DEPARTMENT OF MINES
SOUTH AUSTRALIA

AUSTRALIAN OIL AND GAS CORPORATION

LAKE VICTORIA NO. 1 WELL

SUBSURFACE STRATIGRAPHY AND MICROPALAEONTOLOGICAL STUDY

by

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SENIOR PALAEONTOLOGIST.

with

APPENDIX

Palynological Examination of Cores

by

W. K. Harris
Geologist

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N.H. Ludbrook

ABSTRACT:

A.O.G. Lake Victoria No. 1 was drilled at Lake Victoria 22 miles west north west of Wentworth N.S.W. to a depth of 2475 feet. The well intersected a sequence of Tertiary and Lower Cretaceous rocks to a depth of 2320 feet before entering phyllite bedrock in which the well was abandoned at 2475 feet.

INTRODUCTION

A.O.G. Lake Victoria No.1 stratigraphic test bore was drilled between 5/5/64 and 11/5/64 on the eastern side of Lake Victoria, 22 miles west north west of Wentworth, latitude 34°3'15"S, longitude 141°20'53"E, RL 97.5 feet.

Cuttings samples were taken every 10 feet and cores at approximately 300 foot intervals. All logs including geophysical logs have been measured from the Kelly bushing 14 feet above datum level.

This report presents lithological data and stratigraphic data based principally upon identification of the foraminifera. Some adjustment of stratigraphic boundaries has been made to conform with the electric logs.

Some slight revision of the ages of the middle and upper Tertiary formations has been made since A.O.G. Wentworth No. 1 Well was studied. Present determinations are based on those given by Ludbrook, 1963. Foraminiferal nomenclature has in some cases been adjusted to that of Loeblich & Tappan, 1964.

STRATIGRAPHIC SUMMARY

Stratigraphic units intersected in Lake Victoria No. 1 are as follows:

	Depth (feet)	Thickness (feet)
Quaternary fluviatile and lacustrine sands	0-308	308
Bookpurnong Beds (Upper Miocene to Lower Pliocene)	308-372	64
Pata Limestone equivalents (Lower Miocene)	372-450	78
Morgan Limestone and Mannum Formation - Lower Miocene	450-696	246
Gambier Limestone (Lower Miocene to upper Oligocene)	696-800	104
Ettrick Formation (Oligocene)	800-885	85
Knight Group (Eocene)	885-1780	985
Lower Cretaceous sediments (Albian)	1780-2165	385
Lower Cretaceous sediments (Aptian)	2165-2320	155
?Kanmantoo Group phyllite (Cambrian)	2320-2475	155
		2475

QUATERNARY FLUVIATILE AND LACUSTRINE SANDS 0-308 feet.

The well first intersected a sequence of gypseous sands passing into pyritic sands with carbonized wood fragments and fish bones. It is possible that the lower part of the sequence is equivalent to the Loxton Sands but positive evidence is lacking.

BOOKPURNONG BEDS (Upper Miocene to Lower Miocene) 308-372 feet.

Typical Bookpurnong Beds consisting of grey glauconitic shelly silt and clay with a rich microfauna occurred between 308 and 372 feet.

PATA LIMESTONE equivalents (Lower Miocene) 372-450 feet.

The upper part of the section equivalent to the Pata Limestone consists of calcareous siltstone and fine silty sandstone passing into sandy marl. Foraminifera including Heterolepa

victoriensis are common and well preserved. Pata Limestone belongs to the Bairnsdalian stage, at present thought to be equivalent to uppermost Burdigalian rather than Helvetian.

MORGAN LIMESTONE AND MANNUM FORMATION (Lower Miocene) 450-696 feet.

Bryozoal limestones of the Morgan Limestone and Mannum Formation occurred between 450 and 696 feet but owing to contamination of the cuttings and the hard recrystallized nature of the limestone below 500 feet it is not possible to establish a boundary between the two.

GAMBIER LIMESTONE (Lower Miocene to Upper Oligocene) 696-800 feet.

Below 696 feet the well passed into dense hard cherty limestone with glauconite and sulphide minerals. Eponides repandus and Gyroidina sp. A are present at 700-710 feet and at 760 feet the first Victoriella conoidea was observed. The zone of Victoriella conoidea is represented between 760 and 800 feet by abundant well preserved tests.

