nannoceratopsis pellucida (R)
?*Nannoceratopsis senex* (R)
Pterospermopsis sp. (R)
Tasmanaceae (F)

Remarks. The overlapping ranges of the recorded species suggest an age range of Bajocian to Callovian.
Organic recovery consists mainly of amorphous material and palynomorphs. All are very poorly preserved.

T.A.I. 2.5 - 3.0

41) 98 MU 19-1

FORAMINIFERA

Age. Probable Early to Middle Jurassic
Undifferentiated

Zones. Probable F-17 to F-18

Environment. Probable Bathyal
(Probable Slope)

Fauna. *Ammobaculites alaskensis* (X)
Ammobaculites vetusta (F)
Trochamminoides sp. (small, thin) (R)
Gypsum (F)
Paper shale (F)

Washed Lithology. Dark gray to black slightly paper shale.

PALYNOLOGY

Age. Early to Middle Jurassic
Undifferentiated

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (R)
Micrhystridium spp. (F)
Nannoceratopsis senex (A)
Tasmanaceae (F)

Remarks. Organic recovery consists mainly of amorphous material and palynomorphs. All are very poorly preserved.

T.A.I. 2.5 - 3.0

42) 98 MU 19

FORAMINIFERA

Age. Probable Early to Middle Jurassic
Undifferentiated

Zones. Probable F-17 to F-18

Environment.	Probable Bathyal (Probable Slope)
Fauna.	*Ammobaculites vetusta* (F) *Trochamminoides* sp. (small, thin) (R) Gypsum (F) Megaspores (X) Paper shale (F)
Washed Lithology.	Dark gray to black slightly paper shale.

PALYNOLOGY

Age.	Probable Early to Middle Jurassic Undifferentiated
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Micrhystridium* spp. (F) ?*Nannoceratopsis senex* (V) *Veryhachium* spp. (R) Tasmanaceae (C)
Remarks.	Organic recovery consists mainly of amorphous material and palynomorphs. All are very poorly preserved.
T.A.I.	2.5 - 3.0

43) 98 MU 33-7

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Distal (Starved Basin)
Fauna.	Barren of Foraminifera. Bentonite (F) Paper shale (C) Rounded frosted quartz floaters (R)
Washed Lithology.	Black bentonitic paper shale.
Discussion.	Age based on lithology only.

PALNOLOGY

Age.	Early Cretaceous Barremian to Aptian

Zone.	P-M18a
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) *Cleistosphaeridium* spp. (F) *Cyclonephelium distinctum* (R) *Gardodinium deflandrei* (V) *Odontochitina operculata* (A) *Oligosphaeridium complex* (C) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists mainly of amorphous material and palynomorphs.
T.A.I.	2.3 - 2.5

44) 98 MU 33-6

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Distal (Starved Basin)
Fauna.	Barren of Foraminifera. Bentonite (R) Paper shale (C) Rounded frosted quartz floaters (F)
Washed Lithology.	Black paper shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Barremian to Aptian
Zone.	Probable P-M18a
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) *Cleistosphaeridium* spp. (C) *Imbatodinium jaegeri* (R) *Odontochitina operculata* (F) *Oligosphaeridium complex* (F)

Remarks.	Organic recovery consists mainly of amorphous material and palynomorphs. All poorly preserved.
T.A.I.	2.3 - 2.5

45) 98 MU 33-5

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Distal (Starved Basin)
Fauna.	Barren of Foraminifera. Bentonite (R) Paper shale (C) Rounded frosted quartz floaters (F)
Washed Lithology.	Black paper shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Barremian to Aptian
Zone.	Probable P-M18a
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) *Cyclonephelium distinctum* (F) *Micrhystridium* spp. (R) *Odontochitina operculata* (F) *Oligosphaeridium complex* (F)
Remarks.	Organic recovery consists mainly of amorphous material and palynomorphs. All poorly preserved.
T.A.I.	2.3 - 2.5

46) 98 MU 33-4

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian

Zone.	Probable F-12
Environment.	Distal (Starved Basin)
Fauna.	Barren of Foraminifera. Bentonite (R) Paper shale (C) Rounded frosted quartz floaters (F) Spines (X)
Washed Lithology.	Dark gray to black slightly sandy paper shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Barremian to Aptian
Zone.	Probable P-M18a
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) *Cleistosphaeridium* spp. (R) *Cyclonephelium distinctum* (R) *Oligosphaeridium complex* (F) *Palaeoperidinium cretaceum* (V)
Remarks.	Organic recovery consists mainly of amorphous material and some palynomorphs. All poorly preserved.
T.A.I.	2.3 - 2.5

47) 98 MU 33-3

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Distal (Starved Basin)
Fauna.	Barren of Foraminifera. Bentonite (R) Paper shale (A) Rounded frosted quartz floaters (R)
Washed Lithology.	Black paper shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Barremian to Aptian
Zone.	Probable P-M18a
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) *Cleistosphaeridium* spp. (R) *Gardodinium deflandrei* (V) *Imbatodinium jaegeri* (R) *Odontochitina operculata* (R) *Oligosphaeridium complex* (C) *Wallodinium krutzschii* (V)
Remarks.	Organic recovery consists mainly of amorphous material and some palynomorphs. All poorly preserved.
T.A.I.	2.3 - 2.5

48) 98 MU 33-2

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Distal (Starved Basin)
Fauna.	Barren of Foraminifera. Bentonite (R) Paper shale (A) Rounded frosted quartz floaters (F)
Washed Lithology.	Black paper shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Barremian to Aptian
Zone.	Probable P-M18a
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) *Gleicheniidites senonicus* (V) *Cleistosphaeridium* spp. (R)

Cyclonephelium distinctum ©
Gardodinium deflandrei (R)
Gardodinium trabeculosum (V)
Muderongia sp. (V)
Oligosphaeridium complex (C)
Palaeoperidinium cretaceum (V)
Pterospermopsis sp. (R)

Remarks. Organic recovery consists mainly of amorphous material and some increase in palynomorphs. All poorly preserved.

T.A.I. 2.3 - 2.5

49) 98 MU 33-1

FORAMINIFERA

Age. Early Cretaceous
Probable Barremian

Zone. Probable F-12

Environment. Distal
(Starved Basin)

Fauna. Barren of Foraminifera.
Bentonite (R)
Paper shale (A)
Rounded frosted quartz floaters (F)

Washed Lithology. Black paper shale.

Discussion. Age based on lithology only.

PALYNOLOGY

Age. Probable Early Cretaceous
Probable Barremian to Aptian

Zone. Probable P-M18a

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (C)
Gleicheniidites senonicus (V)
Cleistosphaeridium spp. (R)
Cyclonephelium distinctum ©
Gardodinium deflandrei (R)
Gardodinium trabeculosum (V)
Muderongia sp. (V)
Oligosphaeridium complex (C)
Palaeoperidinium cretaceum (V)

Pterospermopsis sp. (R)

Remarks. Organic recovery is mainly palynomorphs with amorphous material constituting about 40% of the total. All poorly preserved.

T.A.I. 2.3 - 2.5

50) 98 DL 120-27

FORAMINIFERA

Age. Early Cretaceous
Possible Aptian

Zone. F-11?

Environment. Marine (Undiff.)

Fauna. *Ammobaculites fragmentarius* (X)

Washed Lithology. Dark gray micaceous shale.

Discussion. Age based on lithology only.

PALYNOLOGY

Age. Early Cretaceous
Valanginian

Zone. P-M20

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Classopollis classoides (F)
Deltoidospora spp.(R)
Densosporites spp.(F) *****
Gleicheniidites senonicus (R)
Kraeuselisporites spp. (R) *****
Lycopodiumsporites spp. (R)
Apteodinium spongiosum (operculum) (R)
Clathroctenocystis elegans (R)
Cribroperidinium edwardsi (R)
Cyclonephelium distinctum (F)
Gochteodinia villosa (R)
Micrhystridium spp. (F)
Nelchinopsis kostromiensis (F)
Oligosphaeridium complex (A)
Sirmiodinium grossi (V)
Tanyosphaeridium magneticum Davies (R)

Remarks. Organic recovery is mainly palynomorphs with amorphous material constituting about 40% of the total.

Most of the dinocyst species are Valanginian forms and presumed to be indigenous. The foraminiferal analysis suggests that the sample may be of younger age. It is possible that the Valanginian dinocysts are reworked into a younger, undifferentiated Cretaceous section.

T.A.I. 2.5

51) 98 DL 120-25

FORAMINIFERA

Age. Possible Early Cretaceous
Possible Aptian

Zone. F-11?

Environment. Indeterminate

Fauna. Barren of Foraminifera.

Washed Lithology. Dark gray micaceous shale.

Discussion. Age based on lithology only.

PALYNOLOGY

Age. Early Cretaceous
Valanginian

Zone. P-M20

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Cicatricosisporites spp. (F)
Classopollis classoides (F)
Deltoidospora spp.(F)
Densosporites spp.(F) *****
Gleicheniidites senonicus (R)
Lycopodiumsporites spp. (F)
Trilobosporites sp. (R)
Apteodinium spongiosum (operculum) (R)
Clathroctenocystis elegans (R)
Cleistosphaeridium spp. (F)
Gochteodinia villosa (F)
Gonyaulacysta jurassica (V) *****
Nelchinopsis kostromiensis (C)
Oligosphaeridium complex (C)
Sirmiodinium grossi (V)
Tubotuberella apatela (R)

Remarks. Organic recovery is mainly palynomorphs with amorphous material constituting about 40% of the total.

Most of the dinocyst species are Valanginian forms and presumed to be indigenous. The foraminiferal analysis suggests that the sample may be of younger age. It is possible that the Valanginian dinocysts are reworked into a younger, undifferentiated Cretaceous section.

T.A.I. 2.5

52) 98 RK 1-91

FORAMINIFERA

Age. Indeterminate

Environment. Indeterminate

Fauna. Barren of Foraminifera.
Gypsum (R)

Washed Lithology. Dark brownish-gray slightly micaceous shale.

PALYNOLOGY

Age. Probable Early Cretaceous
Possible Aptian to Albian

Zones. P-M18? to P-M17?

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Cicatricosisporites sp. (V)
Densosporites spp.(C) *****
Gleicheniidites senonicus (R)
?*Muderongia* sp. (V)
Odontochitina operculata (V)
Oligosphaeridium complex (R)
Sverdrupiella usitata (V) *****
Pterospermopsis sp. (R)

Remarks. Organic recovery is mainly woody-fusinitic with some palynomorphs.

T.A.I. 2.5

53) 98 RK 1-84

FORAMINIFERA

Age. Late Jurassic to Early Cretaceous (Neocomian)
Oxfordian to Barremian

Zones.	F-12 to F-16b
Environment.	Marine (Undiff.)
Fauna.	*Bathysiphon* sp. (X) Pyrite (R) Rounded frosted quartz floaters (R)
Washed Lithology.	Dark brownish-gray to black shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Possible Aptian to Albian
Zones.	P-M18? to P-M17?
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Densosporites* spp.(C) ***** *Triancoraesporites communis* (V) ***** *Oligosphaeridium complex* (R) *Oligosphaeridium complex* (thick-wall) (V) ***** *Palaeoperidinium cretaceum* (V)
Remarks.	Organic recovery is mainly woody-fusinitic with some palynomorphs.
T.A.I.	2.5

54) 98 RK 1-78

FORAMINIFERA

Age.	Late Jurassic to Early Cretaceous (Neocomian) Oxfordian to Barremian
Zones.	F-12 to F-16b
Environment.	Indeterminate
Fauna.	Barren of Foraminifera. Rounded frosted quartz floaters (R)
Washed Lithology.	Dark brownish-gray to black silty shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Probable Early Cretaceous Possible Aptian to Albian
Zones.	P-M18? to P-M17?
Environment.	Marine

Palynomorphs.	Undifferentiated bisaccates (C) *Densosporites* spp.(F) ***** *Cyclonephelium distinctum* (V) *Imbatodinium jaegeri* (V) *Oligosphaeridium complex* (R) *Oligosphaeridium complex* (thick-wall) (F) *****
Remarks.	Organic recovery is mainly woody-fusinitic with some palynomorphs.
T.A.I.	2.3 - 2.5

55) 98 RK 1-65

FORAMINIFERA

Age.	Late Jurassic to Early Cretaceous (Neocomian) Oxfordian to Barremian
Zones.	F-12 to F-16b
Environment.	Indeterminate
Fauna.	Barren of Foraminifera. Rounded frosted quartz floaters (R)
Washed Lithology.	Dark brownish-gray to black shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Early Cretaceous Possible Aptian to Albian
Zones.	P-M18? to P-M17?
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (F) *Densosporites* spp.(R) ***** *Cyclonephelium distinctum* (F) *Gardodinium deflandrei* (V) *Imbatodinium micropodum* (V) ***** *Oligosphaeridium complex* (R) *Oligosphaeridium complex* (thick-wall) (V) *****
Remarks.	Organic recovery is mainly woody-fusinitic with some palynomorphs.
T.A.I.	2.5 - 2.7

56) 98 RK 1-57

FORAMINIFERA

Age.	Probable Late Jurassic Possible Oxfordian
Zone.	F-16b?
Environment.	Probable Outer Neritic to Middle Bathyal (Probable Outer Shelf to Middle Slope)
Fauna.	*Bathysiphon* sp. (X) *Gaudryina dyscrita* (X) Rounded frosted quartz floaters (X)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Probable Early Cretaceous Possible Aptian to Albian
Zones.	P-M18? to P-M17?
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) *Deltoidospora* spp. (F) *Densosporites* spp. (R) ***** *Endosporites* sp. (V) ***** *Gleicheniidites senonicus* (R) *Lycopodiumsporites* spp. (R) *Semiretisporis* sp. (V) ***** *Oligosphaeridium complex* (F) *Veryhachium* sp. (V)
Remarks.	Organic recovery is mainly woody-fusinitic with some palynomorphs.
T.A.I.	2.5 - 3.0

57) 98 RK 1-43

FORAMINIFERA

Age.	Late Jurassic Oxfordian
Zone.	F-16b
Environment.	Outer Neritic to Middle Bathyal (Outer Shelf to Middle Slope)
Fauna.	*Gaudryina dyscrita* (X) *Glomospira pattoni* (R) *Haplophragmoides* spp. (R)

Rounded frosted quartz floaters (X)

Washed Lithology. Dark gray slickensided shale.

