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DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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MICROPALEONTOLOGICAL STUDY OF FIVE WELLS, WESTERN WILLAMETTE VALLEY, OREGON

by

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Consulting Micropaleontologist

1980

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MICROPALEONTOLOGICAL STUDY OF FIVE WELLS, WESTERN WILLAMETTE VALLEY, OREGON

by Daniel R. McKeel

The Department of Geology and Mineral Industries contracted Daniel McKeel, Consulting Micropaleontologist, to work samples from five oil and gas test holes drilled along the west side of Oregon's Willamette Valley. Geologic ages have been assigned by Mr. McKeel to rock units penetrated in the wells. Results of the paleontologic work will be useful for future geologic investigations of the area.

The five wells selected for paleontologic study from north to south are: Texaco Cooper Mountain #1, Reichhold Merrill #1, Reichhold Finn #1, Reserve Bruer #1, and Humble Miller #1.

The Department published paleontologic studies by Dr. Richard Thoms in 1969 under its Oil and Gas Investigation series. The Texaco Cooper Mountain well was first worked by Thoms in 1969. The following statement by Daniel McKeel discusses the present interpretation.

"In my interpretation of the Texaco Cooper Mountain well, the Ulatisian was not reached. The highest occurrence of *Amphimorphina*, *A. becki*, a Narizian species, was noted at 4732 feet. *A. californica*, considered restricted to the Upper Ulatisian in California, was found as high as 6519 feet. However, it occurs with faunas which appear to be distinctly Narizian in age, as it does in the Finn and Bruer wells of this study. Therefore, *A. californica* is interpreted by this author to range into the Lower Narizian in Oregon. Other species considered to be in the same category as *A. californica* are *Trifarina advena californica*, *Nodosaria latejugata var.*, *Vaginulinopsis mexicana var.*, and '*Discorbis coalingensis*' (of Mallory)."

TEXACO, INC.
COOPER MOUNTAIN NO. 1
WASHINGTON COUNTY, OREGON
PALEONTOLOGICAL REPORT

The following foraminiferal report is based on interpretations of 56 previously unprocessed samples (32 core and 24 dry ditch) in the interval from 1096 to 8896 feet.

The well penetrated strata of Refugian and Narizian age. Refugian sediments were deposited in a nearshore environment where circulation with the open sea was cut off or restricted. Open marine conditions existed during the Narizian, and deposits were also generally nearshore. Two maximum transgressions are indicated at 4936-4944 and 6959 feet.

Below is a summary of age and paleoenvironmental interpretations followed by species lists or explanations for each distinctive interval. Species "tops" and larger abundances of certain species considered significant are all listed in descending order of their highest occurrences in the well.

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
1096*	Indeterminate	Marine
1102-1594*	Indeterminate	Indeterminate
1982-2208*	Refugian	Outer Neritic to Upper Bathyal
2437-2455*	Indeterminate	Marine
3316*	Indeterminate	Indeterminate
4273-4290*	Narizian	Open Marine, Middle to Outer Neritic
4492-4924*	Narizian	Open Marine, Outer Neritic to Bathyal
4936-4944*	Lower Narizian	Open Marine, Upper to Middle Bathyal
5105;5275	Indeterminate	Indeterminate

* Core sample(s)

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
5285;5306*	Indeterminate	Marine
5759-5797*	Narizian	Open Marine, Outer Neritic to Bathyal
6519-6679**	Lower Narizian	Open Marine, Outer Neritic to Bathyal
6799**	Lower Narizian	Open Marine, Neritic to Upper Bathyal
6879**	Indeterminate	Open Marine
6959-7247**	Lower Narizian	Open Marine, Upper to Middle Bathyal
7275;7365**	Indeterminate	Open Marine
7445**	Indeterminate	Indeterminate
7525;7605**	Lower Narizian	Open Marine, Outer Neritic to Bathyal
7695**	Indeterminate	Indeterminate
7775**	Indeterminate	Open Marine
7804-7816*	Indeterminate	Indeterminate
7812-8020**	Lower Narizian	Open Marine, Outer Neritic to Bathyal
8100**	Lower Narizian	Open Marine, Bathyal
8596*	Indeterminate	Open Marine
8598*	Lower Narizian	Open Marine, Outer Neritic to Bathyal
8812-8832*;8896**	Indeterminate	Indeterminate

