

Frontier Oil Company  
1720 Kansas State Bank Building  
Wichita, Kansas 67202

Re: Frontier Oil Company  
Eberly No. 4  
SW SW SE 14-19S-15W  
Barton County Kansas

Dear Sir:

The following is a Geological Report with a Time Log attached on the above captioned well.

Drilling was supervised from 1600' to 3460', rotary total depth. Samples were examined from 1600' to 3460', rotary total depth.

All formation tops, zones of porosity and staining, are based on rotary bushing measurements. Any corrections in measurements during the drilling of this well have been incorporated into this report.

| Elevation           | 1914 GL -- 1919 KB |         |
|---------------------|--------------------|---------|
| Anhydrite           | 853                | (+1066) |
| Herington           | 1757               | (+162)  |
| Winfield            | 1809               | (+110)  |
| Ft. Riley           | 1898               | (+21)   |
| Council Grove       | 2091               | (-172)  |
| Cottonwood          | 2195               | (-276)  |
| Red Eagle           | 2307               | (-388)  |
| Brownville          | 2475               | (-556)  |
| Tarkio              | 2591               | (-672)  |
| Elmont              | 2650               | (-731)  |
| Howard              | 2789               | (-870)  |
| Topeka              | 2866               | (-947)  |
| Heebner             | 3114               | (-1195) |
| Toronto             | 3125               | (-1206) |
| Brown Lime          | 3190               | (-1271) |
| Lansing-Kansas City | 3207               | (-1288) |
| Base-Kansas City    | 3411               | (-1492) |
| Quartz              | 3438               | (-1519) |
| RTD                 | 3460               | (-1541) |

Structurally, on top of the Lansing-Kansas City, the Frontier Oil Company Eberly No. 4 ran 6' high to the Frontier Oil Company Eberly No. 1 located 660' to the north.

On top of the Quartz, the Eberly No. 4 ran 39' higher than the Eberly No. 1.

## ZONES OF INTEREST

### COTTONWOOD (Top 2195)

#### DRILL STEM TEST NO. 1 2177 to 2250

TEST: 60-30-60-30. Gas to surface in 25 minutes. Gauged 76,000. Recovered 425' gassy watery mud.  
PRESSURES: 111-113, 113-115, 688-749 Bhps.

#### TOPEKA (Top 2866) 2866 to 2872

Dark tan dense to cherty lime and white fine crystalline lime.

2901 to 2912

Tan fossiliferous to sucrosic limes with no show of free oil and no odor and a fair show of fluorescence.

#### DRILL STEM TEST NO. 2 2850 - 2930

TEST: 45-30-30-30. Weak blow for 15 minutes, flushed tool, weak blow for 7 minutes. SI 30". Weak blow for 10 minutes, flushed tool - weak blow for 7 minutes. Recovered 80' of slightly gassy mud.  
PRESSURES: 40-61, 61-81, 1010-1006 Bhps.

3029 to 3035

Tan crystalline and cherty junky lime.

3056 to 3059

Tan vuggy oolitic limes.

#### DRILL STEM TEST NO. 3 3019 to 3059

TEST: 30-30-30-30. Weak blow for 10 minutes. SI 30". Weak blow for 25 minutes. Recovered 125' of muddy water.  
PRESSURES: 40-50, 70-80, 1250-1230 Bhps.

3066 to 3075

Tan, vuggy oolitic limes, scattered cherty limes with a few scattered shows of black oil flakes.

#### DRILL STEM TEST NO. 4 3059 to 3090

TEST: 60-30-60-30. Good blow. SI 30". Good blow. Recovered 275' slightly gassy watery mud.  
PRESSURES: 21-101, 103-107, 1038-1038 Bhps.

HEEBNER SHALE (Top 3114)

TORONTO (Top 3125)  
3125 to 3132

Tan crystalline to silty limes.

BROWN LIME (Top 3190)

LANSING-KANSAS CITY (Top 3207)  
3207 to 3218

Tan fine crystalline limes to slightly cherty limes with a trace of free oil.

3222 to 3226

Gray to tan fossiliferous limes with a trace of staining.