PALYNOLOGY

Age. Probable Early Cretaceous
Possible Aptian to Albian

Zones. P-M18? to P-M17?

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (R)
Deltoidospora spp. (R)
Densosporites spp. (R) *****
Cyclonephelium distinctum (R)
Gonyaulacysta jurassica (R) *****
Gonyaulacysta sp. G (R) *****
Kalyptea diceras (V) *****
Oligosphaeridium complex (R)
Oligosphaeridium complex (thick-wall) (F) *****
Pareodinia ceratophora (R) *****
Pareodinia osmingtonensis (R) *****
Sentusidinium rioultii (V)
Sirmiodinium grossi (F) *****

Remarks. Organic recovery is mainly woody-fusinitic with some palynomorphs.

This last sample in the Surprise Creek series contains five dinocyst species that range into the Jurassic or are restricted to the Jurassic. Other forms, however, are not known to occur below the Cretaceous. At this time the mixed assemblage is given the youngest age and the older forms are all attributed to reworking.

T.A.I. 2.5 - 3.0

58) 98 JC 302-1

FORAMINIFERA

Age. Early Cretaceous
Valanginian

Zone. F-13b

Environment. Middle to Outer Neritic
(Middle to Outer Shelf)

Fauna. *Ammobaculites erectus* (F)
Ammobaculites reophacoides (C)
Bathysiphon scintillata (F)

Gaudryina leffingwelli (R)
Gaudryina milleri (R)
Glomospira subarctica (R)
Glomospirella arctica (R)
Haplophragmoides coronis (F)

Washed Lithology. Dark gray shale.

PALYNOLOGY

Age. Early Cretaceous
Valanginian

Zone. P-M20

Environment. Marine

Palynomorphs. *Cyclonephelium distinctum* (A)
Cyclonephelium cuculliforme (R)
Gochteodinia villosa (R)
Gonyaulacysta sp. (R)
Gonyaulacysta sp. G (R)
Nelchinopsis kostromiensis (F)
Oligosphaeridium complex (thick-wall) (A)

Remarks. Organic recovery is mainly dinocysts with about 20% woody-fusinitic material.

T.A.I. 3.0 - 3.5

59) 98 JC 302-2

FORAMINIFERA

Age. Early Cretaceous
Valanginian

Zone. F-13b

Environment. Probable Middle to Outer Neritic
(Probable Middle to Outer Shelf)

Fauna. *Bathysiphon scintillata* (X)
Gaudryina milleri (R)
Haplophragmoides coronis (X)
Trochammina instowensis (R)
Rounded frosted quartz floaters (R)

Washed Lithology. Dark pinkish-gray shale.

PALYNOLOGY

Age. Early Cretaceous

Valanginian

Zone. P-M20

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (R)
Deltoidospora spp. (R)
Cannosphaeropsis sp. (C)
Cyclonephelium distinctum (R)
Gochteodinia villosa (V)
Gonyaulacysta sp. G (F)
Nelchinopsis kostromiensis (R)
Oligosphaeridium complex (thick-wall) (F)
Tanyosphaeridium variecalamum (V)

Remarks. Organic recovery is mainly dinocysts with about 20% woody-fusinitic material.

T.A.I. 3.0 - 3.5

60) 98 JC 302-3

FORAMINIFERA

Age. Early Cretaceous
Valanginian

Zone. F-13b

Environment. Middle to Outer Neritic
(Middle to Outer Shelf)

Fauna. *Ammobaculites erectus* (R)
Ammobaculites reophacoides (R)
Bathysiphon scintillata (F)
Gaudryina leffingwelli (R)
Gaudryina milleri (F)
Haplophragmoides coronis (F)
Haplophragmoides duoflatis (R)
Trochammina instowensis (R)
Rounded frosted quartz floaters (R)

Washed Lithology. Dark reddish-gray hematitic? shale.

PALYNOLOGY

Age. Early Cretaceous
Valanginian

Zone. P-M20

Environment. Marine

Palynomorphs.	Undifferentiated bisaccates (R) *Cannosphaeropsis* sp. (F) *Cyclonephelium distinctum* (R) ?*Ellipsoidictyum* sp. (R) *Gonyaulacysta* sp. G (C) *Oligosphaeridium complex* (thick-wall) (F) *Tanyosphaeridium variecalamum* (R)
Remarks.	Organic recovery is mainly dinocysts with about 25% woody-fusinitic material.
T.A.I.	3.0 - 3.5

61) 98 JC 302-4

FORAMINIFERA

Age.	Early Cretaceous Valanginian
Zone.	F-13b
Environment.	Middle to Outer Neritic (Middle to Outer Shelf)
Fauna.	*Ammobaculites erectus* (R) *Ammobaculites reophacoides* (C) *Bathysiphon scintillata* (F) *Gaudryina leffingwelli* (R) *Gaudryina milleri* (F) *Glomospirella arctica* (X) *Haplophragmoides coronis* (F) *Trochammina instowensis* (R) Rounded frosted quartz floaters (R)
Washed Lithology.	Dark gray shale.

PALYNOLOGY

Age.	Early Cretaceous Valanginian
Zone.	P-M20
Environment.	Marine
Palynomorphs.	*Cyclonephelium distinctum* (A) ?*Ellipsoidictyum* sp. (R) *Gonyaulacysta* sp. G (A) *Gonyaulacysta* cf. *G. serrata* (F) *Oligosphaeridium complex* (thick-wall) (F)

Remarks. Organic recovery consists mainly of dinocysts.

T.A.I. 3.0

62) 98 JC 302-5

FORAMINIFERA

Age. Early Cretaceous
Valanginian

Zone. F-13b

Environment. Middle to Outer Neritic
(Middle to Outer Shelf)

Fauna. *Ammobaculites erectus* (R)
Ammobaculites reophacoides (F)
Bathysiphon scintillata (F)
Gaudryina leffingwelli (R)
Gaudryina milleri (F)
Glomospirella arctica (X)
Haplophragmoides coronis (F)
Haplophragmoides duoflatis (R)
Fish debris (R)

Washed Lithology. Dark pinkish-gray shale.

PALYNOLOGY

Age. Early Cretaceous
Valanginian

Zone. P-M20

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (R)
?*Ellipsoidictyum* sp. (A)
Gochteodinia villosa (R)
Gonyaulacysta sp. G (C)
Nelchinopsis kostromiensis (F)
Oligosphaeridium complex (thick-wall) (V)
Oligosphaeridium vasiformum (R)
Tanyosphaeridium magneticum Davies (R)
Tanyosphaeridium variecalamum (R)
Veryhachium sp. (V)

Remarks. Organic recovery consists mainly of dinocysts.

T.A.I. 3.0

63) 98 JC 302-6

FORAMINIFERA

Age.	Early Cretaceous Valanginian
Zone.	F-13b
Environment.	Middle to Outer Neritic (Middle to Outer Shelf)
Fauna.	*Ammobaculites erectus* (R) *Ammobaculites reophacoides* (F) *Bathysiphon scintillata* (F) *Gaudryina leffingwelli* (R) *Gaudryina milleri* (F) *Gaudryina tailleuri* (X) *Glomospirella arctica* (R) *Haplophragmoides coronis* (R)
Washed Lithology.	Dark gray shale.

PALYNOLOGY

Age.	Early Cretaceous Valanginian
Zone.	P-M20
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (R) *Cyclonephelium cuculliforme* (R) *Gonyaulacysta* sp. G (A) *Nelchinopsis kostromiensis* (R) *Oligosphaeridium complex* (thick-wall) (A) *Oligosphaeridium vasiformum* (F)
Remarks.	Organic recovery consists mainly of dinocysts.
T.A.I.	3.0 - 3.5

64) 98 JC 302-7

FORAMINIFERA

Age.	Early Cretaceous Probable Valanginian
Zone.	Probable F-13b
Environment.	Probable Neritic (Probable Shelf)

Fauna. *Ammobaculites erectus* (X)
Ammobaculites reophacoides (R)
Fish debris (R)
Rounded frosted quartz floaters (R)

Washed Lithology. Dark reddish-gray hematitic? shale.

PALYNOLOGY

Age. Early Cretaceous
Probable Valanginian

Zone. Probable P-M20

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (R)
?*Ellipsoidictyum* sp. (V)
Gonyaulacysta sp. G (R)
Oligosphaeridium complex (thick-wall) (F)
Oligosphaeridium vasiformum (F)

Remarks. Organic recovery consists mainly of dinocysts.

T.A.I. 3.0 - 3.5

65) 98 JC 302-8

FORAMINIFERA

Age. Early Cretaceous
Valanginian

Zone. F-13b

Environment. Middle to Outer Neritic
(Middle to Outer Shelf)

Fauna. *Ammobaculites reophacoides* (F)
Gaudryina leffingwelli (R)
Gaudryina milleri (F)
Haplophragmoides coronis (R)
Haplophragmoides duoflatis (R)
Trochammina instowensis (X)

Washed Lithology. Dark gray shale.

PALYNOLOGY

Age. Early Cretaceous
Valanginian

Zone. P-M20

Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (R) *Cyclonephelium cuculliforme* (R) ?*Gochteodinia villosa* (V) *Gonyaulacysta* cf. *G. hyalodermopsis* (R) *Gonyaulacysta* sp. G (A) *Nelchinopsis kostromiensis* (F) *Oligosphaeridium complex* (thick-wall) (R) *Oligosphaeridium vasiformum* (F)
Remarks.	Organic recovery consists mainly of dinocysts.
T.A.I.	3.0 - 3.5

66) 98 JC 302-9

FORAMINIFERA

Age.	Early Cretaceous Valanginian
Zone.	F-13b
Environment.	Middle to Outer Neritic (Middle to Outer Shelf)
Fauna.	*Ammobaculites erectus* (F) *Ammobaculites reophacoides* (F) *Bathysiphon scintillata* (C) *Gaudryina leffingwelli* (R) *Gaudryina milleri* (F) *Gaudryina tailleuri* (R) *Glomospirella arctica* (F) *Haplophragmoides coronis* (F) *Trochammina instowensis* (R)
Washed Lithology.	Dark gray shale.

PALYNOLOGY

Age.	Early Cretaceous Probable Valanginian
Zone.	Probable P-M20
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (R) ?*Cyclonephelium distinctum* (R) ?*Nelchinopsis kostromiensis* (R) *Tubotuberella apatela* (V)

Remarks. Organic recovery consists of dinocysts and woody-fusinitic material. Preservation is very poor.

T.A.I. 3.0 - 3.2

67) 98 JC 302-10

FORAMINIFERA

Age. Early Cretaceous
Valanginian

Zone. F-13b

Environment. Middle to Outer Neritic
(Middle to Outer Shelf)

Fauna. *Ammobaculites erectus* (F)
Ammobaculites reophacoides (F)
Bathysiphon scintillata (R)
Gaudryina leffingwelli (X)
Gaudryina milleri (R)
Glomospirella arctica (R)
Haplophragmoides coronis (R)

Washed Lithology. Dark reddish-gray hematitic? shale.

PALYNOLOGY

Age. Early Cretaceous
Valanginian

Zone. P-M20

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (R)
Deltoidospora spp. (R)
?*Apteodinium spongiosum* (F)
Cleistosphaeridium cf. sp. KE (F)
?*Ellipsoidictyum* sp. (F)
?*Gochteodinia villosa* (V)
Gonyaulacysta cf. *G. hyalodermopsis* (F)
Gonyaulacysta cf. *G. serrata* (R)
Oligosphaeridium complex (thick-wall) (F)
Oligosphaeridium vasiformum (A)
Tanyosphaeridium variecalamum (V)
Tubotuberella apatela (V)

Remarks. Organic recovery consists mainly of dinocysts.