* Core sample(s)
** Ditch sample(s)

SPECIES LIST

1096-1594'	Globobulimina sp. (crushed) R*, Diatoms R (1096' only).
1982-2208'	Globobulimina pacifica oregonensis R, Eponides cf. kleinpelli R, Lenticulina cf. welchi (of Rau, 1948) R, Nonion applini R, Uvigerina cf. cocoaensis R, Cibicides pseudoungerianus evolutus R, Cancris sp. (small) R, Guttulina irregularis R, Cassidulina cf. galvanensis R, Nonion halkyardi R, Bulimina schencki C, Gaudryina alazanensis R, Uvigerina beccarii R.
2437-2455'	Lenticulina fragments R (2455' only).
3316'	Barren of fossils.
4273-4924'	Cibicides natlandi R, Cibicides natlandi/haydoni R, Gyroidina cf. soldanii R, Spumellaria R-VA, Ostracod var. (deep saddle) R, Gyroidina soldanii octocamerata R, Cibicides cushmani R, Cassidulina globosa var. (uncoiling) R, "Discorbis" coalingensis? (of Mallory, 1959) R, Alabamina kernensis R, Cassidulina globosa R-C, Subbotina cf. wilsoni R, Amphimorphina becki R, Globorotalia insolita? (crushed) R, Pseudohastigerina micra R, Pseudohastigerina lillisi R, Gyroidina scalata R, Truncorotaloides aspensis R.
4936-4944'	Cyclammina sp. (large) C, Ammodiscus sp. (large) R, Nodosaria latejugata, s.s. R, Anomalina cf. crassisepta R, Bathysiphon eocenica R, Subbotina spp. C, Trifarina advena californica R, plus species listed above.
5105';5275'	Barren of fossils.
5285';5306'	Arenaceous indeterminate R, Haplophragmoides sp. R.
5759-5797'	Spongodiscidae R, Gyroidina cf. guayabalensis? (of Mallory, 1959) C, plus species listed above.
6519-6799'	Amphimorphina californica R, Quadrimorphina sp. R, Shell Fragments R, Bulimina sculptilis R, Cibicides cf. mcmastersi R, Vaginulinopsis mexicana var. R, Alabamina scitula C, Valvulineria jacksonensis welcomensis R, Marginulina subbulata R, Eponides minima R, Ostracod variety ("winged") R, plus species listed above.
6879'	Spumellaria C, replaced Foraminifera (indeterminate) R.

* R=1-10 specimens per sample; C=11-32; A=33-100; VA=100+

6959-7247'	Bulimina sculptilis laciniata C, Chilostomella sp. (obese) R, Eponides umbonata R, Bulimina alazanensis? R, Bulimina corrugata R, Nassellaria R, Spumellaria (many "pinkish") VA, Cibicidoides coalingensis (of Mallory, 1959) R, Lenticulina welchi R, Vaginulinopsis sp. R, Uvigerina sp. (small, lightly costate) R, Bulimina whitei? R, plus species listed above.
7275';7365'	Spumellaria C-VA, plus species listed above.
7445'	Bentonite flood. Barren of indigenous fossils.
7525';7605'	Gyroidina cf. soldanii C, Lenticulina spp. A, Trochammina cf. glogigerinaformis R, Gyroidina scalata C, plus species listed above.
7695'	Probably barren of indegenous Foraminifera.
7775'	Spumellaria C, plus species listed above R.
7804-7816'	Barren of fossils.
7812-8100'	Statocysts R, Pseudoglandulina inflata R, Pseudoglandulina conica R, Dentalina dusenburyi R, Bulimina macilenta R, plus species listed above.
8596'	Spumellaria A, pyrite VA.
8598'	Bolivina basisenta R, Spumellaria VA, plus species listed above R.
8812-32';8896'	Barren of fossils.

REFERENCES CITED

Mallory, V.S., 1959. Lower Tertiary Biostratigraphy of the California Coast Ranges. Amer. Assoc. Petrol. Geol., Tulsa, Oklahoma.

Rau, W. W., 1948. Journal of Paleont., vol. 22, No. 2, pp. 152-174.

