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GEOLOGICAL REPORT

Lewis & Clark Exploration Company  
Larsen #23-14X  
SE SW Section 23, T15S-R46W  
Cheyenne County, Colorado

Report By:  
George L. Crawford  
Lewis & Clark Exploration Company

GEO 105A

BEST IMAGE  
AVAILABLE

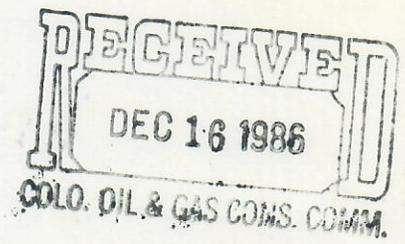
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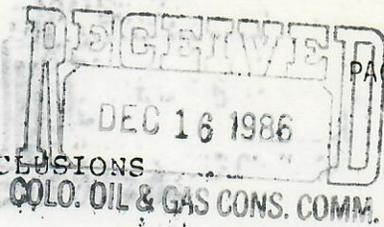
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## GEOLOGICAL FORMATION DEPTHS



Elevation:           4469' Ground Level  
                       4482' KB

| <u>Ace/Formation</u> | <u>Dual Induction<br/>Log Depth</u> | <u>SubSea<br/>Datum</u> |
|----------------------|-------------------------------------|-------------------------|
| <u>Pennsylvanian</u> |                                     |                         |
| Topeka               | 4168                                | + 314                   |
| Lansing-Kansas City  | 4300                                | + 182                   |
| Des Moines           | 4750                                | - 268                   |
| Marmaton             | 4888                                | - 406                   |
| Cherokee             | 4948                                | - 466                   |
| Atoka                | 5101                                | - 619                   |
| Morrow               | 5270                                | - 788                   |
| Keyes                | 5436                                | - 954                   |
| <u>Mississippian</u> |                                     |                         |
| St. Louis            | 5452                                | - 970                   |
| Spergen              | 5540                                | -1058                   |



GEOLOGICAL SUMMARY AND CONCLUSIONS

The Lewis & Clark Exploration Company Larsen 23-14X well in Cheyenne County, Colorado, was spudded on August 26, 1984. A total depth of 5659' (driller) was reached on September 7, 1984.

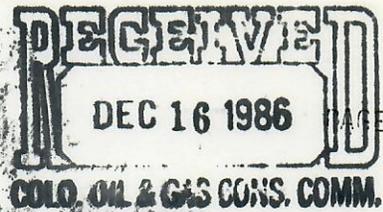
The shallowest sample show was observed in the Pennsylvanian Des Moines formation. Sample interval 4750'-60' is an oolitic Limestone with excellent porosity, spotty bright yellow-white fluorescence and a good fast streamy cut. Drill Stem Test #1, 4736'-66', recovered 900' of gas in pipe, 4' gassy oil, 150' gas and oil cut water, and 720' gas cut water. No other shows were seen through the Pennsylvanian section and no sand was developed within the Morrow formation.

The Mississippian Spergen pay interval of the Grouse Field was the primary zone of interest in the Larsen 23-14X well which is a 60' offset to the producing Larsen #1 RDD well. That well is being abandoned in the Mississippian Spergen formation because of mechanical problems. Excellent shows were observed in the Spergen pay zone in the Larsen 23-14X well. A medium-dark brown Dolomite with good vuggy porosity, brown oil stain, and good fast streamy cut was seen in the sample interval 5570'-5610'.

Circulation was lost at 5659' (driller) in the Larsen 23-14X well. Attempts to regain circulation were unsuccessful and two joints of drill pipe were stuck in the hole while pumping sand into the lost circulation zone. The pipe was recovered and circulation was obtained after a fishing job. The decision was made to run production pipe and to abandon efforts to run open hole logs. Casing was run successfully and a Gamma-Neutron Correlation log was run through cased hole.