DRILL STEM TEST NO. 5  
3198 to 3226

TEST: 60-30-60-30. Strong blow in 12".  
SI 30". Gas to surface in 15". TSTM.  
Recovered 520' heavy gassy oil.  
PRESSURES: 61-120, 182-223, ISI Not  
Recorded. FSI 1150 Bhps.

3232 to 3238

Tan fine crystalline to dense limes.

DRILL STEM TEST NO. 6  
3224 to 3245

TEST: 30-30-15-30. Weak blow. SI 30".  
No blow. Recovered 5' of mud.  
PRESSURES: None recorded.

DRILL STEM TEST NO. 7 (Rerun - Western)  
3220 to 3245

TEST: 30-30-15-30. Weak blow for 16",  
flushed tool - no help. SI 30". No blow.  
Recovered 5' watery mud.  
PRESSURES: 28-28, 28-28, 28-28 Bhps.

3244 to 3250

Tan fossiliferous to crystalline flakey  
limes with scattered show of free oil  
and a fair odor.

3256 to 3262

Tan dense to cherty lime with good spotted  
dark staining.

DRILL STEM TEST NO. 8  
3242 to 3267

TEST: 60-30-60-30. Gas to surface in 50".  
TSTM. SI 30". Strong blow throughout.  
Recovered 1360' oil, 180' frothy oil.  
PRESSURES: 69-232, 304-447, 1122-1120 B

3270 to 3274

Well developed oolitic lime with scattered black staining.

3276 to 3288

Well developed barren oolitic lime.

3300 to 3310

Tan to gray dense limes.

DRILL STEM TEST NO. 9

3267 to 3319

TEST: 60-30-60-30. Strong blow in 8". SI 30". Strong blow. Recovered 1900' of gassy salt water.  
PRESSURES: 102-604, 614-855, 1156-1176

3329 to 3334

Tan dense to crystalline lime.

DRILL STEM TEST NO. 10

3319 to 3340

TEST: 60-30-60-30. Strong blow. Gas to surface in 90". SI 30". Strong blow. Recovered 400' clean gassy oil, 350' gassy frothy oil.  
PRESSURES: 50-180, 210-285, 590-590 Bhps.

3351 to 3356

White oolitic fossiliferous limes with a good show of free oil and a fair odor.

DRILL STEM TEST NO. 11

3340 to 3359

TEST: 60-30-60-30. Gas to surface in 25". SI 30". Good blow. Recovered 70' gassy oil cut mud and 120' oil.  
PRESSURES: 24-61, 81-101, 121-121 Bhps.

3364 to 3369

Tan fine crystalline to dense limes with scattered shows of free oil and a faint odor.

DRILL STEM TEST NO. 12

3359 to 3375

TEST: 30-30-15-30. Weak blow for 15', flushed tool, no help. SI 30". No blow. Recovered 3' mud.  
PRESSURES: 40-35, 35-35, 35-35 Bhps.

3382 to 3386

White fine crystalline to dense limes.

DRILL STEM TEST NO. 13

3375 to 3387

TEST: 30-30-15-30. Weak blow throughout. SI 30". Weak blow throughout. SI 30". Recovered 60' watery mud.  
PRESSURES: 2-2, 2-2, 1014-1014 Bhps.

3394 to 3408

White fine crystalline to chalky limes.

BASE-KANSAS CITY (Top 3411)  
3411 to 3414

White junky limes and red soft shales.

DRILL STEM TEST NO. 14  
3387 to 3414

TEST: 30-30-15-30. Weak blow for 1 minute.  
Flushed tool - no help. SI 30". No blow.  
Recovered 3' of mud.  
PRESSURES: 40-40, 40-40, 40-40 Bhps.

3424 to 3430

Red and gray soft gummy shales with  
scattered barren oolitic lime.

3430 to 3436

Scattered well developed oolitic limes  
with a scattered fair to good show of fine  
oil and no odor.

QUARTZ (Top 3438)  
3438 to 3442

Clear quartz with muscovite and scattered  
biotite micas.

DRILL STEM TEST NO. 15  
3410 to 3440

TEST: 60-30-30-30. Fair blow. SI 30".  
Weak blow. Recovered 40' of mud.  
PRESSURES: 30-30, 30-30, 41-41 Bhps.