REICHHOLD ENERGY NNG
MERRILL #1
MARION COUNTY, OREGON
PALEONTOLOGICAL REPORT

The following report is based on analysis and interpretation of 35 previously processed ditch samples from 640 to 5283 feet. Two distinctively different fossiliferous intervals occur in the well. The higher interval (640 to 2470 feet) is Refugian in age. The top two-thirds is Upper Refugian and the lower third is Refugian undifferentiated. The lower interval (2530 to 4480) contains intermittent Upper Narizian faunas.

Paleoenvironmental interpretations indicate two nearshore transgressive sequences, separated by a regression. In Upper Narizian time, bathymetry changed from neritic to open marine bathyal depths, and back to neritic. In the Refugian, waters were again deeper, fluctuating between outer neritic and bathyal depths.

Below is a summary of age and paleoenvironmental interpretations for each distinctive interval examined, followed by species listed generally in descending order of their highest occurrences for each interval.

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
640-1210	Upper Refugian	Open Marine, Nearshore, Outer Neritic to Upper Bathyal
1270-1390	Upper Refugian	Nearshore Bathyal
1450-1840	Upper Refugian	Nearshore Outer Neritic to Upper Bathyal
1990-2200	Refugian	Nearshore Bathyal
2350-2380	Indeterminate	Indeterminate
2440-2470	Refugian	Nearshore Outer Neritic to Upper Bathyal
2530-2560	Upper Narizian	Nearshore Outer Neritic

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
2710-2740	Indeterminate	Indeterminate
2890-2920	Indeterminate	Nearshore Inner to Middle Neritic
2980-3190	Upper Narizian	Mixed Nearshore Inner Neritic to Bathyal
3250-3370	Upper Narizian	Open Marine, Near-shore Bathyal
3520-4090	Indeterminate	Indeterminate
4150-4270	Upper Narizian	Open Marine, Near-shore Bathyal
4330-4360	Indeterminate	Indeterminate
4450-4480	Upper Narizian	Nearshore Neritic
4510-4540	Indeterminate	Indeterminate
4690-4810	Indeterminate	Non-marine to Marginal Marine
4960-5283	Indeterminate	Indeterminate

SPECIES LIST

0-640' No samples available.

640-1840' Cibicides pseudoungerianus evolutus R*, Guttulina sp. a (of Beck, 1943) R, Anomalina aff. patella R, Nonion applini R, Spumellaria (spheres) R, Pseudoglandulina inflata R, Cassidulina galvanensis R, Elphidium sp. R, Uvigerina cocaensis R-C, Uvigerina cf. atwilli R-C, U. cf. gallowayi R, Plectofrondicularia packardi packardi R, Eponides kleinpelli R, Nonion pompilioides R, Uvigerina atwilli R, Bulimina schencki R, Bolivina cf. astoriensis R, Bolivina kleinpelli R, Uvigerinella? obesa cf. impolita? R, Cibicides pseudoungerianus cf. evolutus (thick sutures and peripheral rim) R, Cassidulina globosa R, Guttulina irregularis R, Ceratobulimina washburnei R, Elphidiella sp. R, Uvigerina vicksburgensis? R, Uvigerina cocaensis/ gallowayi R, Cibicides haydoni R.

