



**MICROPALEO**  
CONSULTANTS, INC.

**USGS/HUSKY - NPRA**  
**WEST DEASE NO. 1**

**API #50-023-20014**

**SEC. 21, T21N/R14W UM**

**NORTH SLOPE, ALASKA**

**Prepared by:**

**Michael B. Mickey - Foraminifera**

**Hideyo Haga - Palynomorphs**

**BIOSTRATIGRAPHY REPORT**

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## **INTEGRATED SUMMARY**

100-1870'

Early Cretaceous  
Middle to Late Albian

1870-2910'

Early Cretaceous  
Aptian to Early Albian

2910-2945'C

Early Cretaceous  
Barremian  
KE<sub>B</sub>

2945C-3370'

Early Cretaceous  
Hauterivian  
KE<sub>H</sub>

3370-3792'C

Early Jurassic  
Pliensbachian  
JE<sub>P</sub>

3792C-3814'C

Late Triassic  
Rhaetian  
TL<sub>R</sub>

3814C-4005'C

Late Triassic  
Norian  
TL<sub>N</sub>

4005C-4151.5'C

Indeterminate Age

Discussion. Black wavy banded argillitic shale and siltstone.

# **FORAMINIFERA REPORT**

**Interpreted by**

**Michael B. Mickey**

## **FORAMINIFERA SUMMARY**

### 100-1850'

<u>Age.</u>	Early Cretaceous Middle to Late Albian
<u>Zones.</u>	F-9 to F-10
<u>Environment.</u>	Inner to Outer Neritic (Inner to Outer Shelf)

### 1850-2900'

<u>Age.</u>	Early Cretaceous Aptian to Early Albian
<u>Zone.</u>	F-11
<u>Environment.</u>	Bathyal (Slope)

### 2900-2945'C

<u>Age.</u>	Early Cretaceous Barremian
<u>Zone.</u>	F-12
<u>Environment.</u>	Bathyal (Slope)

2945C-3360'

<u>Age.</u>	Early Cretaceous Hauterivian
<u>Zone.</u>	F-13a
<u>Environment.</u>	Middle Neritic to Upper Bathyal (Middle Shelf to Upper Slope)

3360-3793'C

<u>Age.</u>	Early Jurassic Pliensbachian
<u>Zone.</u>	F-18b
<u>Environment.</u>	Middle Neritic to Lower Bathyal (Middle Shelf to Lower Slope)

3793C-3814'C

<u>Age.</u>	Late Triassic Rhaetian
<u>Zone.</u>	F-19a
<u>Environment.</u>	Middle Neritic (Middle Shelf)



3814C-4012'SW

<u>Age.</u>	Late Triassic Norian
<u>Zone.</u>	F-19b
<u>Environment.</u>	Inner to Middle Neritic (Inner to Middle Shelf)

4012SW-4151.5'C

<u>Age.</u>	Indeterminate
<u>Environment.</u>	Indeterminate
<u>Discussion.</u>	Black wavy banded argillitic shale and siltstone.

## **INTRODUCTION**

### **Scope**

Data from 279 Foraminifera samples from the USGS/Husky West Dease No. 1 well were incorporated into this report. These samples consisted of 134 ditch, 121 conventional core and 24 sidewall core samples covering the interval 100 to 4151.5C feet. This work was done as part of M.C.I. Job Number 21-106.

### **Procedures**

Standard techniques were used to process the material. All samples were boiled in Quaternary-O and washed over 20 and 200 mesh screens. Frequency symbols correspond to the following numerical values: very rare (1), rare (2 - 4), frequent (5 -25), common (26 - 100), abundant (101 - 999) and prolific (1000+). The picked foram slides and residues are repositied at the State of Alaska Geological Materials Center in Eagle River, Alaska.