Conclusions

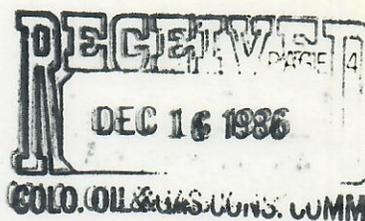
1. Des Moines sample show interval 4750'-60' is judged to be an excellent secondary zone of interest worthy of production testing.
2. Spergen Grouse Field pay zone represents a probable primary oil pay zone worthy of production testing.



WELL DATA SUMMARY

Operator: Lewis & Clark Exploration Company  
Well Name: Larsen 23-14X  
Location: 660 feet from south line, 2040 feet from west line, Section 23, Township 15 South, Range 46 West, Cheyenne County, Colorado  
Elevation: 4469' Ground  
4482' Kelly Bushing  
Spud Date: August 26, 1984  
Total Depth: 5659' (Driller)  
Completed Drilling: September 7, 1984  
Rig Release: September 12, 1984  
Well Status: Pump testing  
Casing: 8-5/8" at 503', 5-1/2" at 5640'  
Drill Stem Tests: DST #1 4736'-4766'  
Penn Des Moines  
Engineer: Richard Ellicott  
Formation Testers, Inc.  
Lamar, Colorado  
Cutting Samples: 3000' to 5659'; spl interval 10'  
Samples stored at American Stratigraphic Sample Library, Denver, Colorado  
Logging Program: Radioactivity Log 4000'-5590'  
Cased Hole Log  
Engineer: Pat Patterson  
Mercury  
Cheyenne Wells, Colorado  
Mud Logging: None  
Mud Program: Amazon Technologies, Longmont, Colorado  
Cementing Service: Halliburton, Lamar, Colorado  
Drilling Contractor: Murfin Drilling Company, Rig 27  
Wellsite Engineer: H. Wayne Stack, Denver, Colorado  
Wellsite Geologist: George L. Crawford, Denver, Colorado

## WELL HISTORY



8/26/84 MIRT

8/27/84 Spud 9:30 P.M. 8/26/84. Drlg at 317', 3 hrs. down time, no Co. time, md wt 8.9, VIS 37.  
 Survey: 1° at 71'  
 1° at 102'  
 3/4° at 162'  
 1/4° at 224'  
 1/4° at 317'  
 Cum mud cost \$600.00

8/28/84 Drlg at 583', cut 266' last 24 hrs., 12 hrs down time, WOC, plus 3/4 hr. down time on pump, 2-3/4 hr down time, lost circ at 562' & 583', no Co. time, md wt 8.9, VIS 32, 8# LCM. Survey: 1/2° at 520', Cum mud cost \$1,767. Ran 8-5/8" casing, 12 joints, tally 503.83'. Set casing at 516', total of 300 sx, 150 sx Halco Lite, 3% cc, plus 150 sx Class C, 3% cc. Plug down 2:30 P.M. 8/27/84, cement did circulate. Drilled out at 2:30 A.M. 8/28/84. ok

8/29/84 Drlg at 1840', cut 1257' last 24 hrs, 4 hrs down time, lost circ at 583' & 1032', no Co. time, md wt 8.9, VIS 40, WL 14.0, 8# LCM. Survey 1/4° at 1159'. Cum mud cost \$5,367. ok

8/30/84 Drlg at 2290', cut 450' last 24 hrs., 12 hrs. down time, lost circ at 2124', no Co. time, md wt 8.6, VIS 38, WL 10.0, 14# LCM Survey: 0° at 2084', Cum mud cost \$8,572. ok

8/31/84 Drlg at 3140', cut 850 last 24 hrs., 1/2 hr. down time on draw work, no Co. time, md wt 9.1, VIS 40, WL 10.0, 12# LCM, Cum mud cost \$10,465.

9/1/84 Drlg at 3580', cut 440' last 24 hrs., 1/4 hr. down time on pump, no Co. time, md wt 8.9, VIS 35, WL 8.0, 4# LCM. Survey: 1/2° @ 3245', Cum mud cost \$13,320.