*R=1-10 specimens per sample; C=11-32; A=33-100; VA=100+

1990-2470	Fauna generally same as above minus Cassidulina galvanensis, plus Cibicides natlandi olequaensis? R, and Cibicides aff. natlandi R. Also, a decrease in abundance of Eponides kleinpelli, accompanied by an increase in a fewer chambered form (Eponides yeguanesis?) distinguishes this interval from the above. The included interval from 2350 to 2380 feet is probably barren of indigenous fossils.
2530-2560	Refugian species plus Bulimina schencki (large) R, Bulimina sculptilis R, Cibicides natlandi R, Lenticulina inornata R.
2710-2920	Probably barren of indigenous fossils except for Elphidiella sp. R, and Lenticulina spp. C at 2890 to 2920 feet.
2980-3370	Lenticulina inornata R-C, Elphidiella sp. R-C, Gyroidina scalata/condoni R, Subbotina spp. R, Lenticulina chirana R, "Half tubes" R, Cibicides hodgei R, Bulimina microcostata R-A, Bolivina basisenta R-C, Frondicularia? sp R, Cibicides natlandi R, Valvulineria tumeyensis R, Valvulineria churchi R, Textularia? sp. R, Uvigerina garzaensis R, Subbotina yeguaensis R, Epsitomina sp. R, Sigmoilina sp. R, Spumellaria (discs) R, Cibicides cushmani/hodgei R, Karreriella contorta R, Alabamina sp. R, Pseudohastigerina micra R, Bulimina sculptilis laciniata R, Bulimina sp. (spinose lower half) R, Spumellaria (spheres) R-C, Lenticulina welchi/chirana (juvenile) R, Nodogenerina aff. lepidula R.
3520-4090	Probably barren of indigenous fossils.
4150-4270	Valvulineria jacksonensis welcomensis R, Bolivina basisenta oregonensis R, Haplophragmoides? sp. (crushed) R, Gyroidina cf. scalata R-C, Spumellaria (spheres) R, Arenaceous (crushed) R, Haplophragmoides obliquicameratus? R, Nonion aff. cushmani? R, Lenticulina cf. terryi R, Lenticulina welchi, s.l. R, Gyroidina cf. soldanii R, cibicides cushmani R.
4330-4360	Barren of indigenous fossils.
4450-4480	Lenticulina spp. C, Elphidium? (Elphidiella?) sp. ("sucrosic" preservation) R, Bulimina schencki C, Elphidium cf. minutum? R.
4510-5283	Generally barren of indigenous fossils. Common coal (?) occurs at 4690-4720 feet. A possibly indigenous foraminifer (Arenaceous sp., crushed) occurs at 4780-4810 feet.

REFERENCE CITED

Beck, R.S., 1943. Jour. Paleontology, 17:6.

REICHHOLD ENERGY NNG
FINN #1
POLK COUNTY, OREGON
PALEONTOLOGICAL REPORT

The following report is based on the analysis and interpretation of 48 previously processed ditch samples from 40 to 7252 feet.

The well penetrated strata of Refugian, Narizian and Ulatisian (west coast provincial Oligocene to Middle Eocene) age. The stage boundaries indicate significant depositional and/or paleoceanographic changes. The absence of fossil plankton in the Refugian suggests that there was little or no circulation with the open sea during that time, even though the water was deep (bathyal). The large faunal change across the Refugian-Narizian boundary (between 490 and 550 feet) is perhaps the result of this down-hole change from restricted to open sea circulation. The exact depth of the Narizian-Ulatisian boundary is clouded by sparse faunas in sediments containing limestone. Although open ocean circulation continued across this boundary, paleobathymetry changed drastically from deep bathyal in the lower Narizian (3340-3370 feet) to warm, very shallow seas (inner neritic) in the highest Upper Ulatisian fauna in the well at 3640 to 3670 feet.

Below is a summary of age and paleoenvironmental interpretations plus species lists or explanations for each distinctive interval examined. Species are listed generally in descending order of their highest occurrences in the well.

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
40-490	Refugian	Nearshore Bathyal
520-610	Upper Narizian	Open Marine, Bathyal
700-850	Indeterminate	Indeterminate
880-1630	Upper Narizian	Open Marine, Near-shore Bathyal
1660-1750	Narizian	Open Marine, Near-shore Bathyal
1780-1990	Narizian	Open Marine, Near-shore Middle to Lower Bathyal
2080-2110	Indeterminate	Open Marine, Near-shore

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
2140-3070	Lower Narizian	Open Marine, Near-shore Middle to Lower Bathyal
3160-3310	Indeterminate	Open Marine, Near-shore
3340-3370	Lower Narizian	Open Marine, Near-shore Middle to Lower Bathyal
3460-3610	Indeterminate	Open Marine, Near-shore
3640-3670	Upper Ulatisian	Open Marine, Tropi-cal Inner to Middle Neritic
3700-3730	Upper Ulatisian	Open Marine
4030-4060	Indeterminate	Indeterminate
4300-4330	Ulatisian	Nearshore Inner Neritic
4600-4630	Indeterminate	Indeterminate
4660-5320	Ulatisian	Open Marine, Bathyal
5740-5770	Indeterminate	Indeterminate
6550-6580	Indeterminate	Indeterminate
7240-7252	Indeterminate	Indeterminate

SPECIES LIST

40-490 Eponides kleinpelli R*, Cassidulina galvanensis R, Cibicides pseudoungerianus evolutus R, Nonion pompilioides R, Cassidulina globosa/galvanensis R-A, Quinqueloculina imperialis R, Uvigerina atwilli R, Nonion applini R, Bulimina schencki R, Uvigerina cocaensis R, Uvigerina cf. gallowayi R, Pseudoglandulina inflata R, Gyroidina condoni/ scalata R, Cibicides haydoni R, Nonion halkyardi R, Guttulina irregularis R, Uvigerina cf. atwilli R-A,

*R=1-10 specimens per sample; C=11-32; A=33-100; VA=100+.