Certain factors such as shelf widths, basin configuration and overall basin depths associated with Arctic Mesozoic basins are not completely understood at present. The paleoenvironments presented in this report reflect relative basinal position only and should not be tied to specific water depths. Generally, neritic corresponds to shelf or deltaic environments, while bathyal corresponds to slope or prodelta environments and bathyal (starved basin) corresponds to distal (far from the source) deposition. As an example, prodelta deposits could represent deposition as shallow as middle neritic or as deep as bathyal (slope) depending on the delta type and shelf width. With a narrow shelf, a river-dominated deltaic system could build across the shelf and the prodelta deposits would be in a bathyal (slope) depth. A tide-dominated deltaic system associated with a wide shelf could result in middle neritic prodelta deposition.

## **Format**

A listing of the age, environment, fauna and occasional lithology comments for each biostratigraphic interval follows. A generalized summary of the well is presented in the Conclusions section at the end of the Foraminifera Report. Foraminifera Distribution Chart (Figures F-1) and a High-Resolution Biostratigraphy Plot (Figure B-1) containing foram diversity/abundance plots, a cumulative faunal plot and paleoenvironmental plot(s) are in pockets at the back of this report.

## RESULTS

100-1850'

Age. Early Cretaceous  
Middle to Late Albian

Zones. F-9 to F-10

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

Fauna. *Quadrिमorphina ruckerae*, *Gavelinella stictata*,  
*Miliammina manitobensis*, *Lenticulina macrodisca*, *L.*  
*erecta*, *Haplophragmoides excavatus*, *H. gigas*, *H.*  
*topagorukensis*, *Verneuilinoides borealis*,  
*Marginulinopsis collinsi*, *Saracenaria projectura*,  
*Glomospirella gaultina*, *Hippocrepina barksdalei*,  
*Bathysiphon vitta*, *Valvulineria loetterlei*, *Tritaxia*  
*manitobensis*, *Ammobaculites wenonahae*, *Gaudryina*  
*nanushukensis*, *Eurycheilostoma grandstandensis*,  
*Ditrupa cornu*, *Inoceramus* prisms, pelmatozoan  
fragments, plant debris, coal, pyrite, pyrite sticks, and  
common tar between 330 and 600 feet.

1850-2900'

<u>Age.</u>	Early Cretaceous Aptian to Early Albian
<u>Zone.</u>	F-11
<u>Environment.</u>	Bathyal (Slope)
<u>Fauna.</u>	<i>Gavelinella stictata</i> , <i>Lenticulina macrodisca</i> , <i>Haplophragmoides excavatus</i> , <i>Bathysiphon vitta</i> , <i>Verneuilinoides borealis</i> , <i>Hippocrepina barksdalei</i> , <i>Miliammina manitobensis</i> , <i>Ammodiscus rotalarius</i> , megaspores, <i>Ditrupa cornu</i> , plant debris, <i>Inoceramus</i> prisms, pelecypods (pyrite casts), pyrite and frequent to common pyritized radiolaria.

2900-2945'C

<u>Age.</u>	Early Cretaceous Barremian
<u>Zone.</u>	F-12
<u>Environment.</u>	Bathyal (Slope)
<u>Fauna.</u>	Barren of indigenous Foraminifera. Pyrite, glauconite, rounded frosted quartz floating sand grains and frequent pyritized radiolaria.

2945C-3360'

<u>Age.</u>	Early Cretaceous Hauterivian
<u>Zone.</u>	F-13a
<u>Environment.</u>	Middle Neritic to Upper Bathyal (Middle Shelf to Upper Slope)
<u>Fauna.</u>	<i>Gaudryina subcretacea</i> , <i>G. tailleuri</i> , arenaceous spp. (large, coarse), <i>Ammobaculites reophacoides</i> , <i>Haplophragmoides duoflatis</i> , <i>H. coronis</i> , <i>Bathysiphon vitta</i> , <i>B. scintillata</i> , <i>Gavelinella awunensis</i> , <i>Saracenaria projectura</i> , <i>Trochammina squamata</i> , <i>T. cf. instowensis</i> , <i>Glomospirella</i> sp. S, <i>Glomospira subarctica</i> , <i>Lenticulina muensteri</i> , <i>Miliammina ischnia</i> , <i>Reophax tundraensis</i> , <i>Thuramminoides septagonalis</i> and frequent to abundant rounded frosted quartz floating sand grains.

