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GEOLOGICAL REPORT

Horizon Oil & Gas Co. of Texas &
Edwin L. Cox

#1-32 Adams
NE NE Sec. 32-34-30
Meade County, Kansas

by

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GEOLOGICAL REPORT

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C NE NE Sec. 32-34S-30W
Meade County, Kansas
Adams Ranch Area
Wildcat

Commencement Date: 7/5/66
Rotary Completion Date: 7/29/66 T.D.
Rotary Completion Date: 8/2/66 pipe set
Elevation: 2635 K.B. (Datum)
2632 D.F.
2623 G.L. by L&S

Casing:
Surface: 8 5/8" @ 1476'
Prod: 5 1/2" @ 6000'
w/425 sks.

Total Depth:
Driller & Schlumberger: 6510
Contractor: Moran Bros, Rig #2
Electrical Surveys: Schlumberger:
Dual Induction-
Laterolog with
Gamma Ray,
Compensated Formation
Density, BHC Sonic,
Sidewall Neutron and
Compressional Amplitude

Special Equipment: Baroid
Gas Detecting equipment
was in operation from ap-
proximately 4200' to T.D.

Drilling of this hole was witnessed by the writer from a depth of approximately 4300' to total depth. Both wet and dry samples caught at intervals of 5 or 10 feet were examined from 4300' to total depth. One foot drilling time was recorded and plotted from 2500' to total depth.

Gas detecting equipment was installed at approximately 2900', but was not functioning properly and was taken out of service at approximately 3110'.

FORMATION TOPS AND STRUCTURAL COMPARISONS

	Horizon and Cox #1-32 Adams NE NE Sec. 32-34S-30W	Cities Service (Columbian Fuel) A. W. Adams M-2 NE NE SW Sec. 33-34S-30W	Relative Position
Wreford	2992 (-357)	2954 (-380)	23' high
Council Grove	3047 (-412)	3010 (-436)	24' high
Barragree Zone	3123 (-488)	3088 (-514)	26' high
Heebner Shale	4364 (-1729)	4329 (-1755)	26' high
Toronto	4392 (-1757)	4361 (-1787)	30' high
Lansing	4520 (-1885)	4482 (-1908)	23' high

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Kansas City (Drum)	4800 (-2165)	4758 (-2184)	19' high
Dewey	4822 (-2187)	4776 (-2202)	15' high
Hodges	5008 (-2373)	4960 (-2386)	13' high
Base of Kansas City	5200 (-2565)	5140 (-2566)	1' high
Marmaton	5234 (-2599)	5173 (-2599)	Flat
Cherokee	5443 (-2808)	5417 (-2843)	35' high
Keating Zone	5582 (-2947)	5560 (-2986)	39' high
Morrow Shale	5784 (-3149)	5761 (-3187)	38' high
Miss. Chester	5888 (-3253)	5872 (-3298)	45' high
Basal Chester Sand	6144 (-3509)	-----	-----
Miss. Ste. Genevieve	6176 (-3541)	-----	-----
Miss. St. Louis	6280 (-3645)	-----	-----
Miss. St. Louis			
"B" Zone	6337 (-3702)	-----	-----
"C" Zone	6409 (-3774)	-----	-----
"D" Zone	6446 (-3811)	-----	-----
Total Depth	6510 (-3875)	5980 (-3406)	-----

SAMPLE DESCRIPTIONS, MUD GAS INCREASES, TESTS, ETC.

Toronto

- 4392-4400 White and gray mottled, chalky fossiliferous lime and some tan fossiliferous-oolitic lime. Some small vug porosity with scattered bright blue fluorescence and fair cut. A maximum mud gas increase of 110 units of methane was recorded from this interval.
- 4400-4406 Gray, granular to very fine crystalline lime. Mud gas reading decreased to no more than 7½ units of methane from this interval.
- 4406-4416 Lime as at 4392-4400, described above. A gas increase of 55 units of methane was noted.
- 4430-4444 Medium gray mottled lime with black oolites and fossils. No gas increase was recorded in this lime.
- 4452-4466 Gray, dense, tight lime with gray fossiliferous chert. No shows, no gas increase.

The above zones were covered by D.S.T. #1.

D.S.T. #1 4377-4470 (no correction between open hole and log depths appears necessary.
Tool open 15 minutes for initial flow, shutin for 30 minutes initial BHP, open 90 minutes for final flow period and shutin 45 minutes for final BHP.