	Guttulina frankei R, Uvigerina cf. coœaensis R-C, Plectofrondicularia packardi packardi R, Cibicides natlandi/haydoni R, Robertina washingtonensis R, Bolivina basisenta (reworked?) R, Bolivina jacksonensis striatella R, Uvigerinella? obesa impolita? R, "Half tubes"R.
520-1630	Lenticulina chirana R, Valvulineria churchi R-C, Cibicides hodgei R, Spumellaria (spheres) R-VA, Subbotina spp. R, Valvulineria tumeyensis R, Spumellaria (discs) R-A, Plectofrondicularia searsi R, Plectofrondicularia minuta R, Saccammina? sp. R, Uvigerina garzaensis R, Valvulineria churchi var. (high-spired) R, Bulimina microcostata R-C, Nassellaria R, Subbotina linaperta R, Pseudohastigerina micra R, Angulogerina cooperensis? R-C, Plectofrondicularia oregonensis R, Lenticulina welchi, s.l. R, Spumellaria (spheres-"spiny") R, Dentalina dusenburyi R, Amphimorphina jenkinsi R, Bolivina basisenta R-A, Bulimina sp. (large, smooth) R.
1660-1990	Fauna generally same as above plus Uvigerina elongata R, Subbotina sp. (large) R, Quadrimorphina sp. R, Bathysiphon eocenica R, Valvulineria jacksonensis welcomensis, s.s. R.
2080-2110	Sumellaria C, Arenaceous sp. (large, crushed) R.
2140-3070	Gyroidina cf. soldanii R, Alabamina scitula R, Gyroidina soldanii octocamerata R, Bulimina corrugata R, Uvigerina sp. (hispidocostate) R, Darbyella sp. R, Spumellaria R-VA, Eponides gaviotaensis R, Baggina aff. californica R, Nodosaria latejugata? (fragment) R, Cassidulina globosa var. (uncoiling) R, Uvigerina alabamensis (of Mallory, 1959) R, Amphimorphina californica R, Bulimina lirata R, Eponides dorfi (of Mallory, 1959) R, Discorbis coalingensis (of Mallory, 1959) R. Trochammina cf. globigerinaformis R, Eggerella elongata R, Bulimina whitei? R, Bulimina alazanensis? R, Pseudoglandulina conica R, Truncorotaloides collactea R.
3160-3310	Spumellaria R-C, Nodosaria? (broken) R-C.
3340-3370	Eggerella elongata R, Spumellaria A.
3460-3610	Probably barren of indigenous Foraminifera. Spumellaria C-A.

3640-3730	Operculina cushmani? (of Mallory, 1959) R, Vaginulinopsis nudicostata R, Cibicides spp. R-A, Discorbis baintoni R, Cibicides spiropunctatus R, Elphidium spp. R, Cibicides spp. (attached forms) R, Nassellaria R, Spumellaria C-A, Amphistegina? sp. R, Nodosaria latejugata R, Gastropods R.
4030-4060	Probably barren of indigenous fossils. Inorganic spheres VA.
4300-4330	Elphidium californicum R.
4600-4630	Barren of indigenous fossils.
4660-4870	Bulimina cf. carlsoni R, Subbotina frontosa R, Cibicidoides venezuelanus R, Acarinina wartsteinensis R, "Globorotaloides" sp. (of McKeel and Lipps, 1975) R, Bifarina nuttalli R, Spumellaria C-VA, Bulimina whitei, s.s. R, Planorotalites cf. planoconica R, Parrella culter midwayana R, Valvulineria childsi R, Anomalina dorri aragonensis R, Uvigerina lodoensis miriamae R, Acarinina crassata cf. densa R.
4960-5320	Lenticulina turbinatus R, Subbotina spp. R-A, Dorothia principiensis R, Bolivina explicata lodoensis R, Spumellaria R-VA, Nassellaria R, Truncorotaloides spinulosa? R, Subbotina aff. soldadoensis R, Acarinina cf. pseudotopilensis R, Plectofrondicularia kerni? (crushed) R.
5740-5770	Barren of indigenous fossils.
6550-6580	Barren of indigenous fossils.
7240-7252	Barren of indigenous fossils.

