



00205478

C & F ENERGY, INC.
FOSSTON-STATE #10-16
NW-SE SEC.16-T7N-R63W
WELD COUNTY, COLORADO

KENT LOCKHART
CONSULTING GEOLOGIST

RECEIVED

SEP 28 1992

COLO.OIL & GAS CONS.COMM

GEOLOGICAL SUMMARY

The Fosston-State #10-16 was drilled on a seismically defined closed structure at the Lyons Sandstone horizon. The primary purposes of the well were to investigate the porosity and facies development in the Lyons Sandstone, J Sandstone, Codell Sandstone, and Niobrara Chalk formations.

PARKMAN SANDSTONE

The upper Cretaceous Parkman Sandstone was fairly well developed along with indications of stratigraphic closure in a 4' interval from 3718'-22'. The drilling sample from that interval was comprised of fine grained subrounded sandstone with minor clays, mica, and glauconite. The even 30% dull yellow oil fluorescence produced slow wispy streaming yellow cuts upon solvent immersion, indicating the presence of movable oil. This 4' interval lies between two siliceous tight streaks which could act as a water barrier. Gas was not monitored through the zone. Although electric logs are not definitive, log resistivities and porosities here are similar to those in Parkman production 10 miles south-west.

NIOBRARA

At 6620 (-1780'), the Niobrara shale was topped. Gas detection indicated fractures in all three benches. The "A Bench" contained mineral and fracture fill calcite. No crystalline "open-faced" calcite was seen which indicates the presence of micro-fracturing rather than a large uni-directional fracture network. Gas detection showed 80 units background with three individual fractures yielding 325, 280, and 270 units of gas. Electric logs indicated poor resistivity (23 ohms) and no x-plot porosity. Between the Niobrara "A Bench" and "B Bench", poor shows were recorded in the silty carbonaceous shale and chalky shales.

NIOBRARA "B BENCH"

The "B Bench" of the Niobrara yielded the highest fracture frequency as indicated by both gas detection and occurrence of calcite in the chalk and marlstone layers. Electric logs displayed higher resistivities (60 ohms) and porosities (13%) than either the "A" or "C" benches. This interval more closely resembles the productive interval found in the Niobrara to the south-west.

GEOLOGICAL SUMMARY (P. 2)

FT. HAYS

The Ft. Hays was topped at 6922' (-2082) with an immediate decrease in penetration rate. Two gas spikes were recorded, 520, and 560 units, however, no oil shows or staining were noted. This indicates the possibility of a dry gas fracture network. Economical volumes or fracture extension is unknown. Perforating and production testing this zone with the Niobrara "B Bench" and/or Codell is recommended.

CODELL SANDSTONE

The Codell sandstone was present as a 12' thick zone from 6946'-6958'. Upon examination of well samples, a very fine grained sand with fair porosity and fair to good oil shows were observed. Electric logs showed 10' of sand exceeding 10% porosity. Gas peaked at 600 units from a 100 unit background, indicating natural gas and oil existing collectively in this zone.

GREENHORN

The Greenhorn developed as two benches, with minor gas increases from both benches. Gas rose from 45 units to 240 units peak with samples showing a dirty marlstone with no open crystalline type fractures. Electric logs confirmed the lack of resistivity and porosity needed for economical production.

D SANDSTONE

The D Sandstone exists as a poorly developed thin tight silica cemented very fine grained sand. No sample shows or porosity were noted. Electric logs support the conclusion of sample examination that the zone would be non-productive.