9/2/84 Drlg at 4055', cut 475' last 24 hrs., no down time, 4-1/2 hrs. Co. time, lost circ at 3891', md wt 9.0, VIS 35, WL 8.0, 8# LCM, Cum mud cost \$17,250. ok

9/3/84 Drlg at 4545', cut 490' last 24 hrs, no down time, no Co. time, md wt 9.5, VIS 40, WL 8.8, 10# LCM, Cum mud cost \$20,730. ok

WELL HISTORY (cont'd)

9/4/84 Drlg at 4745', cut 200' last 24 hrs., no down time, 15-3/4 hrs. Co time, md wt 9.3, VIS 48, WL 8.8, 10# LCM. Survey: 1-1/4° @ 4745', Cum mud cost \$23,937. 7?

9/5/84 Drlg at 4766', cut 21' last 24 hrs, no down time, 23-1/4 hrs. Co. time, md wt 9.3, VIS 52, WL 8.9, 6# LCM, Cum mud cost \$24,000.

Remarks: Waiting on smaller core barrel, sub was not tightened by core man. Picked up barrel and sub came loose. Core barrel and jars dropped in hole. TIH w/ pipe, screwed into and pulled out of hole. ok

9/6/84 Drlg at 4966', cut 200' last 24 hrs., no down time, 11-1/2 hrs. Co. time, md wt 9.1, VIS 43, WL 8.4, 4# LCM, Cum mud cost \$25,284

DST #1: 4736'-4766': times: 15-30-60-120 ok

Rec: 874' total fluid recovered

900' gas in pipe

4' free oil

150' Gas, Oil, & Mud Cut Water (GOMCW)  
(22% G, 3% oil, 5% mud, 70% W)

450' GCW with oil spots

270' Gassy water

Sample Chamber: 2100 cc water with oil spots  
90# psi, 127° BHT

Pressures: IF 183-248, ISI 1143  
FF 259-411 FSI 1153  
IH 2388, FH 2348

SAMPLE DESCRIPTION OF SHOWS

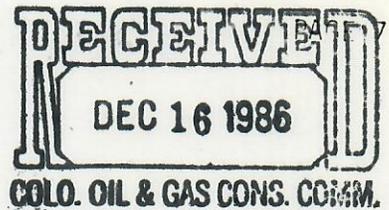
Interval 4752-63'

Lithology: Type #1 Limestone, white, light grey, chalky, very soft with bright yellow white fluorescent and slow weak cut.

Type #2 Limestone, white, light grey, fine-medium xln, very oolitic with trace oolitic, trace muggy porosity with spotty yellow white fluorescence, good fast streaming cut, spotty free oil in many samples. Looks like an oolite, NOT oolitic.

WELL HISTORY (cont'd)

- 9/7/84 Drlg at 5390', cut 424' last 24 hrs., no down time, no Co. time, md wt 9.1, VIS 44, WL 9.2, 6# LCM, Cum mud cost \$27,710.
- 9/8/84 Drlg at 5659', cut 269' last 24 hrs., no down time, 12-1/4 hrs. Co. time. Lost circ and stuck. Remarks: Lost circ pump, 2 pits of mud, no circ, TOOH. Went in open-ended, spotted 25 sx of sand at 5336', let settle, TIH to 5475' and hit a bridge. Partial return. Tried to circ, no return. Can still pump with no circ.
- 9/9/84 Depth of 5659', cut 0 feet last 24 hrs., no down time, 24 hrs. Co time, md wt 8.6, VIS 59, WL 8.4, 8# LCM, Cum mud cost \$36,035. Remarks: Free point - stuck on bottom of pipe at 5470', backed off at 5440'. Left 1 joint of pipe in hole, TOOH with mud. Went in and conditioned, TIH with wash pipe.
- 9/10/84 Depth of 5659', no down time, 24 hrs. Co time. Washed over, TOOH. Went in with over-shot, couldn't get hold, TOOH. Went back with over-shot and kinked joint of pipe, could get a hold. TIH with bit to locate top of pipe.
- 9/11/84 Depth of 5659', no down time, 24 hrs. Co. time, md wt 8.8, VIS 100, WL 7.2, 8# LCM, Cum mud cost \$37,087. Remarks: TIH with wash over pipe, wash to 5499', bottomed out. TIH with over-shot and wall hook, no luck. Pulled grapple out of over-shot. TIH with 2 joints wash over pipe, wash to 5527', bottomed out. TOOH.
- 9/12/84 RTD 5659', no down time, md wt 8.8, VIS 80, WL 7.6, 6# LCM, Cum mud cost \$39,397. Remarks: TIH, screwed into fish, fish out of hole 4:30 P.M. 9/11/84. Hole complete 6:45 P.M. 9/7/84. No log to run pipe.