REFERENCES CITED

Mallory, V.S., 1959. Lower Tertiary Biostratigraphy of the California Coast Ranges. Amer. Assoc. Petrol. Geol., Tulsa, Oklahoma.

McKeel, D.R., and Lipps, J. H., 1975. Jour. Foram. Res., 5:4.

RESERVE OIL AND GAS COMPANY
BRUER #1
POLK COUNTY, OREGON
PALEONTOLOGICAL REPORT

The following foraminiferal report is based on interpretations of 51 previously processed dry ditch samples from 30 to 5520 feet.

The well penetrated strata of Refugian and Narizian age. Fossil plankton are absent in the Refugian but Radiolaria and a few planktonic Foraminifera are present throughout the Narizian portion of the well. Therefore open ocean circulation was restricted or absent in Refugian time, but during the Narizian there was open sea circulation. All sediments in this well were deposited close to shore. Water depths fluctuated generally between outer neritic and middle bathyal. One major exception is a sandy interval from 880 to 1460 feet, which is possibly of inner to middle neritic origin.

Below is a summary of age and paleoenvironmental interpretations plus species lists or explanations for each distinctive interval examined. Species are listed generally in descending order of their highest noted occurrences in the well.

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
30	Indeterminate	Marine
150-510	Refugian	Outer Neritic to Upper Bathyal
560	Refugian	Outer Neritic
580	Indeterminate	Open Marine
600-740	Upper Narizian	Middle Bathyal
880-1320	Indeterminate	Indeterminate
1460	Indeterminate	Probably Inner to Middle Neritic
1600-1880	Narizian	Middle Bathyal
2020-3140	Narizian	Middle Bathyal

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
3280-3800	Narizian	Bathyal
3940	Indeterminate	Open Marine
4040-4340	Lower Narizian	Outer Neritic to Bathyal
4440-4540	Lower Narizian	Middle Bathyal
4580	Indeterminate	Open Marine
4600-4740	Indeterminate	Indeterminate
4800	Lower Narizian	Bathyal
4840-4980	Indeterminate	Open Marine
5040-5520	Indeterminate	Indeterminate

SPECIES LIST

30'	Globobulimina sp. R*, Anomalina sp. (etched) R.
150-510'	Uvigerina cf. cocoaensis R, Cassidulina galvanensis R, Uvigerina beccarii (fat) R, Robertina washingtonensis R, Guttulina frankei R, Cibicides pseudoungerianus evolutus R, Nonion planatum R, Guttulina irregularis R, Cibicides haydoni R, Uvigerina cocoaensis, s.s. R, Uvigerina cf. atwilli R, Plectofrondicularia packardi packardi R, Eponides kleinpelli R, Uvigerina atwilli, s.s. R, Bulimina schencki R, Nonion halkyardi R, Pseudoglandulina inflata R, Cibicides hodgei R, Cibicides natlandi olequaensis R, Plectofrondicularia packardi robusta R, Nonion applini R, Bolivina jacksonensis striatella R, Shell fragments A, Bulimina schencki var. (elongate) A, Uvigerina cf. mexicana R.
560'	Plectofrondicularia oregonensis R, Elphidiella sp. R, Sponge spicules C, Statocysts C, Echinoid spines R, plus species listed above.