ETTRICK FORMATION (Oligocene) 800-885 feet.

at 800 feet the well entered grey marly and shelly limestone and pyritic shelly marl of the Ettrick Formation. The lowest 15 feet between 870 and 885 feet consists of the highly glauconitic marl bed encountered in Wentworth No. 1 Well between 826 and 857 feet. Washings consist largely of abundant large pellets of green and brown glauconite.

This bed marks the base of the normal marine sequence in the northern part of the Murray Basin. The sequence thickens only slightly between Wentworth and Renmark; from the base of the Ettrick to the top of the Bookpurnang thicknesses in Wentworth No.1, Lake Victoria No. 1 and North Renmark No. 1 are respectively 493, 513 and 566 feet.

KNIGHT GROUP (Eocene) 885-1780 feet.

Sands, carbonaceous clay and lignite of the Knight Group

paralic sequence were intersected between 885 and 1780 feet. Molluscan fragments, fish fragments and tests of Cyclammina and Ammodiscus occur in the upper beds while the basal of beds consist of very coarse grit. These sediments show a progressive westerly thickening of from 416 feet in Wentworth No. 1 to 1095 feet in North Renmark No. 1 Well.

The 895 feet present in Lake Victoria No. 1 probably represent most of Eocene time, the microfloral content of the lignite at the top of the sequence in Core 3 being distinctly younger than those of Cores 4 and 5 (Harris, Palyn. Rep. 5/64 Appendix to this report)

LOWER CRETACEOUS (Albian) sediments 1780-2165 feet

Below 1780 feet two unnamed formations or members of Lower Cretaceous age were intersected. The upper unit is a green grey fine silty feldspathic sandstone with abundant plant megaspores of Arcellites (formerly recorded as Pyrobolospora). The unit is of non-marine origin.

LOWER CRETACEOUS (Aptian) sediments 2165-2320 feet

155 feet of marine Aptian shales with Bigenerina loeblichae were present. The unit is rich in glauconite, in contrast with the more chloritic overlying non-marine unit.

PHYLLITE ?KANMANTOO GROUP (Cambrian) 2320-2475 feet.

At 2320 feet highly metamorphosed phyllite was entered. It is possible, though not confirmed, that this belongs to the Kanmantoo Group, of Cambrian age.

DESCRIPTION OF THE CORES AND CUTTINGS.

Cuttings Depth (feet)	Core No.	Description
14 - 20		Sand with fine angular quartz, iron oxide, gypsum.
20 - 30		Gypsum

Cuttings Depth (feet)	Core No.	Description
30- 40		Gypsum, coarse subangular quartz, pyrite and plant fragments.
40- 80		Yellow coarse subangular quartz sand.
80- 90		As above, with fish bones.
90- 130		As above, pyritic.
130- 160		Coarse sand, greyish, with iron oxide coating some grains, duricrust grains and chert.
160- 210		As above, with pyritized wood fragments, abundant chert.
210- 308		As above with much pyritized wood.
308- 320		Cuttings as above.
320- 330	1	Recovered 6.3 feet. Grey clauconitic shelly silt and clay in irregular swirls, molluscan fragments and complete shells common, washings consist of clay, shell fragments and glauconite pellets. Ledella, Eotrigonia, Turritella and carditids present, abundant foraminifera.
330- 372		Cuttings almost completely contaminated by overlying sand.
372- 390		Cuttings are so contaminated by overlying sand and grit that it is difficult to determine the true nature of the strata which are probably fine glauconitic sand and silt. Ditrupa, bryozoa, Heterolepa victoriensis present.
390- 400		As above, with Heterolepa victoriensis, Quinqueloculina vulgaris, Cornuspiroides.
400- 410		As above, with Austrotrillina bowchini, abundant Quinqueloculina vulgaris.
410- 420		With Heterolepa victoriensis, Quinqueloculina vulgaris, corals, echinoids, bryozoa, mollusca common, including Turridae.
420- 450		Shelly bryozoal sandy marl with Operculina victoriensis, Sphaerogypsina globula. Foraminifera well preserved and unrecrystallized.
450- 460		Grey bryozoal limestone with Amphistegina lessonii, Carpenteria proteiformis.
460- 470		As above with brachiopod.
470- 480		As above, with Operculina victoriensis, Amphistegina lessonii, Sphaerogypsina globula, abundant bryozoa.
480- 500		As above, with Gypsina howchini.
500- 530		Grey hard crystalline limestone with abundant Cibicides pseudoungerianus, Amphistegina lessonii, Calcarina verriculata, Operculina victoriensis, brachiopods.