Mud Record

| <u>Depth</u> | <u>Mud Weight</u> | <u>Viscosity</u> | <u>Water Loss</u> | <u>PH</u> |
|--------------|-------------------|------------------|-------------------|-----------|
| 317          | 8.9               | 37               | --                | --        |
| 583          | 8.9               | 32               | 8                 | --        |
| 1840         | 8.9               | 40               | 8                 | 14        |
| 2290         | 8.6               | 38               | 14                | 10        |
| 3140         | 9.1               | 40               | 12                | 10        |
| 3580         | 8.9               | 35               | 4                 | 8         |
| 4055         | 9.0               | 35               | 8                 | 8         |
| 4545         | 9.5               | 40               | 10                | 8.8       |
| 4745         | 9.3               | 48               | 10                | 8.8       |
| 4766         | 9.3               | 52               | 6                 | 8.9       |
| 4966         | 9.1               | 43               | 4                 | 8.4       |
| 5390         | 9.1               | 44               | 6                 | 9.2       |
| 5659         | 8.6               | 59               | 8                 | 8.4       |

DRILL STEM TEST INFORMATION

DST #1: 4736'-4766'. Pennsylvanian Des Moines formation.  
Test of one porosity zone with shows.

Recovered: 900' gas in pipe, 4' gassy oil, 150' gas and oil cut water (3% oil), 450' gas cut water with oil spots, 270' gas cut water.

|      |         |      |         |
|------|---------|------|---------|
| IHP  | 2369    | FFP  | 320-387 |
| IFP  | 281-277 | FSIP | 1137    |
| ISIP | 1100    | FHP  | 2330    |

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Contractor Murfin Drilling  
 Rig No. 27  
 Spot --  
 Sec. 23  
 Twp. 15 S  
 Rng. 46 W  
 Field --  
 County Cheyenne  
 State Colorado  
 Elevation 4482' KB  
 Formation Lansing

Surface Choke 1"  
 Bottom Choke 3/4"  
 Hole Size 7 7/8"  
 Core Hole Size --  
 DP Size & Wt. 4 1/2" XH 16.60  
 Wt. Pipe --  
 I.D. of DC 2 1/4"  
 Length of DC 550'  
 Total Depth 4766'  
 Type Test Conventional  
 Interval 4736'- 4766'

Mud Type --  
 Weight 9.4  
 Viscosity 52  
 Water Loss 8.4  
 Filter Cake 2/32  
 Resistivity .16 @ 63.4 of  
52,000 Ppm. NaCl  
 B.H.T. 127 of  
 Co. Rep. George Crawford  
 Tester Richard Elliott

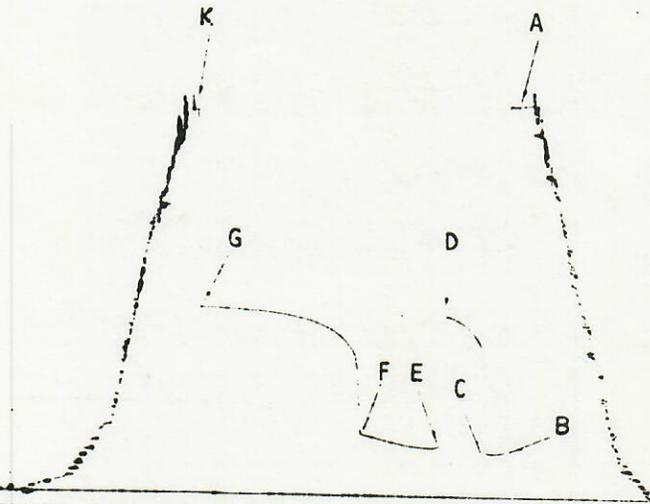
Operator Lewis & Clark Exploration Co.  
 Ticket No. --  
 Date 9/5/84