3360-3793'C

<u>Age.</u>	Early Jurassic Pliensbachian
<u>Zone.</u>	F-18b
<u>Environment.</u>	Middle Neritic to Lower Bathyal (Middle Shelf to Lower Slope)
<u>Fauna.</u>	<i>Trochammina canningensis</i> , <i>Astacolus dubius</i> , arenaceous spp. (large, coarse), <i>Lituotuba irregularis</i> , <i>Ammobaculites alaskensis</i> , <i>A. barrowensis</i> , <i>A. vetusta</i> , <i>A. kingakensis</i> , <i>A. cf. fontinensis</i> , <i>Reophax suevica</i> , <i>Dentalina pseudocommunis</i> , <i>Nodosaria radiata</i> , <i>N. detruncata</i> , <i>Ammodiscus siliceus</i> , <i>A. asperus</i> , <i>Citharina harpa</i> , <i>C. fallax</i> , <i>Marginulinopsis bergquisti</i> , tasmanites, <i>Inoceramus</i> prisms, megaspores, pyrite, glauconite, phosphate? pebbles, and frequent to abundant <i>Halobia?</i> shell fragments below 3720 feet.

3793C-3814'C

<u>Age.</u>	Late Triassic Rhaetian
<u>Zone.</u>	F-19a
<u>Environment.</u>	Middle Neritic (Middle Shelf)
<u>Fauna.</u>	<i>Gaudryina adoxa</i> , <i>Frondicularia baueri</i> , <i>Astacolus connudatus</i> , <i>Nodosaria larina</i> , <i>N. shublikensis</i> , and frequent <i>Monotis/Halobia</i> shell fragments below 3810 feet.

3814C-4012'SW

<u>Age.</u>	Late Triassic Norian
<u>Zone.</u>	F-19b
<u>Environment.</u>	Inner to Middle Neritic (Inner to Middle Shelf)
<u>Fauna.</u>	<i>Astacolus connudatus</i> , <i>Nodosaria larina</i> , <i>N. shublikensis</i> , <i>N. radiata</i> , <i>N. liratella</i> , <i>Frondicularia baueri</i> , <i>Pseudoglandulina simpsonensis</i> , <i>Marginulina prisca</i> , <i>Vaginulinopsis acrolus</i> , conodont fragments, ostracods (medium, smooth), echinoid spines, glauconite, phosphate? pebbles, and frequent to abundant <i>Monotis/Halobia</i> shell fragments below 3910 feet.

4012SW-4151.5'C

<u>Age.</u>	Indeterminate
<u>Environment.</u>	Indeterminate
<u>Fauna.</u>	Probably barren of indigenous Foraminifera.
<u>Discussion.</u>	Black wavy banded argillitic shale and siltstone.



## **CONCLUSIONS**

The USGS/Husky West Dease No. 1 well penetrated the following biostratigraphic sequence based on foraminiferal analysis:

- 3260+ feet (100-3360') of Hauterivian to Albian age (Early Brookian & Beaufortian - Rift Sequence) generally upward shallowing base of slope bottomsets, slope foresets and inner to outer shelf topsets with a basal transgressive middle shelf sandstone.
- 433 feet (3360-3793'C) of Pliensbachian age (Beaufortian - Incipient Rift Sequence) middle shelf to lower slope sedimentation.
- 219 feet (3793C-4012'SW) of Late Triassic age (Late Ellesmerian) inner to middle shelf deposition.
- 139.5+ feet (4012SW-4151.5'C) of indeterminate age black wavy banded (Franklinian?) argillitic shale and siltstone basement.

# **PALYNOLOGY REPORT**

**Interpreted by:**

**Hideyo Haga**

## PALYNOLOGY SUMMARY

### 110-2945'C

<u>Age.</u>	Early Cretaceous Aptian - Early Albian
<u>Zone.</u>	P-M18
<u>Environment.</u>	Marine
<u>Remarks.</u>	This age assignment is based on negative evidence.