*R=1-10 specimens per sample; C=11-32; A=33-100; VA=100+

580'	Glauconitic mudstone. Haplophragmoides (crushed) R, Spongodiscidae R, Cyclammina sp. R, Nassellaria R, Spumellaria R.
600-740'	Cibicides natlandi R, Spongodiscidae C, Bulimina microcostata R, Valvulineria churchi R, Anomalina garzaensis R, Arenaceous indeterminate R, Subbotina sp. R, Uvigerina garzaensis R, Lenticulina chirana R, Ellipsonodosaria sp. R, Spumellaria var. ("spiny") R, Bolivina kleinpelli var. (large) R, Bolivina basisenta oregonensis R, Lenticulina welchi, s.l. R, Cassidulina globosa var. (uncoiling) R, Bolivina kleinpelli C.
880-1320'	Probably barren of indigenous Foraminifera.
1460'	Elphidium sp. (worn) R.
1600-1880'	Trochammina cf. globigerina formis R, Eponides gaviotaensis R, Bulimina microcostata C, Plectofrondicularia vokesi R, Valvulineria tumeyensis? R, Nodosaria deliciae R, Bulimina alazanensis? R, Acarinina pentacamerata? R, Subbotina frontosa R, Gyroidina cf. guayabalensis (of Mallory, 1959) R, Bulimina cf. whitei R, Plectofrondicularia packardi var. (keeled) R, Ostracod var. (deep saddle) R, Bolivina basisenta R, Bulimina corrugata/cf. whitei R, Bulimina corrugata R, Virgulina sp. (small, slender, finely costate) C, Virgulina sp. (small, slender, smooth) C.
2020-3140'	Gyroidina cf. scalata R, Uvigerina garzaensis var. (large) R, Amphimorphina jenkinsi R, Bolivina basisenta C, Trifarina advena California? (small) R, Marginulinopsis sp. R, Valvulineria tumeyensis? var. (fat, large) R, Pseudohastigerina micra R, "Hastigerinella" eocenica? (juv.) R, Valvulineria tumeyensis var. (large, high-spired) R, Subbotina angiporoides minima R, Pseudohastigerina lillisi R, Gyroidina soldanii octocamerata R, Subbotina sp. (large) R, Spumellaria VA, Bulimina semicostata lacrima R, Subbotina pseudoeocaena R, Uvigerina elongata, s.s. R, Lenticulina pseudovortex? R, Globorotaloides sp. (of McKeel and Lipps, 1975) R, Bulimina corrugata, s.s. R, Lenticulina welchi var. (sutures very wide and depressed) R, Alabamina scitula R.

3280-3800'	Eponides umbonatus R, Gyroidina guayabalensis (of Mallory, 1959), s.s. R, Nodosaria longiscata R, Cibicides pachyderma (of Mallory, 1959) R, Spumellaria VA, Valvulineria jacksonensis welcomensis R.
3940'	Spongodiscidae C, Spumellaria R.
4040-4340'	Lenticulina midwayensis? (of Mallory, 1959, pl. 7) R, Cibicides cushmani R, Amphimorphina californica R, Trifarina advena californica R, Gaudryina sp. R, Cibicides sandiegensis R, "Discorbis" coalingensis (of Mallory, 1959) R, Pseudoglandulina conica R.
4440-4540'	Bulimina macilenta R plus species listed above, including Bulimina microcostata R, Bulimina corrugata/alazanensis group R, and Valvulineria jacksonensis welcomensis R.
4580'	Spumellaria VA+, Bathysiphon eocenica R.
4600-4740'	Barren of indigenous fossils.
4800'	Bulimina lirata R plus species listed above.
4840-4980'	Spumellaria R-C plus rare Foraminifera considered as contamination from above.
5040-5520'	Barren of indigenous Foraminifera.

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HUMBLE OIL AND REFINING COMPANY
MILLER #1
SEC. 10, T10S, R3W, LINN COUNTY, OREGON
PALEONTOLOGICAL REPORT

The following foraminiferal report is based on the interpretation of 33 ditch sample residues within the interval from 50 to 4940 feet. Samples processed previously for paleontology were borrowed from the Oregon Department of Geology and Mineral Industries Warehouse in Portland.

There are essentially three fossiliferous intervals in the well. All are interpreted as Upper Narizian (Upper Eocene) in age, representing nearshore outer neritic or upper bathyal depths in each case. The younger two (1220 to 1520' and 2480 to 2690') lack planktonic microfossils, indicating possible restriction from open ocean circulation. The oldest interval (3560 to 4580') contains planktonic spumelline radiolaria, which indicate open marine conditions, or at least good circulation with the open sea.

Below is a summary of age and paleoenvironmental interpretations for each distinctive interval examined, followed by species listed generally in descending order of their highest occurrences for each interval.