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Gas to surface in 7 minutes.
Gas gauged 221 MCF in 15 minutes.
Shutin for 30 minutes.
Gas gauged 303 MCF in 15 minutes of final flow period.
Gas gauged 290 MCF in 30 minutes of final flow period.
Gas gauged 303 MCF in 45 minutes of final flow period.
Gas gauged 303 MCF in 60 minutes of final flow period.
Gas gauged 303 MCF in 90 minutes of final flow period.
Shutin 45 minutes.

Recovered 120' GCM with specks of oil and 90' watery GCM.
Chlorides of recovery:
Top - 18,095 PPM
Bottom - 39,525 PPM

Chlorides of drilling mud prior to test - 18,500 PPM
Flow pressures = 43-87 (43-58) and (58-87)
Shutin pressures = Initial 1403/30 min; Final 1389/45 min.
Hydrostatic pressures = 2116 and 2116

Lansing
4520-4546

Medium to dark gray, coarse crystalline to fragmental, fossiliferous, slightly oolitic lime. Some tan dense, oolitic-fossiliferous lime. Lime is chalky. Visable porosity is poor. Trace of small vug porosity and a few visable fractures. Very slight questionable stain in part. Fair oil odor in wet samples. Fair fluorescence and slight cut.

A mud gas kick was recorded as commencing at 4527 and continuing to 4543. A maximum increase of 70 units of methane was noted as coming from a depth of 4538.

D.S.T. #2 and #3 were run on this zone.

Comparison of open hole drilling time and Schlumberger logs indicate that a 3' down-hole adjustment of drilling time and open hole depths must be made to agree with log depths.

D.S.T. #2 4520-4540 = 4523-4543 log depth. Tool slid 15' to 18' to bottom after opening. GTS in 3 minutes. Tool plugged. Misrun.

D.S.T. #3 4520-4540 = 4523-4543 log depths. Rerun of D.S.T. #2.

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Tool open 1 hour 30 minutes. No initial BHP taken.
Gas to surface in 2 minutes.
Gas gauged 1,630 MCF in 3 minutes.
Gas gauged 2,125 MCF in 5 minutes.
Gas gauged 2,190 MCF in 10 & 15 minutes.
Mud to surface in 18 minutes.
Oil to surface in 22 minutes.
Gas gauged 1,930 MCF plus oil and mud in 30 minutes.
Gas gauged 4,260 MCF plus oil in 60 minutes.
Making oil and some water in 64 minutes.
Gas gauged 4,735 MCF plus oil in 65 minutes.
Gas gauged 4,735 MCF plus heavy slugs of oil in 80 minutes.
Gas gauged 5,210 MCF plus heavy slugs of oil in 90 minutes.
Note: 30 minute through 90 minute gas gauges are judged to be somewhat in error because of fluid in the gas stream making spring gauge read too high.
Shutin 45 minutes.
Recovered 250' oil (44.4° gravity @ 60° F) and 214' water.
Chlorides of recovery = 140,074 PPM
Chlorides of mud prior to test = 20,500 PPM
Recovery Rw = .05 @ 84°
Mud Rmf = .16 @ 84°
Flow pressure = 604-776
Final shutin pressure = 1574 in 45 minutes.
Hydrostatic pressures = 2288 and 2288

Estimated 10 to 15 barrels of oil produced during test.

Lansing-Lime

4550-4800

Majority of this interval consisted of gray to cream colored, crystalline, chalky, fossiliferous lime with some good porosity. Some fine crystalline oolitic lime was noted at 4700 and 4780. No shows, fluorescence, or mud gas increases were noted in any of this interval.

Kansas City-Drum Lime

4800-4806

Gray to cream crystalline, oolitic-fossiliferous lime with oolitic and some crystalline porosity. Very small oolites and oolcasts. No stain, only very slight questionable fluorescence and cut. 7½ unit methane mud gas increase.

Dewey Lime

4822-4846

Gray to cream to buff dense to very fine crystalline chalky lime. Few indistinct oolites. Poor to no visible porosity. Few fractures. Very slight fluorescence and

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cut. Fair odor in wet samples. Methane gas kick commencing at 4826 increasing to a maximum of 80 units at 4830.

Both the Drum and Dewey limes were covered by D.S.T. #4. It appears that drilling time measurements must be adjusted down hole 2' at this depth to agree with log depths.