### 2945C-3325'SW

<u>Age.</u>	Early Cretaceous Barremian - Aptian
<u>Zone.</u>	P-M18a
<u>Environment.</u>	Marine

### 3325SW-3360'

<u>Age.</u>	Early Cretaceous Hauterivian
<u>Zone.</u>	P-M19
<u>Environment.</u>	Marine

3360-3793'C

<u>Age.</u>	Probable Early Jurassic Undifferentiated
<u>Zone.</u>	P-M24?
<u>Environment.</u>	Marine - Marginal Marine

3793C-3850'

<u>Age.</u>	Late Triassic Possible Rhaetian
<u>Zone.</u>	P-M25?
<u>Environment.</u>	Marine - Marginal Marine

3850-4003.5'C

<u>Age.</u>	Late Triassic Norian
<u>Zone.</u>	P-M26
<u>Environment.</u>	Marine

4003.5C-4151.5'C

<u>Age.</u>	Indeterminate
<u>Environment.</u>	Indeterminate
<u>Remarks.</u>	Barren of indigenous palynomorphs

## **INTRODUCTION**

### **Purpose and Scope**

The USGS/Husky West Dease No. 1 well completed drilling in March, 1980, During the drilling process, a palynological study was conducted of selected sample material from the well. A total of 190 palynology samples were examined in the course of this investigation. The sample total consisted of 43 ditch-cutting composites, 123 conventional core fragments, and 24 sidewall cores taken between 110 feet and 4151.5 feet.

The cores were originally sampled and examined at very close intervals. For this report many of the core data are composited into larger intervals where the contained assemblages are similar and no biostratigraphic boundaries are straddled.

This report provides an updated format from the original data. Some of the taxa designations have been revised to reflect the newer taxonomic assignments that have evolved over the decades since the initial study.

### **Procedures**

For the original analysis, palynological samples were processed in San Diego, California, using techniques that were standard for the time. The chemical treatments involved the use of hydrochloric, hydrofluoric and nitric acids. The resulting kerogen residues were further concentrated by physical separation with heavy liquids and a sieving/panning technique. Permanent slide mounts were made of the residue concentrates. The coverslip mounting medium used was a synthetic resin sold under the brand name of "Coverbond".

The original palynomorph distribution chart data were entered into a desktop PC using proprietary software to compile new format charts. The charts are located in the pockets.

The Palynomorph Distribution Chart (Figure P-1) lists the occurrence and abundance of recorded taxa in each sample. Included on this chart are the diversity and abundance curves for the spore-pollen and the microplankton cysts.

High Resolution Biostratigraphy Plots - Foraminifera/Palynomorphs (Figure B-1) are also provided. This chart includes additional palynology parameters in the form of a cumulative plot that illustrates the relative abundance of the nonmarine, marine and miscellaneous palynomorph components.

## RESULTS

Based on the palynomorph assemblages observed, an age and generalized environment of deposition were interpreted for each palynostratigraphic subdivision. The environments, as interpreted from the palynological preparations, are simply categorized as nonmarine, marginal marine or marine. These categories are based on the absence or presence and diversity of microplankton.

The samples available for examination begin at 110 feet and the youngest units encountered at that depth were of Early Cretaceous age. The oldest datable strata seen were of Late Triassic age. The well bottoms in argillitic basement.

### 110-2945'C

<u>Age.</u>	Early Cretaceous Aptian to Early Albian
<u>Zone.</u>	P-M18
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	<p>This uppermost interval carries a generalized Aptian - Albian palynomorph assemblage. The assemblage includes the dinocysts <i>Odontochitina operculata</i>, <i>Oligosphaeridium</i> complex, <i>Palaeoperidinium cretaceum</i>, <i>Pseudoceratium polymorphum</i> and <i>P. retusum</i>.</p> <p>Common to this interval are numerous scattered occurrences of reworked Carboniferous, Triassic and Jurassic palynomorphs.</p>



Discussion. Although the assemblage is similar to the Middle - Late Albian, P-M17 zonule, an absence of Albian-restrictive species is significant. In particular, the marker species *Luxadinium propatulum*, *Ovoidinium verrucosum*, *Spinidinium vestitum* and *Wigginsiella grandstandica* were not present. Based on this absence an Aptian - Early Albian age is assigned.