3442 to 3450

Clear fractured quartz with muscovite  
micas with a few scattered dead flakes of  
oil and plastic oil and scattered pink  
feldspars and red granite.

3450 to 3460

Clear fractured quartz with scattered  
muscovite and biotite micas and scattered  
pink to red feldspars with scattered  
fluorescence.

DRILL STEM TEST NO. 16  
3410 to 3460

TEST: 60-30-60-30. Strong blow. SI 30".  
Strong blow. SI 30". Recovered 61' of  
watery mud.  
PRESSURES: 81-81, 81-81, 81-81 Bhps.

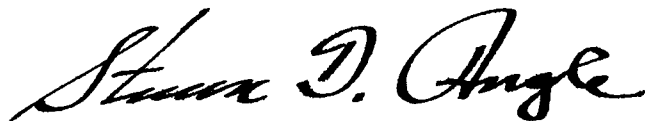
ROTARY TOTAL DEPTH @ 3460'

4½" 10.5# Casing was set at 3459', 21' into the Quartz, 1' off bottom with 200 sx of common cement plus 10% salt.

A Halliburton DV Tool was set in the Brownville Lime at 2480' with 150 sx of common cement plus 10% salt.

The shoe joint is 41.00' in length and zero point is 5' AGL.

Sincerely,

A handwritten signature in black ink, reading "Steven D. Angle". The signature is written in a cursive, flowing style with a large, prominent "S" and "A".

Steven D. Angle

DRILLING INFORMATION ON THE EBERLY NO. 4

14-19-15W

Drilling Contractor: Red Tiger Drilling  
Rig No. 4  
Tool Pusher: W. C. Ogle

Drillers: W. Ogle  
A. Bates  
W. Ogle, Jr.

Spud Date: August 20, 1984

Date of RTD: September 1, 1984

Surface Pipe: 8-5/8" @ 862.5' w/375 sx  
60/40 Poz, 2% Gel, 3% CC.  
CDC.

Casing: 4½" @ 3459' w/200 sx common  
Plus 10% salt.  
DV @ 2480' w/200 sx common  
Plus 10% salt. Top with 150 sx  
common plus 10% salt.

TOTAL FOOTAGE DRILLED PER DAY

Under surface at 8:30 A.M. on 8-21-84

|      |      |    |           |    |         |
|------|------|----|-----------|----|---------|
| 2025 | Feet | At | 7:00 A.M. | On | 8-22-84 |
| 2325 | "    | "  | "         | "  | 8-23-84 |
| 2810 | "    | "  | "         | "  | 8-24-84 |
| 2980 | "    | "  | "         | "  | 8-25-84 |
| 3090 | "    | "  | "         | "  | 8-26-84 |
| 3226 | "    | "  | "         | "  | 8-27-84 |
| 3245 | "    | "  | "         | "  | 8-28-84 |
| 3319 | "    | "  | "         | "  | 8-29-84 |
| 3359 | "    | "  | "         | "  | 8-30-84 |
| 3387 | "    | "  | "         | "  | 8-31-84 |
| 3440 | "    | "  | "         | "  | 9-01-84 |
| 3460 | Feet | At | 4:39 P.M. | On | 9-01-84 |

MUD RECORD

Surface - 15 sx aquagel, 3 sx hulls, 1 sx lime.

1760 - 20 sx salt gel.

2250 - 25 sx starch, 2 sx Bentonite, 20 sx salt mud, 4 sx hulls, 1 sx preservative.

2675 - 10 sx starch, 30 sx salt gel, 4 sx hulls.

2930 - 6 sx starch, 26 sx salt gel.

3080 - 6 sx starch, 23 sx salt gel.

3226 - 6 sx starch, 1 sx aldacide.

3246 - 9 sx starch, 6 sx salt mud.

3319 - 15 sx salt mud.

3359 - 6 sx starch, 15 sx salt gel, 1 sx preservative.

3375 - 5 sx starch, 10 sx salt gel.

3425 - 5 sx starch, 15 sx salt mud.