Cuttings Depth (feet)	Core No.	Description.
530- 560		Crystalline limestone with dark green glauconite.
560- 570	2	Recovered 6.0 feet. Light grey crystalline glauconitic limestone with abundant small fossils, mostly Cibicides pseudoungerianus
570- 620		Well cemented, and cuttings heavily contaminated with cement.
620- 696		Grey bryozoal limestone, with Carpenteria rotaliformis and Eponides repandus.
696- 760		Grey dense bryozoal limestone, cherty, with glauconite and sulphide materials. Eponides repandus and Gyroidina sp. A present.
760- 800		Grey bryozoal limestone with abundant well preseved Victoriella conoidea.
800- 850		Grey marly shelly limestone with fish bones and fine grained glauconite.
850- 860		Grey pyritic shelly marl, rich in pyrite aggregates, Turritella, Dentalium, Nuculana, Cibicides umbonifer, Cassidulina, Pullenia, Anomalina, Siphonina.
860- 870		As above, with abundant foraminifera, fish tooth.
870- 880		Greenish marl with abundatn pellets of green and brown glauconite.
880- 885		As above, with limonite and glauconite pellets, Cyclammina.
885- 895	3	Recovered 10 feet. Lignite and pyritic sandstone with fine angular clear quartz, some grey quartz, mica, pyrite, rare mollusca including Ledella leptorhyncha, Trochammina sp.
900- 920		Carbonaceous clay and pyritic sandstone.
920- 930		As above, with fish fragments.
930- 940		As above, with pyritized Lagena, Cyclammina.
950-1010		Clay, with Cyclammina
1010-1080		Grey coarse subangular sand.
1080-1090		As above, with shark tooth.
1100-1120		Grey carbonaceous sand, lignitic, with shark tooth.
1120-1140		Grey sand with pyritized wood.
1140-1160		Lignite and carbonaceous clay.
1160-1190		Dark grey sandy clay.
1190-1200	4	Recovered 1'8". Dark grey brown silty sandstone, highly carbonaceous, with coarse to fine ill-sorted quartz in a carbonaceous silty matrix.

Cuttings Depth (feet)	Core No.	Descriptions.
1200-1220		As above, with Cyclammina.
1220-1240		Sandstone, as above, with duricrust grains, lithic grains, large Ammodiscus.
1240-1250		Lignite.
1250-1270		Sandstone, with Cyclammina.
1270-1360		Sandstone as above, cuttings 1350-1360 have grains of silicified fossil wood.
1360-1500		Grey gritty sand with coarse subangular to sub-rounded clear quartz grains, quartz - pyrite aggregates, lignite.
1500-1510		Lignite.
1510-1520	5	Recovered 10 feet. Top 9" lignite, 7½" light buff grey siltstone with lignite fragments, 2'1" very fine grained sandstone with muscovite and carbonaceous flecks.
1520-1550		As above.
1530-1560		Lignite.
1560-1710		Sandstone and siltstone as core 5.
1710-1780		Grey very coarse grit with milky quartz, the coarse quartz grains having a translucent coating.
1780-1807		Green-grey fine silty sandstone feldspathic with green-grey grains, biotite, feldspar, clay, chlorite. Arcellites reticulata.
1807-1817	6	Recovered 10 feet. Sandstone as above with Arcellites reticulata, "cones", iridescent megaspore.
1817-1890		Sandstone, siltstone and mudstone.
1890-1950		Grey dolomitic sandstone, feldspathic, carbon-aceous.
1950-2060		As above, with dolomite globules.
2060-2090		As above, with fish bone.
2090-2105		With Arcellites
2105-2115	7	Recovered 8 feet. Greenish grey sandy siltstone with fine to medium angular quartz grains in a silty matrix; washings fine angular quartz, chlorite, grey grains, silt material, biotite, carbonaceous fragments.
2115-2150		As above, with graphite grains.
2170-2220		Green-grey shale with abundant dark olive-green glauconite.
2220-2230		With Bigenerina loeblichae.

Cuttings Depth (feet)	Core No.	Descriptions.
2230-2240		Shale, with fish fragments.
2240-2260		Shale as above with Arcellites
2260-2290		Shale, with Arcellites, Lingula, Bigenerina loeblichae.
2290-2320		As above.
2320-2375		Phyllite
2375-2380	8	Recovered 4 feet. Phyllite.
2380-2465		Phyllite.
2465-2475	9	Recovered 9'6". Phyllite.