2945C-3325'SW

Age. Early Cretaceous  
Barremian to Aptian

Zone. P-M18a

Environment. Marine

Palynomorphs. The Barremian - Aptian interval is marked by an increase in dinocyst abundance and diversity. The assemblage includes *Cyclonephelium distinctum*, *Gardodinium trabeculosum*, *Imbatodinium jaegeri*, *Odontochitina operculata*, *Oligosphaeridium complex* and *Palaeoperidinium cretaceum*.

3325SW-3360'

<u>Age.</u>	Early Cretaceous Hauterivian
<u>Zone.</u>	P-M19
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	The appearance of the dinocysts <i>Florentinia cooksoniae</i> , <i>Imbatodinium micropodum</i> and the abundance of <i>Oligosphaeridium complex</i> (thick-wall) mark this thin interval.
<u>Discussion.</u>	No evidence was recovered to indicate the presence of any older Cretaceous or Middle - Late Jurassic strata. A large hiatus at the Jurassic/Cretaceous boundary is, therefore, implied for this location.

3360-3793'C

<u>Age.</u>	Probable Early Jurassic Undifferentiated
<u>Zone.</u>	P-M24?
<u>Environment.</u>	Marine to Marginal Marine
<u>Palynomorphs.</u>	<p>Spore-pollen are the major constituents of this assemblage. The recorded forms include <i>Classopollis classoides</i>, undifferentiated bisaccates, <i>Lycopodiumsporites semimurus</i>, <i>Osmundacidites</i> and <i>Vitreisporites pallidus</i>.</p> <p>The marine forms consist of <i>Micrhystridium</i> species only.</p>
<u>Discussion.</u>	The absence of dinocysts suggests that the interval is at least of pre-Toarcian age.

3793C-3850'

<u>Age.</u>	Late Triassic Possible Rhaetian
<u>Zone.</u>	P-M25?
<u>Environment.</u>	Marine to Marginal Marine
<u>Palynomorphs.</u>	<p>The Late Triassic interval has an assemblage similar to the section above, but with fairly consistent occurrences of <i>Taeniaesporites</i>.</p> <p>The marine forms include <i>Cleistosphaeridium mojsisovicsii</i>, <i>Hystriosphæridium langii</i> and <i>Suessia swabiana</i>.</p>
<u>Discussion.</u>	Only a tentative Rhaetian assignment is made due to the rather meager assemblage recovered.

3850-4003.5'C

<u>Age.</u>	Late Triassic Norian
<u>Zone.</u>	P-M26
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	<p>The Norian section reflects an increase in dinocyst diversity. The assemblage includes <i>Heibergella aculeata</i>, <i>H. salebrosacea</i>, <i>Noricysta fimbriata</i>, <i>Suessia swabiana</i>, <i>Sverdrupiella spinata</i> and <i>S. usitata</i>.</p>

4003.5C-4151.5'C

<u>Age.</u>	Indeterminate
<u>Environment.</u>	Indeterminate
<u>Palynomorphs.</u>	Barren of indigenous palynomorphs.
<u>Discussion.</u>	This bottom interval includes argillite basement lithology.

## **CONCLUSIONS**

Palynological analysis of the USGS/Husky West Dease No. 1 well provides the following generalized palynostratigraphic succession:

- Marine Aptian - Early Albian strata are identified between 110 feet and 2945C feet.
- Marine Barremian - Aptian age strata is seen from 2945C feet to 3325SW feet.
- A very thin section of marine Hauterivian strata occurs between 3325SW feet and 3360 feet.
- A large hiatus is represented by the absence of Early Neocomian and Middle to Late Jurassic strata.
- Marine - marginal marine strata of probable Early Jurassic age are identified between 3360 feet and 3793C feet.
- Late Triassic marine strata of Norian to possible Rhaetian age are seen from 3793C feet to 4003.5C feet.
- The bottom interval from 4003.5C feet to 4151.5C feet is of indeterminate age. The well bottoms in argillitic basement lithology.