NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR N0. 258

Summary of the California Oil Co. - Herdt, Bank of North Dakota No. 1
McHenry County, North Dakota
Well No. 2670 - Permit No. 2682

by William P. Eastwood
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The California Oil Company - Herdt, Bank of North Dakota #1 is located in the NE 1/4, NE 1/4 Section 6, T. 158N., R. 80W., (660 from north line, 660 from south line) McHenry County, North Dakota. Elevation: Ground 1494.8, K.B. 1505. Drilling contractor; Cardinal Drilling Company, Bismarck, North Dakota.

The drilling permit was issued on May 31, 1960. The well was drilled to a total depth of 4213 and completed as a producer from the lower limestone unit of the Frobisher-Alida interval on June 28, 1960. This was the discovery well of the Pratt field.

Drill Stem Tests:

1. 4199-4212 (Frobisher-Alida interval, lower limestone unit). One hour initial shut-in. Flowing 2 hours. Final shut-in one hour. Tool opened with fair blow, increased to strong blow in 2 minutes and remained steady throughout. Gas to surface in 80 minutes, not enough to gauge.

Recovery:

325 feet free oil
300 feet gas cut mud and mud cut oil (75% oil)

Pressures:

Initial shut-in	1978
Initial flow	72
Final flow	263
Final shut-in	1793
Hydrostatic	2380

Cores:

1. 4206-4213 (Frobisher-Alida)

Completion Data:

1. Vibrofraced 4202-4207, acidized with 500 gallons.
2. Pumped 96 barrels oil per day, 13% water. GOR: 61. Gravity: 25.9°API. Production from open hole 4201-4212.

Casing and Tubing Record:

411 feet of 8 5/8" surface casing cemented with 200 sacks. 4201 feet of 5 1/2" production casing with 200 sacks. 4200.26' of 2 7/8" tubing.

Mechanical Logs:

Induction - Electrical (4206-411)
Laterolog - Gamma Ray (4208-411)
Microlaterolog (2400-2700, 3511-4211)

Formation tops were determined by well samples and mechanical logs. Color names are those of the Rock Color Chart National Research Council.

FORMATION TOPS

Cretaceous System	
Pierre Formation	487
Niobrara Formation	1648
Greenhorn Formation	2000
Belle Fourche Formation	2110
Mowry Formation	2294
Basal Sands	2520
Jurassic	2809
Rierdon Formation	3025
Piper Formation	3315
Piper Limestone	3370
Triassic System	
Spearfish Formation	3565
Mississippian System	
Poplar Interval (eroded)	3810
Ratcliffe Interval	3920
Midale Subinterval	4048
Frobisher-Alida Interval	4090
Base of Rival Subinterval	4110
Anhydritic Unit	4115
Lower Limestone Unit	4200
Total Depth	4213

0-1900 Missing.
1900-1940 Shale, dark gray (N3) with rare brownish gray (5YR4/1), very soft, subfissile, bentonitic with limy spots.
1940-1980 As above with rare white to pinkish limestone fragments.

2000 Top of Greenhorn Formation
1980-2080 Shale, black, soft, fissile. Very rare shale and limestone as above.
2080-2100 Shale, medium dark gray, very limy with common mollusk fragments.

2110 Top of Belle Fourche Formation
2100-2180 Shale, dark gray to black, slightly limy. Common to rare mollusk fragments.

2294 Top of Mowry Formation
2180-2480 Shale, fissile, as above but not limy. Rare to no mollusk fragments.

2480-2520 Shale, medium dark gray, soft, subfissile. Rare brown chitinous ins (?).

2520 Top of Basal Cretaceous Sands
2520-2600 Shale as above. Rare medium light gray fine grained limy quartz andstone.
2600-2680 Common sandstone and shale as above. Rare to common reddish brown siderite pellets. Rare coarse rounded quartz grains. Sandstone is only slightly limy.
2680-2760 As above but sandstone very rare. Maybe badly caved.

2809 Top of Jurassic System

2760-2830 Rare fine to medium grained white quartz sandstone. Abundant medium gray and light gray shale. Rare siderite pellets. Bentonite at 2800-2810.

2830-3000 Shale, brownish gray (5YR4/1). Rare dark gray shale. Badly caved.

3025 Top of Rierdon Formation

3000-3100 As above with rare pinkish gray (5YR8/1) and greenish gray (5GY6/1) waxy shale. Rare reddish brown shale fragments maybe caused by too much heating in drying the samples.

3100-3240 Light gray to brownish gray soft subfissile shale, common dark gray fissile shale. Badly caved. Rare greenish gray and reddish brown shale, as above.

3240-3290 As above, common reddish brown shale. Rare greenish gray waxy shale. Very rare very light gray waxy shale.

3290-3310 Common greenish gray shale, common reddish brown shale, common light gray soft shale. Common white, partially pyritized fish teeth or mollusk spines at 3290-3300.

3315 Top of Piper Formation

3310-3320 Shale as above. Very common very light gray to white, fine crystalline to sublithographic limestone.

3320-3380 Abundant limestone as above. Common shale as above. Rare pinkish gray gypsum. Limestone slightly sandy and slightly dolomitic.

3380-3410 Limestone as above, very common white medium to coarse crystalline limestone. Common shale cavings. White limestone contains rare large oolites.

3410-3450 Very common white coarse crystalline oolitic limestone as above, rare slightly dolomitic limestone, shale cavings.

3450-3460 Common white fine crystalline limestone, rare very light gray limestone. Shale cavings.