J₁ SANDSTONE

At 7370' (-2530), the J₁ Sandstone was encountered. Samples were circulated at 7382' (E-log corrected). Samples revealed a fine to medium grained subrounded sand with good to excellent porosities and 70% bright yellow-blue fluorescence. Solvent cutting of the sand yielded instant flash blue cuts followed by bright streaming yellow cuts. A drill stem test was recommended. DST #1, 7354-7382' (E-Log corrected) isolated and exposed the J₁ Sand to atmospheric pressures. The drill pipe produced an increasing blow from the test interval with gas to surface in 10 minutes on the second flow period. Fluid was reverse circulated out due to daylight constrictions. A sampler recovery of 325 cc oil, 1600 cc water, and 1.28 ft³ of gas with subsurface pressure gradients of 0.286 psi/ft indicate this zone will produce all three phases of reservoir associates. Electric logs reflect 23-30 ohms resistivity and 10-16% porosity from the top 10' of the

GEOLOGICAL SUMMARY (P.3)

J₁ SANDSTONE (cont.)

formation which calculate economic oil saturations. Commercial quantities of gas and oil should be produced upon completion along with water in quantities that could probably be disposed of on-site.

J₂ and J₃ SANDSTONE

Samples show the percentages of productive sand drops significantly from 7380' feet downward through the J₂ and J₃ Sandstones. Oil fluorescence in the lower two J Sandstone members remained spotty to non-existent, with no to very poor slow solvent cuts, indicating poor porosity and permeability along with high water saturations. Gas shows were also very minor, with no natural fracturing indicated. The J₂ and J₃ Sandstone members do not appear capable of economic hydrocarbon production.

DAKOTA SANDSTONE

The Dakota Sand was topped at 7630' (--2790). Three sand intervals were observed, each with slight drilling increases. The middle interval exhibited the best development with 12% electric log porosity from very fine to fine grained clay filled and silica cemented sand. No sample or gas shows occurred. Electric log resistivity indicates the zone is water saturated.

LAKOTA SANDSTONE

The Lakota Sand developed well. Good visual and electric log porosities were observed throughout the zone. No gas or sample shows existed. Electric log resistivities remained less than 10 ohms which calculates as highly water saturated.

ENTRADA

The Entrada, topped at 7971' (-3131), has an 8' limestone cap-rock. Immediately below the cap-rock, a clean well sorted friable to slightly firm light brown to orange sand was noted. The Entrada Sand did not contain any oil shows, and the gas detection unit recorded a decrease in background gas, indicating a possible influx of water into the well-bore. Electric logs confirm this zone to be wet.

LYONS SANDSTONE

The Lyons Sandstone was topped 2-1/2' into Core #1 at a depth of 8629' (electric log corrected). 60' of core was cut with a recovery of 56.5'. A 2.2' cap consisting of an anhydritic sand was followed by a .2' coal-like organic gilsonite.

GEOLOGICAL SUMMARY (P. 4)

LYONS SANDSTONE (cont.)

Live bleeding oil and bubbling gas was observed in the following 10.3' of sand. Large-scale wedge-planar and tabular cross-bed sets with thin 1/8"-1/2" coal and organic bitumen laminations and horizontal fractures occurred within this 10.3' interval.

The next 5' contained live oil and strong gas odor with no active bleeding. Horizontal with occasional high angle to near vertical fractures were noted over this interval.

The following 7' consisted of 1/2" to 1" low angle to planar cross-bed sets with porous and permeable live oil layers alternating with impermeable anhydritic cemented sand layers. This 7' transition interval directly above the hard oil/water contact appears to lack vertical communication since no vertical fracturing was noted.

The oil/water contact occurs at 8659' (drill depth) or 8653.5' (E-Log depth). It was also at this depth that a marked stratigraphic contact from the high angle cross-bed and wedge facies to the uniform flat lying to homogeneous tan facies occurred. This facies typifies the entire lower Lyons sandstone.

The logs and core analysis corroborate these observations and support the conclusion that economic production should be attained from a completion in the upper portion of the Lyons formation.

In summary, the Fosston-State #10-16 wellbore penetrated several oil and gas bearing formations. The Niobrara, Ft. Hays, Codell, J₁ Sand, and the Lyons all indicated commercial quantities of oil and gas are present and probably producible. There is an outside chance that the Parkman formation could be commercially viable as well. The success of production attempts in the Parkman, J Sand and Lyons will depend on the corollary water production and disposal cost. The Niobrara, Ft. Hays, and Codell will probably need to be produced by commingling. In fact, it would not be out of the question to consider commingling the J Sand with the Niobrara, Ft. Hays, and Codell. Individual testing of the formations will indicate the proper course of action. It is my recommendation that the testing begin with the Lyons.