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
50-1220	Indeterminate	Indeterminate
1220-1520	Upper Narizian	Outer Neritic to Upper Bathyal
1670-2420	Indeterminate	Marginal Marine to Neritic
2480-2690	Upper Narizian	Outer Neritic to Upper Bathyal
2840-3440	Indeterminate	Indeterminate
3560-4580	Upper Narizian	Outer Neritic to Upper Bathyal

DEPTH(FEET)	AGE(STAGE)	PALEOENVIRONMENT
4610-4740	Indeterminate	Marine
4910-4940	Indeterminate	Indeterminate

SPECIES LIST

50-1220'	Barren of indigenous Foraminifera. Rare, poorly preserved Narizian species from 590 to 620 feet are interpreted as probably reworked.
1220-1520'	Globobulimina pacifica oregonensis R*, Nonion applini R-C, Lenticulina inornata R-A, Lenticulina spp. R-C, Gyroidina cf. scalata R, Bulimina schencki R-VA, Plectofrondicularia oregonensis R-C, Bolivina basisenta oregonensis R, Plectofrondicularia packardi packardi R, Pseudohastigerina micra R, Bolivina kleinpelli R, Eponides gaviotaensis R, Cassidulina globosa R-C, Ellipsonodosaria cf. cocoaensis R-A, Quinqueloculina imperialis R, Plectofrondicularia searsi R, Nososaria cf. longiscata R, Valvulineria churchi? R, Lenticulina welchi R, Lenticulina chirana R, Uvigerina garzaensis? R, Anomalina garzaensis R, Eponides minima R.
1670-2420'	Barren of indigenous calcareous Foraminifera. Rare crushed arenaceous Foraminifera, intermittent but often abundant shell fragments and lignite, are considered indigenous. Rare bathyal Foraminifera throughout this interval are considered to be down hole contamination, as they are the same species present in the richly fossiliferous interval from 1220 to 1520 feet.
2480-2690'	Species "tops" in this interval are: Lenticulina cf. terryi R, Globulina landesi R, Cyclammina pacifica R, Cibicides cushmani R, Cibicides hodgei (of Beck, 1943) R, Nonion excavatum (of Cushman, et. al., 1947, part III) R. Species present in this interval but listed in interval(s) above include: Lenticulina inornata R, Lenticulina spp. R-A, Ellipsonodosaria cf. cocoaensis R, Plectofrondicularia searsi R, Plectofrondicularia oregonensis R, Gyroidina cf. scalata R, Lenticulina cf. welchi R, Plectofrondicularia packardi packardi R, Uvigerina garzaensis? R, Cassidulina globosa R.

*R=1-10 specimens per sample; C=11-32; A=33-100; VA=100+

2840-3440'	Essentially barren of indigenous Foraminifera.
3560-4580'	Fossils restricted to this interval are: Eponides yeguaensis R-C, Gyroidina cf. soldanii R-C, Radiolaria (Spumellaria-spherical) R-VA, Nonion florinense? R, Cribrononion cf. roemeri R, Ostracods (small) R, Gyroidina guayabalensis (of Mallory, 1959), = simiensis? R, Tritaxia sp. R, Dentalina colei (of Mallory, 1959) R, Bulimina aff. ovata cowlitzensis (not punctate) R, Valvulineria cf. scrobiculata (of Beck, 1943) R. Species present in this interval but listed in interval(s) above include: Lenticulina welchi R, Lenticulina spp. R-C, Bulimina schencki R-C, Ellipsonodosaria cf. cocoaensis R, Lenticulina inornata R, Cassidulina globosa R, Nonion applini R, Globobulimina sp. (large) R, Quinqueloculina imperialis R, Plectofrondicularia searsi R, Cibicides cushmani R, Globulina landesi R, Bolivina basisenta? (small) R. Remark: One sample (3890-3920') examined in this interval contains rare Middle Eocene Foraminifera, including Lenticulina pseudovortex R, Subbotina frontosa R, and Vaginulinopsis vacavillensis R. This single isolated occurrence is interpreted as reworking from older strata.
4610-4760'	Rare Foraminifera locked in lithology, plus Lenticulina inornata (fragments) R, Ostracods R.
4910-4940'	Barren of Fossils. Coal? R-C.

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