T.A.I. 3.0 - 3.5

68) 98 JC 302-11

FORAMINIFERA

Age.	Early Cretaceous Valanginian
Zone.	F-13b
Environment.	Middle to Outer Neritic (Middle to Outer Shelf)
Fauna.	*Ammobaculites erectus* (F) *Ammobaculites reophacoides* (F) *Bathysiphon scintillata* (F) *Gaudryina leffingwelli* (F) *Gaudryina milleri* (C) *Gaudryina tailleuri* (R) *Haplophragmoides coronis* (F) *Trochammina instowensis* (R)
Washed Lithology.	Dark gray shale.

PALYNOLOGY

Age.	Early Cretaceous Valanginian
Zone.	P-M20
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (R) *Cleistosphaeridium* cf. sp. KE (F) *Gonyaulacysta* cf. *G. hyalodermopsis* (C) *Gonyaulacysta* sp. G (A) *Nelchinopsis kostromiensis* (R) *Oligosphaeridium complex* (thick-wall) (F)
Remarks.	Organic recovery consists mainly of dinocysts.
T.A.I.	3.0 - 3.5

69) 98 JC 302-12

FORAMINIFERA

Age.	Early Cretaceous Valanginian
Zone.	F-13b
Environment.	Middle to Outer Neritic

(Middle to Outer Shelf)

Fauna. *Ammobaculites erectus* (C)
Ammobaculites reophacoides (F)
Bathysiphon scintillata (R)
Gaudryina leffingwelli (R)
Gaudryina milleri (F)
Haplophragmoides coronis (R)
Trochammina instowensis (R)

Washed Lithology. Dark gray shale.

PALYNOLOGY

Age. Early Cretaceous
Valanginian

Zone. P-M20

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (F)
Gochteodinia villosa (R)
Gonyaulacysta cf. *G. serrata* (R)
Gonyaulacysta sp. G (A)
?*Hystrichodinium lanceatum* Davies (V) *****
Nelchinopsis kostromiensis (F)
Oligosphaeridium complex (thick-wall) (C)
Oligosphaeridium vasiformum (F)
Sirmiodinium grossi (R)
Tanyosphaeridium variecalamum (F)
Wallodinium luna (F)

Remarks. Organic recovery consists mainly of dinocysts.

T.A.I. 3.0 - 3.5

70) 98 MU 7-1

FORAMINIFERA

Age. Probable Early Cretaceous
Probable Barremian

Zone. Probable F-12

Environment. Distal
(Starved Basin)

Fauna. Barren of Foraminifera.
Rounded frosted quartz floaters (F)

Washed Lithology. Black slickensided shale.

Discussion. Age based on lithology only.

PALYNOLOGY

Age. Early Cretaceous
Probable Barremian to Aptian

Zone. Probable P-M18a

Environment. Marine

Palynomorphs. *Cleistosphaeridium* spp. (R)
Cyclonephelium distinctum (R)
Gardodinium deflandrei (C)
?*Odontochitina operculata* (frags) (R)
Oligosphaeridium complex (C)
?*Spiniferites* sp. (v)

Remarks. Organic recovery consists mainly of dinocysts. All poorly preserved.

T.A.I. 2.3 - 2.5

71) 98 MU 7-3

FORAMINIFERA

Age. Indeterminate

Environment. Indeterminate

Fauna. Barren of Foraminifera.
Gypsum (C)
Pyrite (R)

Washed Lithology. Dark gray shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian to Kimmeridgian

Zones. P-M22 to P-M21

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (F)
Chytroeisphaeridia pericompsa (R)
Pareodinia ceratophora (C)
Pareodinia osmingtonensis (C)
Sirmiodinium grossi (C)
Tubotuberella apatela (R)

Remarks. Organic recovery consists of 50% woody-fusinitic material and 50% palynomorphs.

The dinocyst assemblage has an overall age range of Oxfordian to Kimmeridgian. However, based on the absence of Oxfordian age-restrictive species, a Kimmeridgian age may be appropriate.

T.A.I. 2.3 - 2.5

72) 98 MU 8

FORAMINIFERA

Age. Early Cretaceous
Valanginian to Hauterivian

Zones. F-13a to F-13b

Environment. Middle to Outer Neritic
(Middle to Outer Shelf)

Fauna. *Ammobaculites erectus* (F)
Bathysiphon granulocoelia (F)
Gaudryina tailleuri (R)
Glomospira subarctica (R)
Glomospirella arctica (F)
Haplophragmoides duoflatis (R)
Rounded frosted quartz floaters (R)

Washed Lithology. Dark gray very fine grained shaly sandstone or siltstone.

PALYNOLOGY

Age. Probable Early Cretaceous
Undifferentiated

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (R)
Cyclonephelium distinctum (F)
Oligosphaeridium complex (R)
Oligosphaeridium complex (thick-wall) (V)

Remarks. Relatively sparse recovery. The organics consist mainly of woody-fusinitic material. All are poorly preserved.

T.A.I. 2.5 - 3.0

73) 98 MU 8-1

FORAMINIFERA

Age. Late Jurassic
Probable Oxfordian

Zone.	Probable F-16b
Environment.	Outer Neritic to Upper Bathyal (Outer Shelf to Upper Slope)
Fauna.	*Ammobaculites alaskensis* (C) *Ammobaculites barrowensis* (R) *Ammodiscus asperus* (X) arenaceous spp. (large-coarse) (C) *Bathysiphon anomalocoelia* (F) *Gaudryina leffingwelli* (C) *Gaudryina milleri* (F) *Haplophragmoides canui* (F) *Haplophragmoides* spp. (C) *Trochammina rostovzevi* (F) Rounded frosted quartz floaters (R)
Washed Lithology.	Dark gray slightly sandy shale.

PALYNOLOGY

Age.	Indeterminate
Environment.	Indeterminate
Palynomorphs.	Barren of palynomorphs.
Remarks.	The organic recovery consists mainly of woody-fusinitic material.
T.A.I.	2.5?

74) 98 MU 8-2

FORAMINIFERA

Age.	Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Outer Neritic to Upper Bathyal (Outer Shelf to Upper Slope)
Fauna.	*Ammodiscus asperus* (X) arenaceous spp. (large-coarse) (R) *Bathysiphon anomalocoelia* (F) *Gaudryina leffingwelli* (C) *Gaudryina milleri* (F) *Haplophragmoides* spp. (F) *Trochammina instowensis* (R) Pyrite (F)
Washed Lithology.	Dark gray slightly silty shale.

PALYNOLOGY

Age.	Possible Late Jurassic Possible Oxfordian to Kimmeridgian
Zones.	P-M22? to P-M21?
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (F) *Deltoidospora* spp. (R) ?*Foveosporites* sp. (C) *Lycopodiumsporites* sp. (R) ?*Gonyaulacysta hyalodermopsis* (V) *Sirmiodinium grossi* (R) ?*Tubotuberella apatela* (V) Scolecodont (V)
Remarks.	The organic recovery consists mainly of palynomorphs. All poorly preserved.
T.A.I.	3.0

75) 98 MU 8-3

FORAMINIFERA

Age.	Late Jurassic to Early Cretaceous Undifferentiated
Environment.	Marine (Undiff.)
Fauna.	*Bathysiphon* sp. (F) *Haplophragmoides* spp. (R) Pyrite (R)
Washed Lithology.	Dark gray shale.

PALYNOLOGY

Age.	Possible Early Cretaceous Possible Valanginian
Zone.	P-M20?
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (R) ?*Foveosporites* sp. (R) *Lycopodiumsporites* sp. (R) ?*Clathroctenocystis elegans* (V)
Remarks.	Very sparse organic recovery.

This is a very tenuous age assignment, based on a single, questionable dinocyst specimen.

T.A.I. 3.0

76) 98 MU 8-4

FORAMINIFERA

Age. Late Jurassic
Probable Oxfordian

Zone. Probable F-16b

Environment. Probable Outer Neritic to Upper Bathyal
(Probable Outer Shelf to Upper Slope)

Fauna. *Ammodiscus orbis* (R)
Bathysiphon anomalocoelia (F)
Gaudryina leffingwelli (R)
Gaudryina tailleuri (X)
Haplophragmoides spp. (R)
Pyrite (F)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Late Jurassic
Oxfordian to Kimmeridgian

Zones. P-M22 to P-M21

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (F)
Gonyaulacysta jurassica (V)
Pareodinia ceratophora (C)
Pareodinia osmingtonensis (A)
Sirmiodinium grossi (A)

Remarks. Organic recovery consists mainly of dinocysts.

The dinocyst assemblage has an overall age range of Oxfordian to Kimmeridgian. However, based on the absence of Oxfordian age-restrictive species, a Kimmeridgian age may be appropriate.

T.A.I. 3.0

77) 98 MU 8-5

FORAMINIFERA

Age.	Late Jurassic Probable Oxfordian
Zone.	Probable F-16b
Environment.	Probable Outer Neritic to Upper Bathyal (Probable Outer Shelf to Upper Slope)
Fauna.	*Gaudryina tailleuri* (X) *Haplophragmoides* spp. (F) *Trochammina instowensis* (X) *Trochamminoides* sp. (small, thin) (R) Fish debris (R) Pyrite (R)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Late Jurassic Oxfordian to Kimmeridgian
Zones.	P-M22 to P-M21
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (F) *Gleicheniidites senonicus* (R) ?*Chytroeisphaeridia "granulosa"* (F) *Chytroeisphaeridia pericompsa* (F) *Gonyaulacysta jurassica* (F) *Pareodinia alaskensis* (A) *Pareodinia ceratophora* (C) *Pareodinia osmingtonensis* (F) *Sirmiodinium grossi* (A) *Tubotuberella apatela* (V)
Remarks.	Organic recovery consists mainly of dinocysts. The dinocyst assemblage has an overall age range of Oxfordian to Kimmeridgian. The presence of the form *Chytroeisphaeridia "granulosa"*, although questionable in this sample, is generally found in Oxfordian age strata.
T.A.I.	2.8 - 3.0

78) 98 MU 9

FORAMINIFERA

Age.	Early Cretaceous Valanginian to Hauterivian

Zones.	F-13a to F-13b
Environment.	Middle to Outer Neritic (Middle to Outer Shelf)
Fauna.	*Ammobaculites erectus* (F) *Bathysiphon granulocoelia* (F) *Gaudryina tailleuri* (R) *Glomospira subarctica* (R) *Glomospirella arctica* (R) *Haplophragmoides duoflatis* (R)
Washed Lithology.	Dark brownish-gray siltstone or silty shale.

PALYNOLOGY

Age.	Early Cretaceous Neocomian
Zones.	P-M20 to P-M19
Environment.	Marine
Palynomorphs.	?*Gardodinium trabeculosum* (V) poorly preserved *Gonyaulacysta* sp. (small) (V) *Oligosphaeridium complex* (thick-wall) (C) *Sentusidinium rioultii* (R)
Remarks.	Organic recovery sparse, consisting mainly of thick woody-fusinitic material.
T.A.I.	3.0 - 3.5

79) 98 MU 9-1

FORAMINIFERA

Age.	Late Jurassic to Early Cretaceous Oxfordian to Barremian
Zones.	F-12 to F-16b
Environment.	Marine (Undiff.)
Fauna.	arenaceous spp. (X) Rounded frosted quartz floaters (C)
Washed Lithology.	Dark gray to black slightly sandy shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Indeterminate

Environment.	Indeterminate
Palynomorphs.	Barren of palynomorphs.
Remarks.	Very sparse organic recovery. Mainly woody-fusinitic material.
T.A.I.	3.0+

80) 98 MU 12

FORAMINIFERA

Age.	Late Jurassic to Early Cretaceous Oxfordian to Barremian
Zones.	F-12 to F-16b
Environment.	Indeterminate
Fauna.	Barren of Foraminifera. Rounded frosted quartz floaters (F)
Washed Lithology.	Black shale.
Discussion.	Age based on lithology only.

PALYNOLOGY

Age.	Early Cretaceous Possible Hauterivian
Zone.	P-M19?
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (F) *Cicatricosisporites* sp. (V) *Gleicheniidites senonicus* (R) Taxodiaceae (R) *Gardodinium deflandrei* (F) ?*Gardodinium trabeculosum* (R) *Sirmiodinium grossi* (V) *Spiniferites* spp. (R) *Pterospermopsis* sp. (F)
Remarks.	Organic recovery consists mainly of palynomorphs. Preservation is very poor.
T.A.I.	2.3 - 2.5

81) 98 MU 14-1

FORAMINIFERA

Age.	Indeterminate
Environment.	Indeterminate
Fauna.	Barren of Foraminifera.
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Indeterminate
Environment.	Indeterminate
Palynomorphs.	Indeterminate spore(?) (R)
Remarks.	Organic recovery consists of thick, woody-fusinitic material.
T.A.I.	3.0

82) 98 MU 24

FORAMINIFERA

Age.	Probable Early Cretaceous Possible Hauterivian to Aptian
Zones.	F-11? to F-13a?
Environment.	Possible Middle to Outer Neritic (Possible Middle to Outer Shelf)
Fauna.	*Marginulinopsis collonsi* (X)
Washed Lithology.	Dark brownish-gray silty micaceous shale.