|               | REPORTED          | CORRECTED  |      |
|---------------|-------------------|------------|------|
| Opened Tool @ | <u>10:35</u>      |            | hrs. |
| Flow No. 1    | <u>15</u>         | <u>12</u>  | min. |
| Shut-in No. 1 | <u>30</u>         | <u>31</u>  | min. |
| Flow No. 2    | <u>60</u>         | <u>59</u>  | min. |
| Shut-in No. 2 | <u>120</u>        | <u>122</u> | min. |
| Flow No. 3    | <u>None Taken</u> |            | min. |
| Shut-in No. 3 | <u>"</u>          | <u>"</u>   | min. |

Recorder Type Kuster AK-1  
 No. 13615 Cap. 4575 psi  
 Depth 4763 feet  
 Inside Outside X

|                     |   |             |
|---------------------|---|-------------|
| Initial Hydrostatic | A | <u>2369</u> |
| Final Hydrostatic   | K | <u>2330</u> |
| Initial Flow        | B | <u>281</u>  |
| Final Initial Flow  | C | <u>277</u>  |
| Initial Shut-in     | D | <u>1100</u> |
| Second Initial Flow | E | <u>320</u>  |
| Second Final Flow   | F | <u>387</u>  |
| Second Shut-in      | G | <u>1137</u> |
| Third Initial Flow  | H |             |
| Third Final Flow    | I |             |
| Third Shut-in       | J |             |

Well Name & No. Champlin Larsen #23-14X  
 Location S-23 T-15S R-46W  
 County, State Cheyenne County, Colorado



Pipe Recovery:

900' Gas above fluid  
 874' Total fluid = 7.30 bbl.  
 4' Gassy oil = 0.06 bbl.  
 150' 22% gas, 3% oil, 5% mud, 70% water = 2.13 bbl.  
 450' Gas cut water with oil spots = 3.79 bbl.  
 270' Gassy water = 1.32 bbl.

Top sample R W: 0.09 @ 48.7° F (96,000 ppm. NaCl.)  
 Middle sample R W: 0.17 @ 90.3° F (37,000 ppm. NaCl.)  
 Bottom sample R W: 0.15 @ 91.2° F (34,000 ppm. NaCl.)

Surface blow:  
1st flow:

Tool opened with a weak blow, increased to bottom of bucket in 7 minutes and remained through flow period.

2nd flow:

Tool opened with a fair blow, increased to bottom of bucket in 12 minutes and remained through flow period.

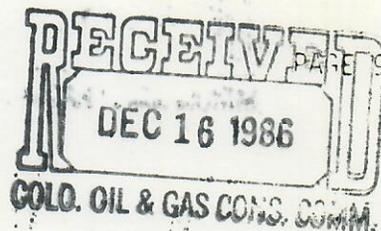
Remarks:

The character of the build-up curves on the pressure extrapolation plots may be indicating the presence of dual porosity zones within the tested interval.