KENT M. LOCKHART
CONSULTING GEOLOGIST

WELL DATA

OPERATOR: C & F ENERGY, INC.

WELL NAME: FOSSTON-STATE #10-16

WELL LOCATION: NW-SE SECTION 16, T7N, R63W
WELD COUNTY, COLORADO

ELEVATION: GL: 4828' KB: 4840'

SPUD DATE: APRIL 16, 1992 @ 11:30 AM

COMPLETED DRILLING: APRIL 30, 1992 @ 7:15 AM

SURFACE CASING: RAN 13 JTS. 24# 8-5/8" NEW EXETER CASING SET AT 541'KB
CEMENTED WITH 360 SACKS REGULAR, 3% CaCl, 1/4# FLOCELE
PLUG DOWN @ 3:15AM ON 4-17-92 WITH GOOD RETURNS.

CONTRACTOR: EXETER DRILLING CO. RIG NO. 18
TOOLPUSHERS: FRED HOPE AND RANDY BREWER

MUD COMPANY: QUALITY DRILLING FLUIDS
ENGINEER: MIKE SCHMIDT

ELECTRIC LOGS: ATLAS WIRELINE, INC.
ENGINEER: ANDY MAYER
DIFL/GR/CAL.....540' - 8768'
CDL/CN/GR.....3500' - 3950' AND 6500' - 8770'
DIRECTIONAL SURVEY....601' - 8767'
CBIL.....3698' - 8764' NON-CONTINUOUS.

DRILL STEM TESTS: DST #1: "J-SAND" 7358'-7386' CONVENTIONAL TEST.
TESTING CO.: TEST-A-LOG, ROGER SEEMAN

CORES: CORE #1: "LYONS SAND" 8632'-8692' STANDARD BARREL.
CORING CO: EASTMAN CRISTENSEN

COMPANY REPS: TOM AND LAURA CROKE

GEOLOGISTS: PROSPECT: DEAN CUMMINS
WELL-SITE: KENT LOCKHART

ENGINEER: WELL-SITE: DEAN GEODEKER

LANDMAN: BILL CREWS

TOTAL DEPTH: DRILLER 8775' LOGGER 8770'

STATUS: RAN 205 JTS. 4-1/2" 11.6# PRODUCTION CASING LANDED
AT 8766.66'KB. CEMENTED WITH 440 SACKS PREMIUM IN TWO
STAGES THROUGH DV TOOL. PLUG DOWN AT 5:00AM 5-4-92.

FORMATION TOPS

C & F ENERGY, INC.
 FOSSTON-STATE #10-16
 NW-SE SECTION 16, T7N, R63W
 WELD COUNTY, COLORADO

GL: 4828' KB: 4840'

FORMATION	LOG TOPS	SUB-SEA
PARKMAN	3648'	+1192
NIOBRARA	6620'	-1780
A BENCH	6649'	-1809
B BENCH	6784'	-1908
C BENCH	6819'	-1979
FT. HAYS	6922'	-2082
CODELL	6946'	-2106
CARLILE	6958'	-2118
GREENHORN	7004'	-2164
X-BENTONITE	7199'	-2359
J SILT	7350'	-2510
J ₁ SAND	7370'	-2530
J ₂ SAND	7397'	-2557
J ₃ SAND	7450'	-2610
SKULL CREEK	7520'	-2680
DAKOTA SILT	7600'	-2760
DAKOTA SAND	7630'	-2790
LAKOTA	7709'	-2869
MORRISON	7752'	-2912
ENTRADA	7971'	-3131
LYKINS	8012'	-3172
PARKCREEK (FORELLE)	8377'	-3537
GLENDO	8388'	-3548
MINNEKAHTA	8458'	-3618
OPECHE	8550'	-3710
BLAINE	8582'	-3742
LYONS	8629'	-3789
OWL CANYON	8732'	-3892
T.D.	8770'	-3930