PALYNOLOGY

Age.	Early Cretaceous Neocomian
Zones.	P-M20 to P-M19
Environment.	Marine
Palynomorphs.	?*Cyclonephelium cuculliforme* (C) *Cyclonephelium distinctum* (F) *Oligosphaeridium complex* (thick-wall) (A) *Pterospermopsis* sp. (C)
Remarks.	Organic recovery consists of about 50% woody-fusinitic material and 50% dinocysts. Total recovery relatively sparse. Palynomorphs are very poorly preserved.
T.A.I.	2.5 - 3.0

83) 98 MU 24-1

FORAMINIFERA

Age.	Early Cretaceous Possible Hauterivian to Barremian
Zones.	F-12? to F-13a?
Environment.	Marine (Undiff.)
Fauna.	*Haplophragmoides coronis* (X) Rounded frosted quartz floaters (R)
Washed Lithology.	Dark gray micaceous? shale.

PALYNOLOGY

Age.	Early Cretaceous Probable Neocomian
Zones.	Probable P-M20 to P-M19
Environment.	Marine
Palynomorphs.	?*Gleicheniidites senonicus* (R) ?*Semiretisporis* sp. (V) ***** *Cyclonephelium distinctum* (R) *Oligosphaeridium complex* (R) *Oligosphaeridium complex* (thick-wall) (F) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists of about 60% woody-fusinitic material and 40% palynomorphs. All palynomorphs are very poorly preserved.
T.A.I.	2.5

84) 98 MU 34

FORAMINIFERA

Age.	Early Cretaceous Probable Hauterivian to Barremian
Zones.	Probable F-12 to F-13a
Environment.	Probable Neritic (Probable Shelf)
Fauna.	*Ammobaculites erectus* (R) *Ammodiscus* sp. (very small) (C) *Bathysiphon scintillata* (C) *Haplophragmoides coronis* (F) *Haplophragmoides duoflatis* (R)

Haplophragmoides excavatus (R)

Washed Lithology. Dark gray slightly sandy micaceous? shale.

PALYNOLOGY

Age. Cretaceous
Undifferentiated

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Cicatricosisporites sp. (V)
Deltoidospora spp. (R)
Densosporites spp. (F) *****
Gleicheniidites senonicus (R)
Taeniaesporites sp. (V)
Cyclonephelium distinctum (R)
Odontochitina operculata (R)
Oligosphaeridium complex (R)

Remarks. Organic recovery consists of about 50% woody-fusinitic material and 50% palynomorphs.

T.A.I. 2.3 - 2.5

85) 98 MU 38

FORAMINIFERA

Age. Indeterminate

Environment. Indeterminate

Fauna. Barren of Foraminifera.
Gypsum (C)

Washed Lithology. Dark gray to black shale.

PALYNOLOGY

Age. Probable Early Cretaceous
Probable Barremian to Aptian

Zones. Probable P-M18a to P-M18

Environment. Marine

Palynomorphs. ?*Cyclonephelium distinctum* (F)
Oligosphaeridium complex (A)

Remarks. Organic recovery consists mainly of dinocysts and some corroded amorphous(?) material. All organics are very poorly preserved.

T.A.I. 3.0+

86) 98 MU 39

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian
Zone.	Probable F-12
Environment.	Marine (Undiff.)
Fauna.	*Haplophragmoides excavatus* (X) Gypsum (F) Rounded frosted quartz floaters (R)
Washed Lithology.	Dark gray iron-stained bentonitic? shale.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Barremian to Aptian
Zones.	Probable P-M18a to P-M18
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) ?*Cyclonephelium distinctum* (C) *Gardodinium deflandrei* (R) *Gardodinium trabeculosum*? (V) *Odontochitina operculata* (F) *Oligosphaeridium complex* (A) ?*Sirmiodinium grossi* (V) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists mainly of dinocysts and some corroded amorphous(?) material. All organics are very poorly preserved.
T.A.I.	2.5 - 3.0

87) 98 MU 39-1

FORAMINIFERA

Age.	Indeterminate
Environment.	Indeterminate
Fauna.	Barren of Foraminifera. Gypsum (F)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Indeterminate
Environment.	Indeterminate
Palynomorphs.	*Pterospermopsis* sp. (F)
Remarks.	Organic recovery is sparse and consists mainly of herbaceous material.
T.A.I.	3.0 - 3.5

88) 98 HA 126

FORAMINIFERA

Age.	Probable Late Jurassic Probable Oxfordian to Kimmeridgian
Zones.	Probable F-16a to F-16b
Environment.	Probable Outer Neritic to Upper Bathyal (Probable Outer Shelf to Upper Slope)
Fauna.	*Ammobaculites barrowensis* (R) *Ammodiscus asperus* (R) *Cenosphaera* spp. (pyritized) (C) *Haplophragmoides* spp. (C) *Lenticulina* cf. *prima* (X) *Lithocampe* spp. (pyritized) (F) *Patulibracchium* sp. (pyritized) (F) *Rhopalastrum* sp. (pyritized) (R) *Spongodiscus* spp. (pyritized) (F) *Stichomitra* sp. (pyritized) (R) *Trochammina instowensis* (R) *Trochammina kosyrevae* (R) *Trochamminoides* sp. (small, thin) (F) Pyrite (R) Pyrite sticks (F)
Washed Lithology.	Dark gray to black shale.
Discussion.	Similar assemblage previously found in Alaska Peninsula only.

PALYNOLOGY

Age.	Indeterminate
Environment.	No evidence of marine.
Palynomorphs.	?*Classopollis* sp. (R) *Densosporites* spp. (R) Indeterminate spores, small, poorly preserved (A)

Remarks. Organic recovery consists mainly of thick, woody-fusinitic material.

T.A.I. 3.5?

89) 98 HA 129

FORAMINIFERA

Age. Probable Late Jurassic
Probable Oxfordian to Kimmeridgian

Zones. Probable F-16a to F-16b

Environment. Probable Middle Neritic to Upper Bathyal
(Probable Middle Shelf to Upper Slope)

Fauna. *Ammodiscus asperus* (X)
Bathysiphon anomalocoelia (R)
Cenosphaera spp. (pyritized) (F)
Gaudryina milleri (R)
Gaudryina tailleuri (R)
Haplophragmoides spp. (F)
Lenticulina audax (X)
Lithocampe sp. (pyritized) (X)
Spongodiscus spp. (pyritized) (R)
Trochammina rostovzevi (X)
Pyrite sticks (F)

Washed Lithology. Dark gray slickensided shale.

Discussion. Similar assemblage previously found in Alaska Peninsula only.

PALYNOLOGY

Age. Indeterminate

Environment. Marine?

Palynomorphs. Undifferentiated bisaccates (F)
Lycopodiumsporites sp. (V)
?*Osmundacidites* sp. (R)
Indeterminate thin-wall cyst (A)
?*Pareodinia* sp. (V)

Remarks. Organic recovery consists mainly of herbaceous material.

T.A.I. 3.5

90) 98 RR 185B

FORAMINIFERA

Age.	Early Cretaceous Probable Barremian to Aptian
Zones.	Probable F-11 to F-12
Environment.	Marine (Undiff.)
Fauna.	*Bathysiphon scintillata* (F) *Thuramminoides* sp. (X)
Washed Lithology.	Dark brownish-gray shale.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Aptian to Albian
Zones.	Probable P-M18 to P-M17
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Densosporites* spp. (F) ***** *Lycopodiumsporites* spp. (R) *Taeniaesporites* sp. (V) ***** *Cyclonephelium distinctum* (F) *Gardodinium deflandrei* (V) *Gardodinium trabeculosum* (R) ***** *Imbatodinium jaegeri* (R) *Muderongia* sp. 5 (V) *Odontochitina operculata* (V) *Oligosphaeridium complex* (R) *Oligosphaeridium complex* (thick-wall) (R) ***** *Sverdrupiella usitata* (R) ***** *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists mainly of woody-fusinitic material with about 40% palynomorphs. All organics are poorly preserved.
T.A.I.	2.5+

91) 98 RR 186B

FORAMINIFERA

Age.	Indeterminate
Environment.	Indeterminate
Fauna.	Barren of Foraminifera. Tar (F)
Washed Lithology.	Dark brownish-gray very fine grained shaly sandstone or siltstone.

PALYNOLOGY

Age.	Probable Early Cretaceous Probable Aptian to Albian
Zones.	Probable P-M18 to P-M17
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Classopollis classoides* (R) *Densosporites* spp. (R) ***** *Endosporites* sp. (V) ***** *Gleicheniidites senonicus* (R) *Lycopodiumsporites* spp. (R) *Taeniaesporites* sp. (V) ***** *Cyclonephelium distinctum* (F) *Gardodinium trabeculosum* (V) ***** *Odontochitina operculata* (R) *Oligosphaeridium complex* (F) *Oligosphaeridium complex* (thick-wall) (F) ***** *Pseudoceratium polymorphum* (V) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists of equal quantities of woody-fusinitic and herbaceous (palynomorphs) material.
T.A.I.	2.5+

92) 98 RR 197C

FORAMINIFERA

Age.	Indeterminate
Environment.	Indeterminate
Fauna.	Barren of Foraminifera. Tar (F)
Washed Lithology.	Dark brownish-gray very fine grained micaceous sandstone or siltstone.

PALYNOLOGY

Age.	Indeterminate
Environment.	Marine?
Palynomorphs.	*Oligosphaeridium complex* (thick-wall) (V) *****
Remarks.	Organic recovery consists mainly of thick, woody-fusinitic material.
T.A.I.	2.5?

93) 98 RR 240B

FORAMINIFERA

Age.	Early Cretaceous Possible Barremian to Aptian
Zones.	F-11? to F-12?
Environment.	Middle Neritic to Upper Bathyal (Middle Shelf to Upper Slope)
Fauna.	*Ammodiscus* sp. (very small) (X) *Bathysiphon scintillata* (R) *Gaudryina tailleuri* (X) *Marginulinopsis reiseri* (X)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Indeterminate
Environment.	No evidence of marine.
Palynomorphs.	*Densosporites* spp. (R) ***** *Gleicheniidites senonicus* (R) Indeterminate spores (F) *Lycopodiumsporites* sp. (V)
Remarks.	Organic recovery consists mainly of thick, woody-fusinitic material. All poorly preserved.
T.A.I.	3.0 - 3.5

94) 98 RR 250

FORAMINIFERA

Age.	Early Cretaceous Possible Barremian to Aptian
Zones.	F-11? to F-12?
Environment.	Marine (Undiff.)
Fauna.	*Thuramminoides* sp. (X)
Washed Lithology.	Dark gray to black shale.

PALYNOLOGY

Age.	Indeterminate
Environment.	Marginal Marine
Palynomorphs.	Undifferentiated bisaccates (R) *Densosporites* spp. (V) ***** Scolecodont (V)
Remarks.	Organic recovery consists mainly of thick, woody-fusinitic material.
T.A.I.	3.0 - 3.5

95) 98 RR 251A

FORAMINIFERA

Age.	Early Cretaceous Possible Barremian to Aptian
Zones.	F-11? to F-12?
Environment.	Marine (Undiff.)
Fauna.	*Bathysiphon scintillata* (C)
Washed Lithology.	Dark brownish-gray siltstone.

PALYNOLOGY

Age.	Indeterminate
Environment.	No evidence of marine.
Palynomorphs.	Indeterminate spore fragments (R)
Remarks.	Organic recovery consists mainly of thick, woody-fusinitic material.
T.A.I.	2.5 - 3.0

96) 98 DL 137-4

FORAMINIFERA

Age.	Late Cretaceous Probable Cenomanian
Zone.	Probable F-8
Environment.	Probable Neritic (Probable Shelf)
Fauna.	*Haplophragmoides bonanzaensis* (F) *Haplophragmoides rota* (C) *Saccammina lathrami* (F) *Saccammina* sp. (large, thick) (F)

Spiroplectammina webberi (X)
Trochammina ribstonensis (F)
Trochammina rutherfordi (F)
Trochammina whittingtoni (C)
Verneuilinoides fischeri (C)

Washed Lithology. Dark gray very fine grained sandstone or siltstone.

PALYNOLOGY

Age. Late Cretaceous
Undifferentiated

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (F)

Cicatricosisporites cf. *C. venustus* (R)
Lycopodiumsporites spp. (R)
Taxodiaceae (A)
Chatangiella sp. (R)
Hystrichodinium pulchrum (R)
Imbatodinium jaegeri (R)
Isabelidinium acuminatum (R)
Spiniferites ramosus (F)
Xenascus ceratioides (V)
Pterospermopsis sp. (R)

Remarks. Organic recovery consists mainly of palynomorphs with about 25% woody-fusinitic material.