D.S.T. #4 4798-4835 = 4800-4837 log depths.
Tool open 10 minutes, shutin 30 minutes, open 90 minutes, shutin 45 minutes.
Gas to surface in 1 minute.
Gas gauged 1,020 MCF in 10 minutes.
Shutin 30 minutes.
Gas gauged 877 MCF in 5 minutes of second flow period.
Gas gauged 700 MCF in 15 minutes
Gas gauged 621 MCF in 30 minutes
Gas gauged 490 MCF in 45 minutes
Gas gauged 416 MCF in 55 minutes
Gas gauged 439 MCF in 60 minutes
Spray of Mud in 64 minutes.
Flow mud in 75 minutes.
Flow oil in 82 minutes.
Shutin at 90 minutes.
Estimate rate of flow at 15 barrels per hour.
Shutin 45 minutes.
Recovered 954' gassy oil (38° gravity) and 140' water.
Recovered Water Rw = .045 at 88°
Mud Rmf = .26 at 88°
Flow pressure = 274-504
Initial shutin pressure = 1588 in 30 minutes
Final shutin pressure = 1574 in 45 minutes.
Hydrostatic pressure = 2373 and 2373

Kansas City
4850-5000

No shows of oil or mud gas increases were noted from these depths. This interval consisted primarily of gray to cream, chalky, crystalline to dense lime with some gray chert.

Black carboneaceous shale from 5004 to 5008 gave a 15 unit methane gas kick.

Hodges
5008-5100

From 5008 to 5060 mottled gray to brown and cream

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colored, coarse to fine crystalline limes with large fossils were logged. The lime was faintly oolitic in part and very chalky. No visible porosity, shows of oil or mud gas increases were noted.

From 5060 to 5100 the section consisted of mottled, fossiliferous lime as described above with poorly developed oolites and good oolitic porosity. No shows were present.

Checkerboard
5133-5168

Dark brown, very fine crystalline, oolitic and oolitic lime. No shows, no gas increase.

Marmaton
5234-5256

Gray and tan, dense, fossiliferous lime with some tan, fine crystalline oolitic and oolitic lime. No shows, no gas increases. Some interbedded black shale.

5256-5266

Gray and cream coarsely oolitic lime. Trace of poor visible interoolitic porosity. Chalky. Slight fluorescence and cut. Trace of interbedded black shale. A maximum gas increase of 22 units of methane was recorded from this interval.

5266-5271

Dark gray oolitic, nonporous lime. No show. Mud gas reading dropped to normal background level through this interval.

Drilling time depths must be adjusted down-hole 2' at this depth.

D.S.T. #5 5249-5269 = 5251-5271 log depths.
Tool open 10 minutes, shutin 30 minutes, open 90 minutes, shutin 40 minutes.
Gas to surface in 3 minutes.
Gas gauged 293 MCF in 10 minutes.
Shutin 30 minutes.
Gas gauged 277 MCF in 10 minutes of final flow period.
Gas gauged 218 MCF in 30 minutes.
Gas gauged 196 MCF in 60 minutes.
Gas gauged 167 MCF in 70, 80 and 90 minutes.
Shutin 40 minutes.
Recovered 95' watery mud.
Recovery Rmf = .09 @ 93°
Mud system Rmf = .25 @ 93° prior to test.

Flow pressure = 43-50
Initial shutin pressure = 1717 in 30 minutes
Final shutin pressure = 1603 in 40 minutes
Hydrostatic pressure = 2659 and 2659

- 5271-5280 Cream to light gray, dense to crystalline slightly oolitic, very chalky lime. No shows. No gas increase noticable above the 25-30 units of recycled trip gas which was contained in the mud at the time this interval was being circulated out of the hole.
- 5280-5443 The majority of this interval consisted of gray to brown, chalky, dense, fossiliferous, slightly oolitic in part, and cherty lime.

A $7\frac{1}{2}$ unit methane gas increase was noted at 5382-5384. This interval was a brown crystalline, oolitic lime.

Methane gas increases were recorded from the black carbonaceous shales at 5314-5318, 5352-5354, 5412-5416 and 5443-5446.

Cherokee-Keating Zone

- 5582-5596 Dark brownish-gray, coarse crystalline, fossiliferous, oolitic lime. Fair to poor visible porosity. Excellent fluorescence and cut. Slight stain. A maximum 47 units methane gas increase was recorded from the interval 5589-5594.