BIT RECORD

<u>NO.</u>	<u>SIZE</u>	<u>MAKE</u>	<u>TYPE</u>	<u>IN</u>	<u>OUT</u>	<u>FOOTAGE</u>	<u>HOURS</u>
1rr	12-1/4	HTC	ATJ-1S	0'	540'	540'	9-3/4
2	7-7/8	REED	HP-11	540'	3936'	3396'	27-3/4
3	7-7/8	STC	FDS+	3936'	4500'	564'	11-3/4
4rt	7-7/8	REED	HP-11J	4500'	4730'	230'	3-1/4
5	7-7/8	CHRIS	R435SG	4730'	7358'	2628'	38-1/4
6	7-7/8	STC	F-2H	7358'	7386'	28'	1-1/4
7rr6	7-7/8	STC	F-2H	7386'	8050'	664'	38
8	7-7/8	STC	F-17	8050'	8632'	582'	27
9core	7-7/8	CHRIS	C-23	8632'	8692'	60'	29-1/4
10rr8	7-7/8	STC	F-17	8692'	8775'	83'	5-3/4

DEVIATION SURVEYS

<u>DEPTH</u>	<u>DEVIATION</u>	<u>DEPTH</u>	<u>DEVIATION</u>
194'	0	6777'	1/2
540'	1/4	7341'	MR
2029'	1/4	7354'	2
3032'	1/4	7858'	1-3/4
3936'	0	8050'	2
4500'	1-3/4	8632'	7-1/4
5591'	3/4	6280'	1 (off bottom)
6650'	MR	7850'	1-3/4 (off bottom)
6681'	MR	8600'	7 (off bottom)
		8775'	7-1/2

MUD PROPERTIES

<u>DATE</u>	<u>DEPTH</u>	<u>WEIGHT</u>	<u>VISCOSITY</u>	<u>YIELD POINT</u>	<u>WATER LOSS</u>	<u>SOLIDS</u>
4-22-92	6681'	8.6	27	2	15.0	2.0
4-23-92	7386'	8.9	31	2	10.4	4.2
4-24-92	7450'	8.9	50	15	10.4	4.2
4-25-92	7890'	9.0	40	12	8.8	4.8
4-26-92	8050'	9.0	36	3	12.4	4.8
4-27-92	8415'	8.9	31	3	15.0	4.2
4-27-92	8632'	9.1	47	17	10.4	5.6
4-28-92	8636'	9.2	55	27	8.0	6.4
4-29-92	8677'	9.3	47	16	11.4	7.0
4-30-92	8767'	9.3	47	14	12.0	7.0