The presence of *Xenascus ceratioides* in the assemblage places a pre-Maestrichtian, Cretaceous age limitation on this sample.

T.A.I. 2.3 - 2.5

PALYNOMORPHS ONLY RESULTS
(33 Samples)

97) 98 JC 300-21

PALYNOLOGY

Age. Indeterminate

Environment. No evidence of marine.

Palynomorphs. ?*Dulhuntyispora minuta* (V) *****
Hymenozonotriletes lepidophytus (V) *****
?*Lycospora* sp. (V) *****
Indeterminate spinotrilete spore (R)

?*Taeniaesporites* sp. (V) *****

Remarks. Organic recovery consists mainly of woody-fusinitic material. All material is poorly preserved.

The few spores identified appear to be Paleozoic and Permo-Triassic forms. All of these are presumed to be reworked specimens.

T.A.I. 2.5+

98) 98 JC 300-13

PALYNOLOGY

Age. Late Jurassic to Early Cretaceous
Undifferentiated

Environment. No evidence of marine.

Palynomorphs. *Deltoidospora juncta* (V)
Densosporites sp. (V) *****
Indeterminate spores/spore frags (F) poorly preserved
?*Rogalskaisporites cicatricosus* (V)

Remarks. The organic recovery consists mainly of woody-fusinitic material. All poorly preserved.

T.A.I. 2.5 - 3.0+

99) 98 JC 300-3

PALYNOLOGY

Age. Probable Jurassic to Cretaceous
Undifferentiated

Environment. No evidence of marine.

Palynomorphs. ?Undifferentiated bisaccates (R)
Densosporites spp. (F) *****
?*Gleicheniidites senonicus* (R)

Indeterminate spores/spore frags (C) poorly preserved

Remarks. The organic recovery consists mainly of woody-fusinitic material. All very poorly preserved.

T.A.I. 2.5 - 3.0

100) 98 JC 301-13

PALYNOLOGY

Age. Cretaceous
Undifferentiated

Environment.	Marine
Palynomorphs.	*Cleistosphaeridium* sp. (V) *Oligosphaeridium complex* (R)
Remarks.	The organic recovery consists mainly of woody-fusinitic material.
T.A.I.	2.3

101) 98 JC 301-11

PALYNOLOGY

Age.	Early Cretaceous Probable Aptian to Albian
Zones.	Probable P-M18 to P-M17
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Densosporites* spp. (F) ***** *Endosporites* sp. (V) ***** *Gleicheniidites senonicus* (R) *Rogalskaisporites cicatricosus* (V) *Taeniaesporites* sp. (V) ***** *Cyclonephelium cuculliforme* (R) *Cyclonephelium distinctum* (R) *Gardodinium deflandrei* (R) *Odontochitina operculata* (R) *Oligosphaeridium complex* (F) *Oligosphaeridium complex* (thick-wall) (V) ***** ?*Pseudoceratium polymorphum* (V) fragment *Sentusidinium rioultii* (R) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists mainly of palynomorphs with about 30% woody-fusinitic material.
T.A.I.	2.3 - 2.5+

102) 98 JC 301-9

PALYNOLOGY

Age.	Early Cretaceous Aptian to Albian
Zones.	P-M18 to P-M17
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A)

Densosporites spp. (R) *****
Podocarpidites sp. (V)
Taxodiaceae (R)
Gardodinium deflandrei (F)
Gardodinium trabeculosum (R)
Micrhystridium spp. (R)
?*Muderongia* sp. 5 (R)
Odontochitina operculata (F)
Oligosphaeridium complex (F)
Oligosphaeridium complex (thick-wall) (V) *****
Palaeoperidinium cretaceum (R)
Veryhachium spp. (R)

Remarks. Organic recovery consists of equal parts palynomorphs and woody-fusinitic material.
Some of the specimens questionably assigned to *Muderongia* sp. 5 have characteristics approaching *Nektercysta*, an Albian dinocyst described from the western interior of the United States.

T.A.I. 2.3 - 2.5

103) 98 JC 301-4

PALYNOLOGY

Age. Early Cretaceous
Probable Aptian to Albian

Zones. Probable P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (C)
Deltoidospora spp. (R)
Densosporites spp. (F) *****
Lycopodiumsporites spp. (R)
Cyclonephelium distinctum (F)
Gardodinium deflandrei (R)
Odontochitina operculata (R)
Oligosphaeridium complex (thick-wall) (V) *****
Veryhachium spp. (R)
Pterospermopsis sp. (V)

Remarks. Organic recovery consists mainly of woody-fusinitic material and about 20% palynomorphs.

T.A.I. 2.3 - 2.5

104) 98 JC 301-3

PALYNOLOGY

Age.	Early Cretaceous Probable Aptian to Albian
Zones.	Probable P-M18 to P-M17
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Deltoidospora* spp. (R) *Densosporites* spp. (R) ***** *Lycopodiumsporites* spp. (R) *Rogalskaisporites cicatricosus* (V) *Vittatina* sp. (V) ***** *Cyclonephelium cuculliforme* (R) *Cyclonephelium distinctum* (R) *Odontochitina operculata* (R) *Oligosphaeridium complex* (R) *Parvocysta cracens* (V) ***** *Sverdrupiella usitata* (V) ***** *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists mainly of woody-fusinitic material with about 20% palynomorphs.
T.A.I.	2.3 - 2.5

105) 98 MU 3

PALYNOLOGY

Age.	Early Cretaceous Aptian to Albian
Zones.	P-M18 to P-M17
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Cicatricosisporites* sp. (V) *Densosporites* spp. (F) ***** *Lycopodiumsporites* spp. (R) *Taeniaesporites* sp. (V) ***** *Cleistosphaeridium* spp. (R) *Cyclonephelium distinctum* (R) *Gardodinium deflandrei* (R) *Gardodinium trabeculosum* (V) *Muderongia* sp. 5 (R) *Muderongia* sp. (R) *Odontochitina operculata* (R) *Oligosphaeridium complex* (F)

Oligosphaeridium complex (thick-wall) (R) *****
Sentusidinium rioultii (R)
Pterospermopsis sp. (R)

Remarks. Organic recovery consists mainly of palynomorphs with about 20% woody-fusinitic material.
Some of the specimens assigned to *Muderongia* sp. 5 have characteristics approaching *Nektercysta*, an Albian dinocyst described from the western interior of the United States.

T.A.I. 2.3 - 2.5

106) 98 MU 4

PALYNOLOGY

Age. Early Cretaceous
Aptian to Albian

Zones. P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Densosporites spp. (F) *****
Lycopodiumsporites spp. (R)
Cyclonephelium distinctum (R)
Gonyaulacysta sp. G (V) *****
Muderongia sp. 5 (V)
Muderongia sp. (R)
Odontochitina operculata (R)
Oligosphaeridium complex (F)
Oligosphaeridium complex (thick-wall) (R) *****
Pterospermopsis sp. (R)

Remarks. Organic recovery consists mainly of palynomorphs with about 20% woody-fusinitic material. All very poorly preserved.

T.A.I. 2.3 - 2.5

107) 98 MU 4-1

PALYNOLOGY

Age. Early Cretaceous
Probable Aptian to Albian

Zones. Probable P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Deltoidospora spp. (F)
Densosporites spp. (F) *****
Lycopodiumsporites spp. (R)

Taeniaesporites sp. (V) *****
Striatites richteri (V) *****
Cyclonephelium distinctum (R)
Gardodinium deflandrei (R)
Gardodinium trabeculosum (R) *****
Imbatodinium jaegeri (V)
Micrhystridium sp. (V)
Odontochitina operculata (R)
Oligosphaeridium complex (R)
Oligosphaeridium complex (thick-wall) (V) *****
Pterospermopsis sp. (R)

Remarks. Organic recovery consists mainly of palynomorphs with about 20% woody-fusinitic material. All very poorly preserved.

T.A.I. 2.3 - 2.5

108) 98 MU 10

PALYNOLOGY

Age. Indeterminate

Environment. No evidence of marine.

Palynomorphs. *Densosporites* spp. (F) *****

Remarks. Organic recovery consists mainly of woody-fusinitic material.

T.A.I. 2.5?

109) 98 MU 17

PALYNOLOGY

Age. Cretaceous
Undifferentiated

Environment. Marginal Marine?

Palynomorphs. *Classopollis classoides* (V)
Densosporites spp. (F) *****
Gleicheniidites senonicus (R)
Microdinium opacum (R)

Remarks. Organic recovery consists mainly of woody-fusinitic material.

T.A.I. 2.5? - 3.5

110) 98 MU 21

PALYNOLOGY

Age. Cretaceous
Undifferentiated

Environment. Marginal Marine?

Palynomorphs. Undifferentiated bisaccates (R)
Densosporites spp. (F) *****
Microdinium opacum (R)

Remarks. Organic recovery consists mainly of woody-fusinitic material.

T.A.I. 3.0 - 3.5

111) 98 MU 29

PALYNOLOGY

Age. Early Cretaceous
Probable Aptian to Albian

Zones. Probable P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (C)
Densosporites spp. (R) *****
Gleicheniidites senonicus (R)
Striatites richteri (V) *****
Cribroperidinium edwardsi (V)
Cyclonephelium distinctum (F)
Gardodinium deflandrei (R)
Imbatodinium jaegeri (R)
Odontochitina operculata (R)
Oligosphaeridium complex (F)
Oligosphaeridium complex (thick-wall) (R) *****
Palaeoperidinium cretaceum (F)
Pterospermopsis sp. (R)

Remarks. Organic recovery consists mainly of palynomorphs with about 20% woody-fusinitic material.

T.A.I. 2.3 - 2.5

112) 98 HA 106

PALYNOLOGY

Age. Probable Early Cretaceous
Possible Aptian to Albian

Zones. P-M18? to P-M17?

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Cicatricosisporites sp. (V)
Densosporites spp. (R) *****

Gleicheniidites senonicus (V)
?*Gardodinium deflandrei* (V)
Oligosphaeridium complex (R)
Oligosphaeridium complex (thick-wall) (R) *****
Pterospermopsis sp. (R)

Remarks. Organic recovery consists of equal quantities of palynomorphs and woody-fusinitic material. All poorly preserved.

T.A.I. 2.5

113) 98 HA 145

PALYNOLOGY

Age. Probable Early Cretaceous
Possible Aptian to Albian

Zones. P-M18? to P-M17?

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (F)
Densosporites spp. (R) *****
Endosporites sp. (V) *****
Kraeuselisporites sp. (V) *****
Cyclonephelium distinctum (R)
Oligosphaeridium complex (V)
Oligosphaeridium complex (thick-wall) (V) *****
Sentusidinium rioultii (V)

Remarks. Organic recovery consists mainly of woody-fusinitic material and about 30% palynomorphs. All very poorly preserved.

T.A.I. 2.3 - 2.5

114) 98 HA 146

PALYNOLOGY

Age. Early Cretaceous
Probable Aptian to Albian

Zones. Probable P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (F)
Densosporites spp. (R) *****
Gleicheniidites senonicus (R)
Rogalskaisporites cicatricosus (V)
Gardodinium deflandrei (V)
?*Nelchinopsis kostromiensis* (V) *****

Odontochitina operculata (R)
Oligosphaeridium complex (F)
Palaeoperidinium cretaceum (V)

Remarks. Organic recovery consists mainly of palynomorphs.

T.A.I. 2.3 - 2.5

115) 98 RR 103A

PALYNOLOGY

Age. Early Cretaceous
Aptian to Albian

Zones. P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Densosporites spp. (F) *****
Gleicheniidites senonicus (R)
Cyclonephelium distinctum (F)
Gardodinium deflandrei (V)
Gonyaulacysta sp. G (V) *****
Hystrichosphaeridium stellatum (V)
Imbatodinium jaegeri (V)
Muderongia sp. 5 (R)
Nannoceratopsis pellucida (R) *****
Odontochitina operculata (R)
Oligosphaeridium complex (R)
Oligosphaeridium complex (thick-wall) (R) *****
Palaeoperidinium cretaceum (F)
Pterospermopsis sp. (R)

Remarks. Organic recovery consists of about 60% woody-fusinitic material and 40% palynomorphs.

T.A.I. 2.3 - 2.5

116) 98 RR 106B

PALYNOLOGY

Age. Early Cretaceous
Probable Aptian to Albian

Zones. Probable P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Deltoidospora spp. (R)

Imbatodinium jaegeri (V)
Muderongia sp. (V)
Odontochitina operculata (V)
Oligosphaeridium complex (R)
Palaeoperidinium cretaceum (F)
Spiniferites sp. (V)
Pterospermopsis sp. (R)

Remarks. Organic recovery consists of about equal quantities of woody-fusinitic material and palynomorphs.