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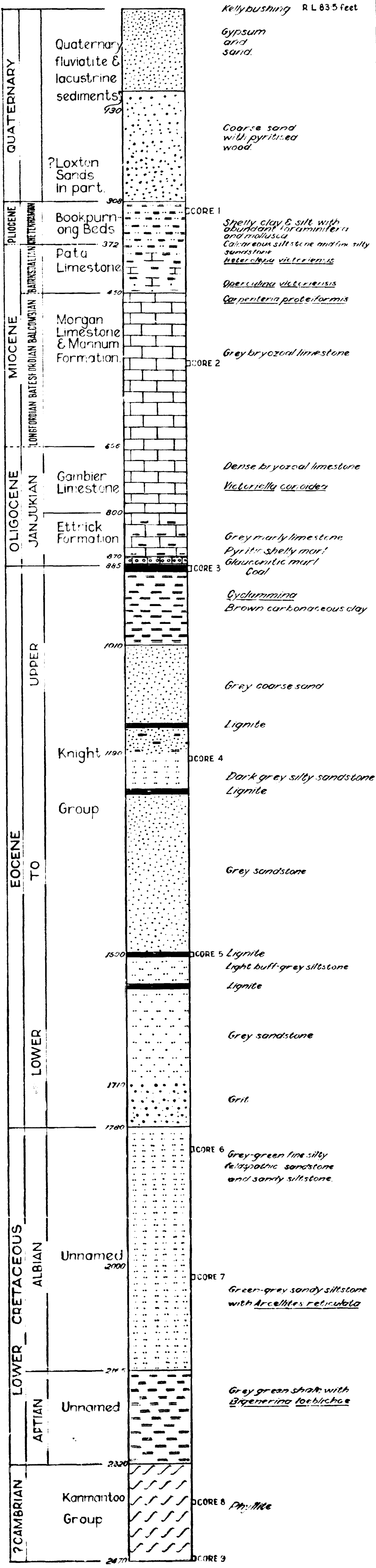
A.O.G. LAKE VICTORIA NO.1 WELL
COLUMNAR SECTION



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DEPARTMENT OF MINES
SOUTH AUSTRALIA

APPENDIX

A.O.G. LAKE VICTORIA No. 1

PALYNOLOGICAL EXAMINATION

OF CORES

by

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S.R. 11/5/140

14th July, 1964

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DEPARTMENT OF MINES
SOUTH AUSTRALIA

APPENDIX
A.O.G. LAKE VICTORIA No. 1
PALYNOLOGICAL EXAMINATION
OF CORES

INTRODUCTION

A.O.G. Lake Victoria No. 1 was drilled to a total depth of 2,475 feet between A.O.C. North Renmark No. 1 and A.O.G. Wentworth No. 1.

Core samples submitted by the company for palynological analysis have been examined.

Most cores provided well preserved and diverse microfloras which have been compared with those occurring in dated sediments of southern Australia. Core 2 was barren with respect to pollens and spores.

ANALYSES OF CORES

a. Tertiary

Core 1 320-330' six feet from top.

The following small assemblage was obtained.

Casuarinidites cainozoicus

Cingutriletes clavus

Cyathidites sp.

Dictyophyllidites sp.

Laevigatosporites major

Myrtaceidites eucalyptoides

Nothofagus falcata

Osmundacidites wellmanii

Triorites harrisii

Microplankton: Hystrichosphaeridium sp.

The assemblage is small and not very characteristic except for the presence of M. eucalyptoides which has only been recovered from Pliocene deposits in southern Australia (Cookson and Pike 1954). Dr. N.H. Ludbrook has determined a Pliocene-Miocene age (Bookpurnong

Beds) for this core.

Core 3 885-895' one foot from top.

The following assemblage was obtained.

Araucariacites australis

Cupanieidites orthoteichus

Cyathidites australis

C. minor

Dacrydiumites mawsonii

Dacrycarpites australiensis

Hypolaena type pollen

Liliacidites sp.

Lycopodiumsporites austroclavatidites

Myrtaceidites eugeniioides

Nothofagus emarcida

N. falcata

N. hetera

N. vansteenisi

Podocarpidites ellipticus

Proteacidites annularis

Tricolporites spp.