3460-3510 Limestone as above. Rare to common reddish brown silty shale. Black shale cavings. Rare white, medium crystalline gypsum.

3510-3580 Badly caved, rare limestone, common to rare white to pink gypsum.

3565 Top of Spearfish Formation

3580-3640 Rare to common reddish brown silty shale, very rare reddish brown very fine grained sandstone. Rare pink and white gypsum. Black shale cavings. Large fish tooth (cavings?) at 3610-3620. Very rare coarse rounded quartz grains.

3640-3670 Reddish brown shale as above, rare fine to medium grained reddish brown quartz sandstone.

3670-3730 Common reddish brown sandstone as above containing common coarse rounded quartz grains. Common shale as above. Common loose quartz grains.

3730-3750 Abundant reddish brown medium to coarse grained silty quartz sandstone. Rare reddish brown shale. Badly caved. Cement of the sandstone is slightly limy.

3750-3820 Abundant fine grained reddish brown sandstone. Common to rare medium and coarse grained sandstone. Black shale cavings.

3810 Top of Poplar Interval

3820-3830 Abundant light red (5R6/6) limy or dolomitic siltstone, rare sandstone as above.

3830-3850 Abundant fragments of clear fine crystalline anhydrite (?) with a white powdery coating. Black shale cavings. Rare siltstone and sandstone.
3850-3860 Anhydrite as above but white powdery coating rare.
3860-3880 Limestone, very pale orange (10YR8/2) fine crystalline with common pale yellowish brown (10YR6/2) medium to coarse calcite crystals. Rare anhydrite and black shale cavings. Fair to poor inter-crystalline porosity, no stain.
3880-3890 Limestone, very pale orange, fine crystalline (microsparite) with rare large dark brown dolomite crystals. Very rare medium light gray (N6) dolomitic anhydrite.
3890-3900 Gray dolomitic anhydrite as above, rare limestone as above.
3900-3910 Abundant white to clear fine crystalline anhydrite. Rare limestone as above.
3910-3920 Limestone, very pale orange, with pale yellowish brown calcite crystals and fine intraclasts.

3920 Top of Ratcliffe Interval
3920-3930 Light gray, fine grained, tightly cemented quartz sandstone, slightly anhydritic. Rare anhydrite and limestone cavings.
3930-3940 As above ? Abundant black shale cavings ?.
3940-3950 Abundant fragments of gray anhydrite with powdery white coatings.
3950-3970 Light gray fine crystalline dolomitic anhydrite. No white coatings. Circulated at 3977 for 30 minutes.
3970-3980 Limestone, very pale orange, fine crystalline, containing common to rare brown dolomitic crystals.
3980-3990 Limestone as above with dolomite and calcite crystals more common.
3990-4000 As above, very rare light gray fine crystalline anhydrite.
4000-4010 Abundant light gray fine crystalline, slightly dolomitic anhydrite. Abundant gray to dark gray shale cavings (?).
4010-4020 As above, common cryptocrystalline very pale orange anhydrite.
4020-4030 Abundant light gray fine crystalline anhydrite.
4030-4040 Light gray anhydrite as above but fragments have a white powdery (gypsum?) coating.
4040-4050 Anhydrite, no coating.

4048 Top of Midale Subinterval
4052 Circulated for 45 minutes. Very pale orange fine crystalline slightly limy dolomite. Rare to common fine crystalline very pale orange slightly dolomitic limestone.
4050-4070 As above with rare pale yellowish brown intramicrosparite limestone.
4070-4080 Abundant very pale orange very fine crystalline dolomitic limestone. No oil stain.

4090 Top of Frobisher-Alida Interval
4080-4100 Abundant medium gray fine crystalline anhydrite, common dolomitic limestone with pale brown dolomite crystals. Red and black shale cavings.
4100-4110 Abundant pale yellowish brown fine crystalline (microsparite) limestone, rare pieces of which contain common fine intraclasts. Anhydrite and shale as above.

4110 Base of Rival Subinterval
4110-4150 Badly caved. Gray anhydrite with powdery white coatings.
4150-4160 Anhydrite, white to moderate orange pink (5YR8/4) fine crystalline to cryptocrystalline.
4160-4170 Anhydrite, light gray, cryptocrystalline.
4170-4190 Anhydrite, very light gray, cryptocrystalline, white powdery coatings.
4190-4200 As above, rare light gray fine-grained limy anhydritic quartz sandstone.

4202 Top of Lower Limestone Unit
4206 Circulated 45 minutes. Anhydrite and rare sandstone as above.

Drillstem Test #1
(4199-4212). Gas to surface in 80 minutes. Recovered 325 feet of free oil and 300 feet of gas cut mud and mud cut oil (75% oil).

Core #1
4207-4213 Description of core chips.
4206-4207 Dolomite, limy, light gray, fine crystalline. Irregular intercrystalline stain. Good scattered intercrystalline and pinpoint porosity, good cut. As above, scattered fine rounded intraclasts.
4207-4209 Common clear anhydrite crystal masses. Intraclasts are recrystallized to powdery yellowish brown dolomitic limestone. Good stain and cut. Fair to poor scattered intercrystalline and pinpoint porosity.
4209-4210 Limy stained dolomite as above, thin shaly laminae, irregular stain. Some of the laminae not stained as much as others.
4210-4212 Dolomite, limy. Closely packed remnants of coarse rounded intraclasts. Common coarse clear crystals of anhydrite and celestite. Fair to poor pinpoint and intercrystalline porosity. Scattered stain, not as good as above.
4212-4213 As above. Very poor porosity, very spotty stain.
4213 Total depth.