T.A.I. 2.3 - 2.5

117) 98 RR 139D

PALYNOLOGY

Age. Early Cretaceous
Aptian to Albian

Zones. P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Densosporites spp. (R) *****
Cyclonephelium distinctum (R)
Muderongia sp. 5 (R)
Oligosphaeridium complex (R)
Oligosphaeridium complex (thick-wall) (V) *****
Palaeoperidinium cretaceum (V)

Remarks. Organic recovery consists of about 60% woody-fusinitic material and 40% palynomorphs.

T.A.I. 2.3 - 2.5

118) 98 RR 182C

PALYNOLOGY

Age. Early Cretaceous
Aptian to Albian

Zones. P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Densosporites spp. (R) *****
Gleicheniidites senonicus (R)
Gardodinium deflandrei (V)
Muderongia sp. (V)

Muderongia sp. 5 (R)
Odontochitina operculata (R)
Oligosphaeridium complex (R)
Oligosphaeridium complex (thick-wall) (R) *****
Palaeoperidinium cretaceum (F)
Spinidinium sp. (V)

Remarks. Organic recovery consists of about equal quantities of woody-fusinitic material and palynomorphs.

T.A.I. 2.3 - 2.5

119) 98 RR 204C

PALYNOLOGY

Age. Indeterminate

Environment. No evidence of marine.

Palynomorphs. *Osmundacidites* sp. (V)

Remarks. Organic recovery consists mainly of woody-fusinitic material.

T.A.I. 2.5?

120) 98 RR 253C

PALYNOLOGY

Age. Probable Early Cretaceous
Probable Aptian to Albian

Zones. Probable P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Densosporites spp. (R) *****
Cyclonephelium distinctum (R)
Gardodinium trabeculosum? (V)
Odontochitina operculata (V)
Oligosphaeridium complex (R)
Oligosphaeridium complex (thick-wall) (R) *****

Remarks. Organic recovery consists mainly of palynomorphs with about 25% woody-fusinitic material.

T.A.I. 2.3 - 2.5

121) 98 RR 265A

PALYNOLOGY

Age.	Cretaceous Undifferentiated
Environment.	Marine
Palynomorphs.	*Cyclonephelium distinctum* (R) *Odontochitina operculata* (V) *Pterospermopsis* sp. (V)
Remarks.	Organic recovery consists of about equal quantities of woody-fusinitic and cuticular material.
T.A.I.	2.3 - 2.5

122) 98 RR 266B

PALYNOLOGY

Age.	Early Cretaceous Probable Aptian to Albian
Zones.	Probable P-M18 to P-M17
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) ?*Camarozonosporites insignis* (V) *Deltoidospora* spp. (R) *Densosporites* spp. (R) ***** *Osmundacidites* spp. (R) Taxodiaceae (R) *Cyclonephelium distinctum* (R) *Gardodinium deflandrei* (V) *Oligosphaeridium complex* (R) ?*Sverdrupiella usitata* (R) ***** *Wallodinium krutzschii* (V) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists mainly of palynomorphs with about 20% woody-fusinitic material. All are poorly preserved.
T.A.I.	2.3 - 2.5

123) 98 DL 131-2

PALYNOLOGY

Age.	Late Cretaceous Possible Campanian
Zone.	P-M14?
Environment.	Marine

Palynomorphs. Undifferentiated bisaccates (C)
Deltoidospora spp. (R)
Gleicheniidites senonicus (V)
Osmundacidites spp. (F)
Taeniaesporites sp. (V) *****
Taxodiaceae (F)
?*Chatangiella* spp. (R)
Isabelidinium acuminatum (V)
?*Laciniadinium biconiculum* (F)
Odontochitina operculata (V)
Oligosphaeridium complex (V)
Palaeoperidinium pyrophorum (F)
Spongodinium delitiense (V)
Tasmanaceae (V)

Remarks. Organic recovery consists mainly of woody-fusinitic material with about 25% palynomorphs. All are poorly preserved.
The overlapping ranges of the recorded dinocysts is the tentative basis for the Campanian age assignment.

T.A.I. 2.3

124) 98 DL 131-23

PALYNOLOGY

Age. Late Cretaceous
Probable Senonian

Zones. Probable P-M14 to P-M13

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (F)
Cicatricosisporites sp. (V)
Deltoidospora sp. (V)
Gleicheniidites senonicus (V)
Lycopodiumsporites spp. (R)
Taxodiaceae (R)
Chatangiella granulifera (V)
Chatangiella spectabilis (V)
Cyclonephelium distinctum (R)
?*Florentinia* sp. (V)
?*Laciniadinium biconiculum* (R)
Oligosphaeridium complex (V)
?*Palaeoperidinium pyrophorum* (V)

Remarks. Organic recovery consists of equal quantities of woody-fusinitic material and palynomorphs. All are poorly preserved.

T.A.I. 2.3

125) 98 DL 134-3

PALYNOLOGY

Age.	Possible Early Cretaceous Undifferentiated
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (C) *Cicatricosisporites* cf. *C. venustus* (V) *Cicatricosisporites* spp. (R) *Densosporites* spp. (R) ***** *Gleicheniidites senonicus* (R) ?*Neoraistrickia* sp. (V) *Osmundacidites* sp. (R) *Lycopodiumsporites* spp. (R) Taxodiaceae (F) *Cleistosphaeridium* sp. (V) ?*Dapsilidinium* sp. (V) ?*Gardodinium* sp. (V) *Oligosphaeridium complex* (R) *Oligosphaeridium complex* (thick-wall) (V) ***** *Spiniferites ramosus* (V) *Veryhachium* sp. (V) *Pterospermopsis* sp. (R)
Remarks.	Organic recovery consists of equal quantities of woody-fusinitic material and palynomorphs. All are poorly preserved.
T.A.I.	2.3 - 2.5

126) 98 DL 137-1

PALYNOLOGY

Age.	Cretaceous Undifferentiated
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) *Cicatricosisporites* spp. (R) *Gleicheniidites senonicus* (R) *Lycopodiumsporites* spp. (R) *Osmundacidites* sp. (R) Taxodiaceae (F) *Cyclonephelium distinctum* (R) *Hystrichosphaeridium stellatum* (V) ?*Isabelidinium* sp. (V)

Odontochitina operculata (F)
Oligosphaeridium complex (R)
Spiniferites ramosus (R)

Remarks. Organic recovery consists of about 60% woody-fusinitic material and 40% palynomorphs. All are very poorly preserved.

T.A.I. 2.3 - 2.5

127) 98 DL 137-7

PALYNOLOGY

Age. Late Cretaceous
Probable Senonian

Zones. Probable P-M14 to P-M13

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (A)
Deltoidospora spp. (R)
Taxodiaceae (F)
Chatangiella granulifera (V)
Chatangiella cf. *C. spectabilis* (R)
Chatangiella sp. (R)
Florentinia sp. (V)
?*Imbatodinium jaegeri* (V)
Isabelidinium globosum (R)
?*Laciniadinium biconiculum* (R)
Odontochitina operculata (R)
Oligosphaeridium complex (R)

Remarks. Organic recovery consists of about 60% woody-fusinitic material and 40% palynomorphs. All are poorly preserved.
The presence of *Isabelidinium globosum* suggests that the sample may possibly be as old as Turonian (P-M15).

T.A.I. 2.3

128) 98 DL 141-1

PALYNOLOGY

Age. Early Cretaceous
Aptian to Albian

Zones. P-M18 to P-M17

Environment. Marine

Palynomorphs. Undifferentiated bisaccates (C)
?*Cribroperidinium edwardsi* (V)

	Exochosphaeridium bifidum (V) *Oligosphaeridium complex* (R) *Palaeoperidinium cretaceum* (R) *Pseudoceratium retusum* (R)
Remarks.	Organic recovery consists of about equal quantities of woody-fusinitic material and palynomorphs. All are poorly preserved.
T.A.I.	2.3 - 2.5

129) 98 DL 143-1

PALYNOLOGY

Age.	Early Cretaceous Aptian to Albian
Zones.	P-M18 to P-M17
Environment.	Marine
Palynomorphs.	Undifferentiated bisaccates (A) Taxodiaceae (R) *Imbatodinium jaegeri* (V) *Muderongia* cf. *M. tetracantha* (R) *Muderongia* sp. 5 (F) *Oligosphaeridium complex* (R) *Palaeoperidinium cretaceum* (R)
Remarks.	Organic recovery consists of about equal quantities of woody-fusinitic material and palynomorphs. All are very poorly preserved.
T.A.I.	2.3 - 2.5

REFERENCE

Heroux, Y., Chagnou, A. and Bertrand, R., 1979. Compilation and correlation of major thermal maturation indicators: Bull. Am. Assoc. Petr. Geol., 63: pp. 2128-2144.

Interpreted by:

SEE ORIGINAL REPORT FOR SIGNATURES.

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	SAMPLE #	LOCATION	COLLECTOR	FIELD FORMATION	PALY AGE	TAI	DESCRIPTION	QUAD	LAT	LONG	COMMENTS
		MT KELLY GRAYWACKE MEASURED SECTION									3 samples
97	98 JC 300-21	Telephone Hill	Clough	Kmk	Indeterminate	2.5+	Claystone				Upper part of section
98	98 JC 300-13	Telephone Hill	Clough	Kmk	Late Jurassic-Early Cretaceous	2.5-3.0+	Claystone				
99	98 JC 300-3	Telephone Hill	Clough	Kmk	Probable Jur-Cretaceous	2.5-3.0	Claystone				Lower part of section
		CASTLE SYNCLINE MEASURED SECTION									5 samples
100	98 JC 301-13	Castle syncline	Clough	Kfm/Kmk	Cretaceous (undiff)	2.3	Claystone				Upper part of section
101	98 JC 301-11	Castle syncline	Clough	Kfm/Kmk	Probable Aptian-Albian	2.3-2.5+	Claystone				
102	98 JC 301-9	Castle syncline	Clough	Kfm/Kmk	Aptian-Albian	2.3-2.5	Claystone				
103	98 JC 301-4	Castle syncline	Clough	Kfm/Kmk	Probable Aptian-Albian	2.3-2.5	Claystone				
104	98 JC 301-3	Castle syncline	Clough	Kfm/Kmk	Probable Aptian-Albian	2.3-2.5	Claystone				Lower part of section
		MISCELLANEOUS GRAB SAMPLES									25 samples
105	98 Mu 3	N Flank Tupikchak anticline	Mull	Torok Sh	Aptian-Albian	2.3-2.5	Silty mudst	Pt . Lay	69°02.35	162°56.17	Upper Torok, ` 200 m below top
106	98 Mu 4	Turbid Ck, NW Coke Basin	Mull	Torok Sh	Aptian-Albian	2.3-2.5	Bk silty to fissile shale	DeLong D3	68°54.45	163°21.04	Upper Torok, `100 m below top
107	98 Mu 4-1	Turbid Ck, NW Coke Basin	Mull	Torok Sh	Probable Aptian-Albian	2.3-2.5	Bk silty to fissile shale	DeLong D3	68°54.45	163°21.04	Upper Torok, `100 m below top
108	98 Mu 10	E of Redwul, tributary of Eagle Ck	Mull	Torok Sh	Indeterminate	2.5?	Silty clayst,w th silty beds				Slopes with conspicuous white calc soil.