T. prolata

Triorites harrisii

The particularly common occurrence of Hypolaena pollen in this assemblage is unusual particularly in Eocene sediments from Victoria and South Australia. This would suggest that the assemblage could be younger than Blanche Point Marls in South Australia or the Browns Creek Clays of Victoria. However, the geographic distribution of distinct floras during the Eocene is imperfectly known. On the evidence available the assemblage is best regarded as Upper Eocene but could possibly be younger.

Core 4 1190'-1200' one foot from top.

The assemblage included the following species:

Araucariacites australis

Banksieaeidites spp.

Beaupreaidites verrucosus

Cupanieidites orthoteichus

Cyathidites minor

C. australis

Dacrydiumites florinii

D. mawsonii

Dictyophyllidites sp.

Graminidites sp.

Laevigatosporites major

L. ovatus

Liliacidites sp.

Myrtaceidites eugeniioides

M. mesonesus

Malvaceae pollen

Nothofagus aspera

N. emarcida

N. hetera

N. cincta

N. brachyspinulosa

N. falcata

Podosporites microsaccatus

Polyporina sp.

Podocarpidites ellipticus

Proteacidites pachypolus

P. tuberculatus

P. reticulatus

P. spp.

Rugulatisporites sp.

Santalumidites cainozoicus

Stereisporites antiquasporites

Triorites harrisii

Tricolporites prolata

T. spp.

Verrucatosporites sp.

This assemblage was particularly diverse and well preserved. It is common throughout the Murray Basin in pre-Upper Eocene sediments of the Knight Group. It is certainly younger than Paleocene

but a more precise age other than Lower-Middle Eocene cannot be given.

Core 5. 1510'-1520' one foot from top.

The assemblage included the following species:

Cupanieidites orthoteichus

Dacrydiumites florinii

D. mawsonii

Dacrycarpites australiensis

Malvaceae pollen

Myrtaceidites mesonesus

M. eugeniioides

Nothofagus emarcida

N. heterа

N. brachyspinulosa

Proteacidites annularis

P. pachypolus

P. subscabratus

Santalumidites cainozoicus

Tricolporites prolata

Triorites harrisii

The assemblage is not as diverse as that in core 4. It is of Lower-Middle Eocene age.

b. Cretaceous

Core 6 1807' -1817' three feet from top.

The assemblage contained the following species:

Alisporites grandis

Araucariacites australis

Aequitriradites verrucosus

A. spinulosus

Arcellites (al. Pyrobolospora) reticulatus

Balmeisporites holodictyus

Baculatisporites comaumensis

Ceratosporites equalis

Contignisporites glebulentus

Cicatricosisporites australiensis

Cingutriletes clavus

Crybelosporites striatus

Cyathidites australis

C. minor

C. asper

Gleicheniidites circinidites

Laevigatosporites ovatus

Lycopodiumsporites austroclavatidites

Microcachryidites antarticus

Osmundacidites wellmanii

Podocarpidites ellipticus

Rouseisporites reticulatus

Schizosporis spriggii

S. parvus

Stereisporites antiquasporites

Trilites tuberculiformis

Trilobosporites tribotrys

This well preserved and diverse assemblage is comparable with the Paradoxa Assemblage of Dettmann (1963). Although the "index" species of this Assemblage, Coptospora paradoxa, was not present in core 6 the presence of T. tribotrys and C. glebulentus establishes a correlation with assemblage.

Dettmann (1963) has indicated an Upper Aptian to Upper Albian age for the Assemblage.

Core 7 2105 - 2115' five feet from top.

The following assemblage was obtained:

Cicatricosisporites australiensis

Cyathidites australis

C. minor

Concavisporites sp.

Foraminisporis asymmetricus

F. wonthaggiensis

Gleicheniidites circinidites

Ginkgocycadophytus nitidus

Lycopodiumsporites austroclavatidites

Microcachryidites antarcticus

Podocarpidites ellipticus

Stereisporites antiquasporites

The assemblage was not well preserved or diverse. A more precise age other than Lower Cretaceous is not possible.

CONCLUSIONS

Comparison of assemblage from the Knight Group of this well with well dated Eocene sediments of southern Australia indicates that they represent a substantial time equivalent during the Eocene and are possibly younger.

The Cretaceous of cores 6 and 7 has been confirmed and core 6 has been dated as Upper Aptian - Upper Albian.

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