The limestone from 5603-5610, which was included in D.S.T. #6, appeared similar to that described above, except it was lacking porosity and shows, drilled harder and gave up no gas increases.

D.S.T. #6 5585-5610 (no depth correction appears necessary at this depth)

Tool open 10 minutes, shutin 30 minutes, open 90 minutes, shutin 45 minutes.

Gas to surface in 9 minutes.

TSTM in 10 minutes.

Shutin 30 minutes.

Gas gauged 45 MCF in 5 minutes of final flow period.

Gas gauged 104 MCF in 40 minutes.

Gas gauged 98 MCF in 60 minutes.

Gas gauged 92 MCF in 90 minutes.

Shutin 45 minutes.

Recovered 30' heavily oil and gas cut mud and 90' oil.

(Note: after standing over night, samples of the 30' of recovery described above as being HO & GCM, separated out and appeared to be free oil cut with no more than 5% drilling mud.)

Flow pressure = 20-66

Initial shutin pressure = 1613 in 30 minutes

Final shutin pressure = 1457 in 45 minutes

Hydrostatic pressure = 2723 and 2713

Morrow

Upper Morrow Sand Zone

5808-5834
24

Majority of this interval consisted of fine grained, clear to gray, subangular, tight and glassy quartz sand interbedded with dark gray-black micaceous shale.

5824-5830

Gray to tannish limey, fine grained, glauconitic quartz sand with some poor visible porosity. The sand appeared to contain silt and clay in part. Slight to fair fluorescence and cut was noted. A maximum gas increase of 85 units of methane was recorded from this interval.

D.S.T. #7 5784-5837 = 5785-5838 log depths.

Tool open 10 minutes, shutin 30 minutes, open 90 minutes, shutin 45 minutes.

Tool open with fair blow.

Gas to surface in 47 minutes.

Gas too small to measure through remainder of test.

Recovered 30' gas out mud.

Flow pressure = 46-52

Initial shutin pressure = 455 in 30 minutes.

Final shut in pressure = 1645 in 45 minutes (still building)

Hydrostatic pressure = 2823 and 2802

Lower Morrow Sand Zone

5856-5876

Some limey, glauconitic, quartz sand and sandy, glauconitic lime was noted in the samples from this interval. Although the background gas readings were high through this section, a possible 15 unit methane gas increase was recorded as coming from approximately 5864-5868.

Mississippian Chester

5888-5904

Buff to tan crystalline, fossiliferous, slightly chalky lime with brown oolites. Poor to no visible porosity. A maximum 50 unit methane gas increase was noted from this interval.

5904-5910

The shales in this section were mostly dark gray to black with some light green waxy shale.

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5910-5930 Gray to brown mottled, coarse crystalline, fossiliferous lime. Part of this lime, to 5915, was drilled and included in D.S.T. #8. The samples from 5910 to 5915 were being circulated out of the hole at the same time as the recycled gas from the 50 unit gas kick at 5888 to 5904. If there was a gas increase from the 5910 to 5915 interval, it was not great enough to be noticed over the 25 to 30 units of recycled gas.

One foot of up-hole adjustment of drilling time is necessary at this depth.

D.S.T. #8 5892-5916 = 5891-5915 log depths.
Tool open 10 minutes, shutin 30 minutes, open 60 minutes, shutin 45 minutes.
Gas to surface in 5 minutes.
Gas gauged 240 MCF in 10 minutes.
Shutin 30 minutes.
Gas gauged 240 MCF in 5 minutes of final flow period.
Gas gauged 240 MCF in 15 minutes.
Gas gauged 218 MCF in 30, 45 and 60 minutes.
Shutin 45 minutes.
Recovered 5' drilling mud.
Flow pressure = 22-66
Initial shutin pressure = 1924 in 30 minutes.
Final shutin pressure = 1857 in 45 minutes.
Hydrostatic pressure = 2902 and 2893.

After D.S.T. #8 it was decided to drill ahead without circulating the extra 6 to 8 hours which would have been necessary to remove the D.S.T. and trip gas contamination from the mud system.

Immediately after going to bottom and starting to drill at 5915, a hole apparently developed in the drill pipe at approximately 1800 feet with resulting low pump pressure and sample contamination. Drilling was continued under these conditions to a depth of 6050'. Because of these conditions, no accurate descriptions of the formations drilled or analysis of any possible mud gas increases can be made.