	SAMPLE #	LOCATION	COLLECTOR	FIELD FORMATION	PALY AGE	TAI	DESCRIPTION	QUAD	LAT	LONG	COMMENTS
109	98 Mu 17	Upper upper Ipewik River	Mull	Basal Brookian	Cretaceous (undiff)	2.5?-3.5	Silty mudst in cutbank, thick				
110	98 Mu 21	North of Horseshoe Mtn	Mull	Lower Brookian	Cretaceous (undiff)	3.0-3.5	Bk clay shale, knobby wthrg				Base of long lower Brookian section overllying Otuk.
111	98 Mu 29	Tingmerkpuk trend, east of Kukpowruk	Mull	Lower Brookian	Probable Aptian-Albian	2.3-2.5	Clay sh,silty				
112	98Ha106	W. bank Kukpowruk R.	E. Harris	Klb	Possible Aptian-Albian	2.5	shale	DeLong C3			
113	98Ha145	Thetis Creek	E. Harris	Klb/Kmk	PossibleAptian-Albian	2.3-2.5	silty shale	DeLong C5			
114	98Ha146	Thetis Creek	E. Harris	Klb	Probable Aptian-Albian	2.3-2.5	greywacke	DeLong C5			
115	98 RR 103A	Surprise Ck	Reifenstuhl	Nanushuk	Aptian-Albian	2.3-2.5	Bk silty sh				
116	98 RR106B	Surprise Ck	Reifenstuhl	Nanushuk	Probable Aptian-Albian	2.3-2.5	Bk silty sh				
117	98 RR 139D	Turbid Ck-Coke Basin	Reifenstuhl	Nanushuk	Aptian-Albian	2.3-2.5	Silty sh				
118	98 RR 182C	Dugout syncline	Reifenstuhl	Nanushuk	Aptian-Albian	2.3-2.5	Silty sh				
119	98 RR204C	Pitmegea syncline	Reifenstuhl	Nanushuk	Indeterminate	2.5?	Siltstone				
120	98 RR 253C	Thetis Ck	Reifenstuhl	Nanushuk	Probable Aptian-Albian	2.3-2.5	Carb siltst				
121	98 RR 265A	Thetis Ck	Reifenstuhl	Nanushuk	Cretaceous (undiff)	2.3-2.5	Carb siltst				
122	98 RR 266B	Thetis Ck	Reifenstuhl	Nanushuk	Probable Aptian-Albian	2.3-2.5	Carb siltst				

	SAMPLE #	LOCATION	COLLECTOR	FIELDFORMATION	PALY AGE	TAI	DESCRIPTION	QUAD	LAT	LONG	COMMENTS
		UMIAT-CHANDLER RIVER REGION									
123	98 DL131-2	Schrader Bluff	LePain	Schrader Bluff	Late Cretaceous Poss Campanian	2.3	Carbonaceous (?) siltstone	Umiat			
124	98 DL131-23	Schrader Bluff	LePain	Schrader Bluff	Late Cretaceous Prob Senonian	2.3	Siltstone	Umiat			Carbonaceous (?)
125	98 DL134-3	West end of Ninuluk Bluff	LePain	Ninuluk	Poss E Cretaceous (undiff)	2.3-2.5	Silty shale	Ikpikpuk			Collected above the channel sandstone
126	98 DL137-1	Shale Wall, Nanushak River	LePain	Shale Wall	Cretaceous (undiff)	2.3-2.5	Silty shale	Umiat	69 ° 1.884'	150° 53.054'	Collected 15 cms below 98DL137-2
127	98 DL137-7	Shale Wall, Nanushak River	LePain	Shale Wall	Late Cretaceous Prob Senonian	2.3	Siltstone	Umiat			Collected sand body where 98DL137-6 was collected
128	98 DL141-1	South side of Gunsight Mountain	LePain	Torok Shale	Aptian-Albian	2.3-2.5	Shaley siltstone	Chandler Lake	68° 42.966'	151° 52.943'	Collected at base of section
129	98 DL143-	Northwest of Autumn Creek, T9S, R1W	LePain	Torok Shale	Aptian-Albian	2.3-2.5	Silty shale	Chandler Lake			Same as 98DH100 for vitrinite reflectance

1998 TINGMERKPUK FORAM AND PALYNOLOGY SPREADSHEET

	SAMPLE #	LOCATION	COLLECTOR	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.	DESCRIPTION	COMMENTS
		KUKPOWRUK REDWUL MEASURED SECTION								30 samples
		SEGMENT 1, TOP OF BLUFF								**Measured interval in segment**
1	98 Mu 11	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale/HRZ	Probable Barremian	Probable Barremian	Cretaceous (Poss. Early)	2.3-2.7	Sooty bk sh w bentonite	19 m. Top of exposed section
2	98 Mu 11-1	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem - Aptian	2.3-2.7	Sooty bk sh	17.2 m. Wet gummy sample
3	98 Mu 11-2	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale/HRZ	Probable Barremian	Probable Barremian	Prob. E Cret (Undiff.)	2.3-2.7	Fissile paper sh	16.7 m. Wet gummy sample
4	98 Mu 11-3	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem - Aptian	2.3-2.7	Sooty earthy sh and bentonite, slumped	15 m.
5	98 Mu 11-4	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale/HRZ	Probable Hauterivian	Hauter - Barrem	Probable Hauterivian	2.3-2.6	Sooty earthy sh and bentonite	13 m
6	98 Mu 11-5	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale/HRZ	Probable Hauterivian	Hauter - Barrem	Probable Hauterivian	3.0	Silic silty sh	10.9 m, just below tuff
7	98 Mu 11-6	Redwul, Kukpowruk River	Mull/Kirkham	Pebble Shale/HRZ ?	Hauterivian	Prob. Hauterivian	Hauterivian	2.5-2.6	Silic silty sh	9 m. 110°, 65° S
8	98 Mu 11-7	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian or Hauterivian?	Oxfordian	Possible Hauterivian	2.5?-3.0?	Silic silty sh, red br oxidized	7 m.
9	98 Mu 11-8	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.5-3.0	Gr to bk fissile clay sh, rusty surface weathering	3.8 m
10	98 Mu 11-9	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Gr to bk fissile clay sh, rusty surface weathering	1.0 m
		SEGMENT 2, OFFSET TO EAST IN SMALL GULLY								**Measured interval in segment**
11	98 Mu 11-10	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	3.0	Fissile dk gr clay sh	6 m
12	98 Mu 11-11	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	3.0	Fissile dk gr clay sh	4 m
13	98 Mu 11-12	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	3.0	Fissile dk gr clay sh	2 m. 120°, 55°SW, on hard siltstone
14	98 Mu 11-13	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	3.0	Fissile dk gr clay sh	0 m
		SEGMENT 3, OFFSET TO EAST ON SLOPE FACE								**Measured interval in segment**
15	98 Mu 11-14	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Fissile dk gr clay sh, has white sulfate powder on surface	12 m. 120°, 60°S
16	98 Mu 11-15	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Fissile dk gr clay sh with occasional thin siltstone beds, has rusty surface weathering	10 m.
17	98 Mu 11-16	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Shale as above, slightly harder (silty?), more rusty weathering, some intervals of dk gr clay shale	8 m.
18	98 Mu 11-17	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Shale as above, with scattered discontinuous concretions and three intervals of dk gr limestone with abundant Inoceramus, some large and thick prisms	6 m. Sample just below Inoceramus ls lens. One lens 30 cm. thick, 2 m long
19	98 Mu 11-18	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.7-3.0	Fissile clay shale with rusty weathering shale, occasional thin yel white dry bentonite seams, as above, ovoid concretions more abundant below.	4 m.
20	98 Mu 11-19	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Rusty weathering shale as above, with some dark gray fissile intervals	2 m. One belemnite in fragments.
21	98 Mu 11-19A	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Rusty weathering shale as above, with some dark gray fissile intervals	0 m.

1998 TINGMERKPUK FORAM AND PALYNOLOGY SPREADSHEET

	SAMPLE #	LOCATION	COLLECTOR	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.	DESCRIPTION	COMMENTS
		SEGMENT 4, OFFSET TO WEST IN BOTTOM OF GULLY								**Measured interval in segment**
22	98 MU 11-20	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Indeterminate	Oxfordian	2.5-3.0	Shale, dk gr, fissils, partly oxidized.	SAMPLE NOT LISTED PREVIOUSLY
23	98 Mu 11-21	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Shale, as above, concretions more abundant downward, range from cannon ball size up to 25 cm thick ovoid. Section appears to have bentonitic shale intervals, seen in weathering surface.	23 m.
24	98 Mu 11-21A	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Dr gr fissile clay shale	22 m. Surface sample
25	98 Mu 11-22	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.7-3.0	Dr gr fissile clay shale, with abundant red br oxidized intervals, some thin bentonitic shale intervals	19 m.
26	98 Mu 11-23	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.7-3.0	Dk gr clay shale, with abundant red oxidized zones as above, abundant concretions	17 m. 5 m interval below, covered by talus.
27	98 Mu 11-24	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Dk gr clay shale, 1/2 m interval in overall red oxidized shales	10 m.
28	98 Mu 11-25	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Dk gr clay shale, 1/2 m interval in overall red oxidized shales	6.8 m. Sample below 30 cm. X 1 m concretion.
29	98 Mu 11-26	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-3.0	Dk gr clay shale, 1/2 m interval in overall red oxidized shales	4 m.
30	98 Mu 11-27	Redwul, Kukpowruk River	Mull/Kirkham	Kingak Shale	Oxfordian	Probable Oxfordian	Oxfordian	2.5-2.7	Dk gr shale, oxidized as above	2 m. Base of exposed section.
		HORSESHOE BEND MEASURED SECTION								12 samples
31	98 Mu 19-11	Horseshoe Bend, Ipewik R.	Mull	Pebble Shale	Indeterminate	Indeterminate	Indeterminate	2.3	Organic-rich paper shale	50 yards up gulch from 19-10
		SEGMENT 2, measured 100 m up gully								**Measured interval in segment**
32	98 Mu 19-10	Horseshoe Bend, Ipewik R.	Kirkham/Harris	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.3-2.5	Ck gr to bk clay sh,	Top of measured segment. 4.8m
33	98 Mu 19-9	Horseshoe Bend, Ipewik R.	Kirkham/Harris	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.3-2.5	Dk gr to bk clay shale, bentonittic, w/ glauconite layers	3.5m, Glauconite layer found in ~15cm interval
34	98 Mu 19-8	Horseshoe Bend, Ipewik R.	Kirkham/Harris	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.5-3.0	Dk gr to bk clay shale, bentonittic, w/ glauconite layers	1.5m
35	98 Mu 19-7	Horseshoe Bend, Ipewik R.	Kirkham/Harris	Kingak Shale	Oxfordian	Oxfordian	Oxfordian	2.5	Dk gr to bk clay shale, intermitant Fe staining	0 m, Base of exposed section
		SEGMENT 1, measured at mouth of gully off Ipewik River								**Measured interval in segment**
36	98 Mu 19-6	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	Oxfordian	Oxfordian	Indeterminate	3.0	Dk gr to bk clay sh, bentonitic	12 m, sampled section. Stratigraphic top uncertain.
37	98 Mu 19-5	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	Probable Oxfordian	Probable Oxfordian	Norian? (Poss. reworked)	2.5-3.0	Dk gr to bk clay sh, bentonitic	10 m, sampled section
38	98 Mu 19-4	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	Probable E - M Jurassic	Probable E - M Jurassic	Poss. E - M Jur w/rewrk Norian	2.5-3.0	Dk gr to bk clay sh, bentonitic	8 m, sampled section
39	98 Mu 19-3	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	Probable E - M Jurassic	Probable E - M Jurassic	Poss. E - M Jur w/rewrk Norian	2.5-3.0	Dk gr to bk clay sh, bentonitic	6 m, sampled section
40	98 Mu 19-2	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	Probable E - M Jurassic	Probable E - M Jurassic	Probable E - M Jurassic	2.5-3.0	Dk gr to bk clay sh, bentonitic	4 m, sampled section
41	98 Mu 19-1	Horseshoe Bend, Ipewik R.	Mull/Kirkham	Kingak Shale	E - M Jurassic	Probable E - M Jurassic	E - M Jurassic	2.5-3.0	Dk gr to bk clay sh, bentonitic	2 m, sampled section
42	98 Mu 19	Horseshoe Bend, Ipewik R.	Mull		Probable E - M Jurassic	Probable E - M Jurassic	Probable E - M Jurassic	2.5-3.0	Dk gr to bk clay sh, bentonitic	O m, sampled section.

1998 TINGMERKPUK FORAM AND PALYNOLOGY SPREADSHEET

	SAMPLE #	LOCATION	COLLECTOR	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.	DESCRIPTION	COMMENTS
		IPEWIK TRIBUTARY MEASURED SECTION								7 samples
43	98 Mu 33-7	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Barrem-Aptian	2.3-2.5	bk to dk gr paper sh, w/ red/yellow dirty clay	Top of exposed section. 15.5m
44	98 Mu 33-6	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5	Bk to dk gr paper shale,	14m
45	98 Mu 33-5	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5	Bk paper sh	13m
										Covered interval 7m
46	98 Mu 33-4	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5	Dk gr to bk paper sh	6m