BEST IMAGE AVAILABLE

USI No. 1  
 Interval 4736' - 4766'  
 Formation Lansing

SAMPLE DESCRIPTIONS



- 4750 TOP DES MOINES (PENN)
- 4750-60 Limestone: white, light gray, very chalky, very soft, some sandy, yellow-white fluorescence, slow white cut.
- Limestone: white, light gray, fine-medium crystalline, very oolitic, trace oolocastic, trace vuggy porosity, good to excellent granular porosity, spotty bright yellow-white fluorescence, good fast streamy cut, spotty free oil stain in many samples.
- 4760-4800 60% Shale: red, brown, soft, silty, medium-dark gray, blocky, silty, calcareous.
- 40% Limestone: white, light gray, microcrystalline, fine crystalline, hard, dense, trace oolitic, no show.
- 4800-50 60% Limestone: white, light gray, micro-fine crystalline, trace light brown, medium to coarse crystalline, hard, dense.
- 40% Shale: medium-ark gray, blocky, silty, calcareous.
- 4888 TOP MARMATON (PENN)
- 4850-4900 60% Limestone: white, light-medium gray, fine crystalline, hard, dense.
- 40% Shale: medium-dark gray, blocky, calcareous.
- 4900-50 70% Limestone: light-medium gray, gray-brown, microcrystalline, hard, dense, no visual porosity, trace argillaceous.
- 30% Shale: medium-dark gray, black, blocky-platy, calcareous.
- 4948 TOP CHEROKEE (PENN)
- 4950-5000 50% Shale: dark gray, black, blocky-platy, carbonaceous, slightly calcareous.
- 50% Limestone: light-medium gray, gray-brown, micro-fine crystalline, hard, dense.

- 5000-5100 40% Shale: dark gray, black, blocky-platy, carbonaceous.  
40% Limestone: light-medium gray, microcrystalline, hard, dense.  
20% Dolomite: dark brown, gray-brown, fine-medium crystalline, hard, dense.
- 5101 TOP ATOKA (PENN)
- 5100-50 60% Shale: dark gray, black, platy, hard, carbonaceous, calcareous.  
40% Limestone: light-medium gray, micro-fine crystalline, hard, dense, argillaceous, slightly dolomitic.
- 5150-5270 50% Shale: dark gray, black, blocky-platy, carbonaceous.  
50% Limestone: light-medium gray, gray-brown, micro-fine crystalline, dense, hard, argillaceous.
- 5270 TOP MORROW (PENN)
- 5270-5350 70% Shale: dark gray, black, platy, trace pyrite, carbonaceous, trace silty.  
30% Limestone: light-medium gray, microcrystalline, argillaceous.
- 5350-5400 80% Shale: dark gray, black, platy, trace pyrite, carbonaceous.  
10% Limestone: medium-dark gray, microcrystalline, argillaceous.  
10% Sandstone: white-light gray, very fine-fine crystalline, calcareous cement, trace glauconite.
- 5436 TOP KEYES (PENN)
- 5400-50 90% Shale: dark gray, black, platy, trace silty, carbonaceous, calcareous.  
10% Limestone: light-medium gray, micro-fine crystalline, hard, dense.
- 5452 TOP ST. LOUIS (MISS)

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- 5450-5500 70% Shale: dark gray, platy, silty, carbonaceous.  
30% Limestone: light-medium gray, white, micro-fine crystalline, hard, dense, trace fine-medium crystalline, oolitic, sandy.
- 5500-40 70% Limestone: white, cream, light gray, micro-fine crystalline, trace sandy.  
30% Shale: dark gray, black, blocky-platy, carbonaceous.
- 5540 TOP SPERGEN (MISS)
- 5540-60 70% Limestone: white, light gray, gray-green, micro-medium crystalline, dense.  
30% Shale: dark gray, black, platy, carbonaceous.
- 5560-70 70% Limestone: white, light gray, gray-green, micro-fine crystalline, dense.  
20% Shale: dark gray, black, platy.  
10% Dolomite: dark brown, gray-brown, hard, dense, micro-medium crystalline, trace bright yellow-orange fluorescence, slow blue-white cut.
- 5570-5610 60% Dolomite: medium-dark brown, fine-medium crystalline, sucrosic, good crystalline and vuggy porosity, light-medium brown oil stain, bright yellow-orange fluorescence, good fast streamy cut.  
20% limestone: white, light gray, microcrystalline, dense.  
20% Shale: dark gray, black, platy.
- 5610-5659 70% Dolomite: light-medium gray, gray-brown, fine-medium crystalline, sucrosic, slightly argillaceous, good crystalline proosity, spotty light brown stain on some samples, spotty dull yellow-orange fluorescence, fast milky cut.  
20% Limestone: white, light gray, microcrystalline, hard.  
10% Shale: dark gray, black, blocky-platy, carbonaceous.