When going back in the hole after removing the joint of drill pipe which was washed out and with a new bit, circulation was lost. After the mud system volume was built up, circulation was regained and drilling commenced.

Because of the lost circulation conditions, the decision was made to drill to total depth and run logs before running any additional drill stem tests. After running logs,

any favorable zones could be straddle tested.

Basal Chester Sand

6144-6157

Gray, fine to medium grained, dolomitic quartz sand. Some poor visible porosity. Very dark heavy oil stain. Fair to good fluorescence and cut in part in wet samples. Very little to no fluorescence and cut in dry samples. A methane gas increase of 35 units was logged.

Ste. Genevieve

6176-6280

Majority of this section consisted of cream to gray, medium to coarse crystalline, slightly chalky lime with fine to medium sized tan and gray colored oolites. The lime was mostly finely sandy. Some gray, fossiliferous, sharp chert and milky gray, slightly tripolitic chert was noted in the bottom 20' of Ste. Genevieve.

Throughout the top 80' of the Ste. Genevieve, there could be found occasional pieces of lime with slight stain and fair to good fluorescence and cut in wet samples. Sample quality through part of the interval suffered as a result of having only partial returns following a bit trip made at 6206 until 6247, at which depth the mud system volume became too low to maintain circulation. At this depth, drilling was suspended until the mud system volume and filler content was built up.

St. Louis

6280-6360

This interval contained gray to tan, fine to coarse crystalline, slightly chalky limestones with fine to medium sized oolites and some large fossils. Considerable white to gray oolitic and suboolitic chert interbedded through the section. Some pinkish-gray chert was logged at 6300. Scattered pieces of oolitic lime with fair stain and excellent fluorescence and cut in wet samples were found, especially in the top 20' of the St. Louis. No mud gas increases were recorded from this interval.

6360-6378

From 6361 to 6365, a $7\frac{1}{2}$ unit methane gas increase was logged and from 6368 to 6377 a 50 unit increase was noted. Samples from this interval were logged as being tan, medium to coarse crystalline, slightly chalky lime with medium sized oolites and fossils and considerable mottled gray and white oolitic and subtranslucent chert. A few pieces of lime with visible intercrystalline and interoolitic porosity with good dark brown to black oil stain

with excellent fluorescence and cut were noted. Overall, however, there was not much increase of visible show in the samples from this zone than from the St. Louis sections above.

6378-6464 Majority of this section was gray and tan, chalky, oolitic, cherty lime much as described above interbedded with gray very dense to sublithographic lime. Much white, gray and tan, oolitic, fossiliferous chert was present in this interval.

6464-6490 This interval contained lighter colored grayish-buff, dense to flakey limestone with fewer and less distinct oolites and fossils. The section contained much gray to white translucent chert. Between 6460 and 6470, some snow white very chalky, dense, oolitic lime was logged. There was a trace of very fine succrossic gray dolomite interbedded with the limestones. No gas increases were recorded.

6490-6510 (Total Depth)
Light grayish-buff sublithographic flakey limestone with interbedded gray fine succrossic dolomite as above. The section was non-oolitic for the most part. Much highly gray-white subtransparent shaly chert. No gas increases.

Following Schlumberger Logging and Wire Line Test operations, D.S.T. #9 was run on the St. Louis.

D.S.T. #9 6286-6510
Tool open 2 hours, shut in 45 minutes. (no initial shut-in pressure taken.)

Tool opened with a weak unsteady blow. Blow increased slightly for approximately 1 hour 30 minutes and then decreased slightly for remainder of test. No gas to surface.

Recovered 150' very heavy drilling mud with a few gas bubbles.

Flow pressure = 66-85
Final shut in pressure = 435 in 45 minutes (still building)

Note: The pressure recorder charts showed plugging action

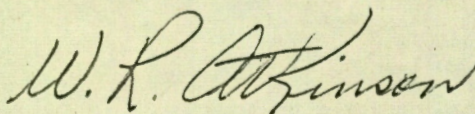
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in the tool throughout most of the flow period. There were seven pressure buildups indicating partial plugging during the flow period. The maximum pressure buildup recorded during the flow period was attained at 1 hour 20 minutes from beginning and reached 248 pounds pressure.

Conclusion

Due to the several good shows of oil and gas recovered on drill stem tests, 5½ inch production casing was run to 6,000 feet and cemented with 425 sacks of cement.



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