1998 TINGMERKPUK FORAM AND PALYNOLOGY SPREADSHEET

	SAMPLE #	LOCATION	COLLECTOR	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.	DESCRIPTION	COMMENTS
47	98 Mu 33-3	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5	Bk sooty paper sh, w bentonite	4m
48	98 Mu 33-2	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5	gr to bk paper sh w/ yellow bentonite	2m
49	98 Mu 33-1	Ipewik River tributary	Kirkham/Harris	Pebble shale/HRZ	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5	Gr paper shale, red oxidation abundant	Base of exposed section, 0m
		TOP OF TIMGMERKPUK MOUNTAIN MEASURED SECTION								2 samples
50	98 DL 120-27	Tingmerkpuk Mtn.	LePain/Adams	Tingmerkpuk	Possible Aptian (w/rewrk Valanginian)	Possible Aptian	Valanginian	2.5	Bk clay shale	Tingmerkpuk section 6 m below top
51	98 DL 120-25	Tingmerkpuk Mtn.	LePain/Adams	Tingmerkpuk	Possible Aptian (w/rewrk Valanginian)	Possible Aptian	Valanginian	2.5	Bk clay shale	Tingmerkpuk measured section. 77 m
		SURPRISE CREEK MEASURED SECTION								6 samples
52	98 RK1-91	Surprise Creek	Kirkham/Harris	Kingak	Possible Aptian-Albian	Indeterminate	Possible Aptian-Albian	2.5	Dk brn shale, small clay component	Resample of 96MAW22. 91m
53	98 RK1-84	Surprise Creek	Kirkham/Harris	Kingak	Oxfordian-Albian?	Oxfordian-Barrem	Possible Aptian-Albian	2.5	Bk sh, small clay component	84m
54	98 RK1-78	Surprise Creek	Kirkham/Harris	Kingak	Oxfordian-Albian?	Oxfordian-Barrem	Possible Aptian-Albian	2.3-2.5	Dk gr to bk sh, has a significant color change at bottom of auger hole, changes to brn-dk brn color, minor clay content	78m
55	98 RK1-65	Surprise Creek	Kirkham/Harris	Kingak	Oxfordian-Albian?	Oxfordian-Barrem	Possible Aptian-Albian	2.5-2.7	dk gr to bk shale, minor clay content,	65m
56	98 RK1-57	Surprise Creek	Kirkham/Harris	Kingak	Possible Oxfordian-Albian	Possible Oxfordian	Possible Aptian-Albian	2.5-3.0	Bk sh w/ significant clay content, mostly water & ice.	57m
57	98 RK1-43	Surprise Creek	Kirkham/Harris	Kingak	Oxfordian-Albian?	Oxfordian	Possible Aptian-Albian	2.5-3.0	Bk sh, very high clay content, mostly water &ice?	43m
		SOUTH TINGMERKPUK MEASURED SECTION								Section underlies Tingmerkpuk Ss, southern facies. 12 samples
58	98 JC 302-1	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5	Gr to med dk gr sh, alternating greenish gr sh	3 m. Top of section.
59	98 JC 302-2	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5	brownish gr sh	12 m.
60	98 JC 302-3	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5	Greenish gr sh	17.5 m.
61	98 JC 302-4	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0	brown gr sh	36 m.
62	98 JC 302-5	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0	gr to br sh	53 m.
63	98 JC 302-6	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0	gr sh	63 m.
64	98 JC 302-7	South Tingmerkpuk	Clough/Kirkham	Kingak	Probable Valanginian	Probable Valanginian	Probable Valanginian	3.0-3.5	maroon to brnish sh	78 m.
65	98 JC 302-8	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5	Gr clay sh	90 m.
66	98 JC 302-9	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Probable Valanginian	3.0-3.2	Gr sh	108 m.

1998 TINGMERKPUK FORAM AND PALYNOLOGY SPREADSHEET

	SAMPLE #	LOCATION	COLLECTOR	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.	DESCRIPTION	COMMENTS
67	98 JC 302-10	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5	Grnish bk sh	121m.
68	98 JC 302-11	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5	Gr shale	133 m.
69	98 JC 302-12	South Tingmerkpuk	Clough/Kirkham	Kingak	Valanginian	Valanginian	Valanginian	3.0-3.5	gr to dk gr shale	141 m. Base of section.
		MISCELLANEOUS GRAB SAMPLES								27 samples
70	98 Mu 7-1	Kukpowruk River, Redwul	Mull	KJk	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.3-2.5	Bk cl sh, soft	2 m exposure, composite of 7-1 and 7-2
71	98 Mu 7-3	Kukpowruk River, Redwul	Mull	KJK	Oxf-Kimm	Indeterminate	Oxf-Kimm	2.3-2.5	BK claystone	Claystone around concretion
72	98 Mu 8	Kukpowruk River, Redwul	Mull	KJk	Valang-Haut	Valang-Haut	Prob. E Cret (Undiff.)	2.5-3.0	Shale, dk gr	080° 42° S. Sequential samples w auger, 1/2 m above hard siltstone
73	98 Mu 8-1	Kukpowruk River, Redwul	Mull	KJk	Probable Oxfordian	Probable Oxfordian	Indeterminate	2.5?	Shale, med gr,	`15 m stratigraphically below 98 Mu 8. Fissile shale in coutcrop, contains ovoid concretions w pyrite-marcasite knobs
74	98Mu 8-2	Kukpowruk River, Redwul	Mull	KJk	Probable Oxfordian	Probable Oxfordian	Possible Oxf-Kimm	3.0	Shale, med gr	` 7 m below. Auger sample lighter gray. Slope above has popcorn whtrg
75	98Mu 8-3	Kukpowruk River, Redwul	Mull	KJk	Possible Valanginian	Late Jurassic-E. Cret (Undiff.)	Possible Valanginian	3.0	Shale, br gr	~7 m below. No apparent conc.
76	98Mu 8-4	Kukpowruk River, Redwul	Mull	KJk	Probable Oxfordian	Probable Oxfordian	Oxf-Kimm	3.0	Shale, br gr	`7 m below. Dk gr weathered.. Has 1/2 cm bent above hole. Conc with B sublaevis coquina in float.
77	98 Mu 8-5	Kukpowruk River, Redwul	Mull	KJk	Probable Oxfordian	Probable Oxfordian	Oxf-Kimm	2.8-3.0	Shale, dk br gr	10 m below 98 Mu 8. Gr fissile sh on weathered surface. Interval contains large round to ovoid concretions,some w large Buchias, poss B. rugosa (Jur.). = 98 Mu 7.3
78	98 Mu 9	Kukpowruk River, Redwul	Mull	KJk	Valang-Hauter	Valang-Hauter	Neocomian	3.0-3.5	Shale, gr, whtrs lt gr-wh	Sh intbd with oxidized gr siltstone. Section has distinctive red br wthrd appearance. Silts prob bioturbated. Sect downstream from above, prob acruss fault
79	98Mu 9-1	Kukpowruk River, Redwul	Mull	KJk	Oxf-Barrem	Oxf-Barrem	Indeterminate	3.0+	Shale, gr, whtrs lt gr-wh	Sh intbd with oxidized gr siltstone. Section has distinctive red br wthrd appearance. Silts prob bioturbated.
80	98 Mu 12	Redwul Kukpowruk	Mull	Pebble Shale	Possible Hauterivian	Oxf-Barrem	Early Cretaceous (Hauterivian?)	2.3-2.5	Bk sooty clayst & bentonite	
81	98 Mu 14-1	Upper Ipewik River	Mull	Upper Kingak?	Indeterminate	Indeterminate	Indeterminate	3.0	Fissile clay shale	Composite from siksik holes on slope
82	98 Mu 24	East Tingmerkpuk	Mull	Kingak	Probable Hauter-Barrem	Possible Hauter-Aptian	Neocomian	2.5-3.0	Hard gn gr shale	
83	98 Mu 24-1	East Tingmerkpuk	Mull	Kingak	Possible Hauter-Barrem	Possible Hauter-Barrem	Probable Neocomian	2.5	Hard gn gr shale	
84	98 Mu 34	Ipewik River tributary	Mull	Lower Brookian	Possible Hauter-Barrem	Possible Hauter-Barrem	Cretaceous (undiff)	2.3-2.5	Bk claystone	

1998 TINGMERKPUK FORAM AND PALYNOLOGY SPREADSHEET

	SAMPLE #	LOCATION	COLLECTOR	FIELD FORMATION	INTEGRATED AGE	FORAM AGE	PALY AGE	T.A.I.	DESCRIPTION	COMMENTS
85	98 Mu 38	S fork Ipewik	Mull	Lower Brookian ?	Probable Barrem-Aptian	Indeterminate	Probable Barrem-Aptian	3.0+	Clay shale, bentonitic, with oxidixed siltstones	
86	98 Mu 39	Ipewik valley	Mull	Lower Brookian ?	Probable Barremian	Probable Barremian	Probable Barrem-Aptian	2.5-3.0	Clay shale, bentonitic, with oxidixed siltstones	
87	98 Mu 39-1	Ipewik valley	Mull	Pebble Shale ?	Indeterminate	Indeterminate	Indeterminate	3.0-3.5	Black sooty claystone	
88	98 Ha126	E. of Sooner, SW of Kukpowruk R.	E. Harris	Kk	Probable Oxf-Kimm	Probable Oxf-Kimm	Indeterminate	3.5?	Shales	Ammonite, Buchia (large)
89	98 Ha129	Ipewik R.	E. Harris	JKk	Probable Oxf-Kimm	Probable Oxf-Kimm	Indeterminate	3.5	Black shale	Concretions
90	98 RR 185B	Dugout syncline	Reifenstuhl	Torok	Probable Aptian	Possible Barrem-Aptian	Probable Aptian-Albian	2.5+	Silty sh	
91	98 RR 186B	Dugout syncline	Reifenstuhl	Torok	Probable Aptian-Albian	Indeterminate	Probable Aptian-Albian	2.5+	Silty sh	
92	98 RR 197C	Dugout syncline	Reifenstuhl	Torok	Indeterminate	Indeterminate	Indeterminate	2.5?	Siltstone	
93	98 RR 240B	Kokolik-Tupikshak	Reifenstuhl	Torok	Possible Barrem-Aptian	Possible Barrem-Aptian	Indeterminate	3.0-3.5	Siltstone	
94	98 RR 250	Tupikchak Mtn	Reifenstuhl	Torok	Possible Barrem-Aptian	Possible Barrem-Aptian	Indeterminate	3.0-3.5	Siltstone	
95	98 RR 251A	S of Tupikchak Mtn	Reifenstuhl	Torok	Possible Barrem-Aptian	Possible Barrem-Aptian	Indeterminate	2.5-3.0	Siltstone	
96	98 DL 137-4	Shale Wall, Nanushuk River	LePain	Shale Wall	Probable Cenomanian	Probable Cenomanian	Late Cretaceous (undiff)	2.3-2.5	Paper shale	Same location as 98TM421-A

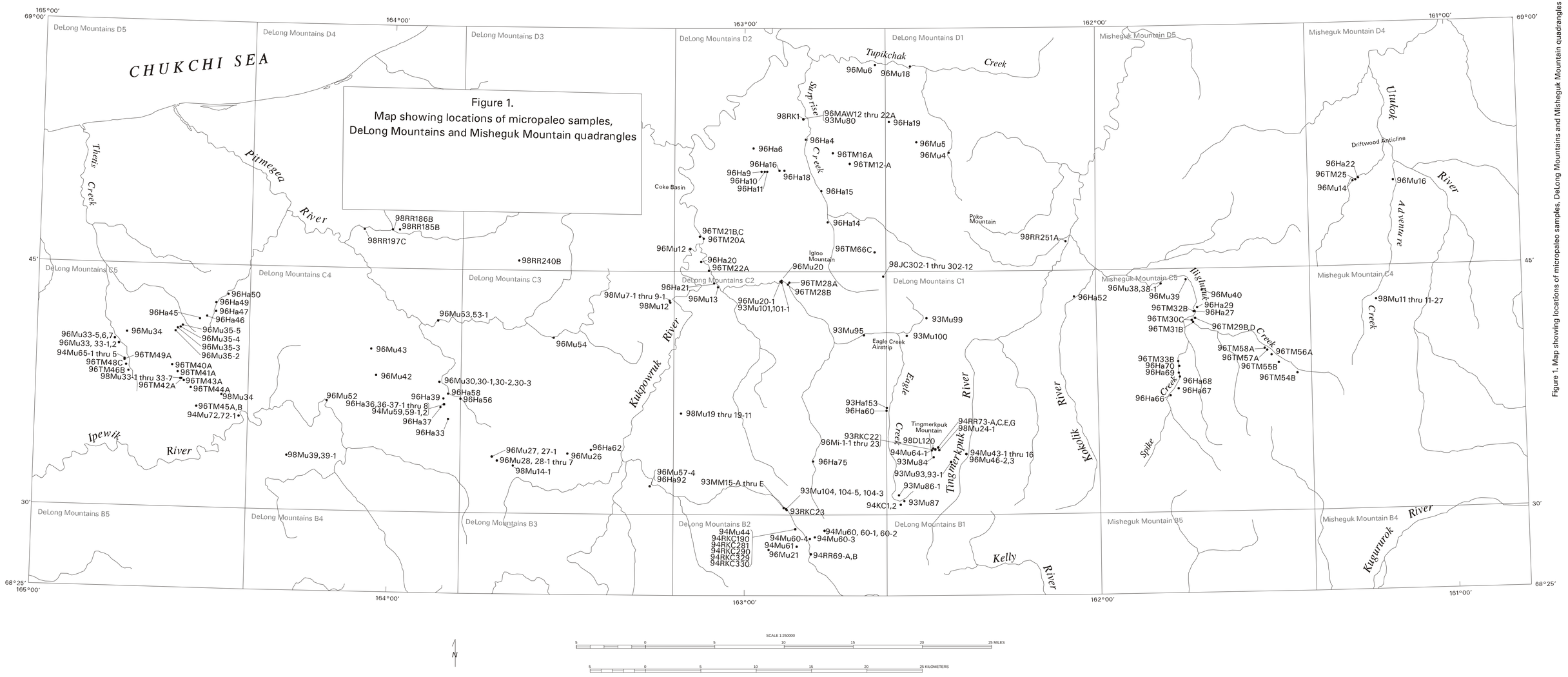

Figure 1. Map showing locations of micropaleo samples, DeLong Mountains and Misheguk Mountain quadrangles