CHRONOLOGICAL HISTORY

DATE	7:00AM DEPTH	FTG MADE (24 HRS)	PRESENT OPERATIONS	ACTIVITY DURING PREVIOUS 24 HOUR PERIOD
4-16-92	0'	0'	RIG UP	MOVE RIG, LEVEL SUB, RAISE DERRICK, DIG DITCHES, MICS. REPAIR (24).
4-17-92	540'	540'	W.O.C.	RIG UP (3.5). DRILL RAT AND MOUSE HOLE (1). SPUD 12-1/4" SURFACE HOLE AT 11:30 AM ON 4-16-92. DRILL (1). RIG REPAIR-DRAWWORKS OILERS & HIGH DRUM AIRLINE (1). DRILL (4). SURVEY @ 194' (.5). DRILL (1). RIG REPAIR AND JET CELLAR (1.5). DRILL (3.75). CIRCULATE, SURVEY, TRIP OUT TO RUN SURFACE CASING (.75). RUN 13 JTS. 8-5/8" 24# NEW EXETER SURFACE CASING AND SET AT 541'KB (1.5). CEMENTED WITH 360 SACKS REGULAR, 3% CaCl AND 1/4#/SK FLOCELE WITH GOOD RETURNS BY CEMENTERS, INC (.75). WAIT ON CEMENT (3.75).
4-18-92	2215'	1675'	DRILLING	W.O.C. (.25). NIPPLE UP B.O.P. (4). PRESSURE TEST BLIND RAMS AND MANIFOLD 1000# FOR 15 MIN. HELD OK (.5). PICK UP MUD MOTOR AND BIT #2 (1.75). TRIP IN, PICKING UP COLLARS (4). DRILL 65' CEMENT (.5). DRILL (11). WIRELINE SURVEY @ 2029' (.5). DRILL (1.5).
4-19-92	3936'	1721'	TRIPPING	DRILL (6.5). WIRELINE SURVEY AT 3032'-1/4 DEG. (.5). DRILL (9). TRIP FOR BIT #3-LOST ALL CONES (2). WAIT ON MAGNET, LAYDOWN MUD MOTOR AND 9 DRILL COLLARS (2.5). P/U MAGNET AND FLOAT SUB AND TRIP IN (2). CIRCULATE AND FISH FOR CONES (.25). TRIP OUT WITH MAGNET (1.25).
4-20-92	4500'	564'	TRIPPING	TRIP OUT WITH MAGNET (1). TRIP IN WITH MAGNET (2). TRIP OUT WITH MAGNET (2). CLEAN OUT JUNK SUB AND EVALUATE (.5). P/U MUD MOTOR AND TRIP IN (2.5). DRILL (12). SURVEY THEN TRIP OUT FOR BIT #4RT (2). CLEAN UP JUNK BASKET AND EVALUATE (.5). PICK UP MAGNET AND TRIP IN (1.5).

CHRONOLOGICAL HISTORY (P. 2)

DATE	7:00AM DEPTH	FTG MADE (24 HRS)	PRESENT OPERATIONS	ACTIVITY DURING PREVIOUS 24 HOUR PERIOD
4-21-92	5276'	776'	DRILLING	FINISH TRIPPING IN WITH MAGNET (1). WORK JUNK BASKET AND MAGNET (.5). TRIP OUT (.25). RIG REPAIR-HIGH DRUM CHAIN BROKE (1.5). FINISH TRIP OUT (1.75). CLEAN OUT JUNK BASKET AND EVALUATE (.5). TRIP IN WITH JUNK BASKET/MAGNET (2). WORK JUNK BASKET ON BOTTOM (.5). DRILL (3.25). TRIP OUT (1.76). CLEAN OUT JUNK BASKET (1). P/U MUD MOTOR AND TRIP IN WITH BIT #5 (2.5). DRILL (7.5).
4-22-92	6681'	1405'	DRILLING	DRILL (2.5). RIG SERVICE (.25). SURVEY @ 5559'-MISRUN (.75). DRILL (.25). SURVEY @ 5591'-3/4 DEG. AND REPAIR BELT ON WIRELINE MACHINE (1.5). DRILL (16.75). ATTEMPT SURVEY-LINE FOULED UP (.25). DRILL (.5). ATTEMPT WIRELINE SURVEY-MISRUN (1.25).
4-23-92	7386'	705'	CIRCULATE	DRILL (1.25). RIG SERVICE (.25). SURVEY @ 6777'-1/2 DEG. (.5). DRILL (9.75). DROP SURVEY AND TRIP OUT FOR BIT #6 (4.25). P/U SHOCK SUB AND 9 DRILL COLLARS (1.25). TRIP IN, SLM, FILL PIPE (3.25). DRILL (1.25). CIRCULATE SAMPLES FROM J ₁ SAND DRILLING BREAK. RECOMMEND D.S.T. (1.25). CONDITION MUD FOR D.S.T. #1 (1).
4-24-92	7456'	70'	DRILLING	CIRCULATE & CONDITION MUD FOR DST #1 (2). SURVEY AND TRIP OUT (3). RIG REPAIR-TONG LINE (.5). PICK UP D.S.T. TOOLS (.5). RIG REPAIR-AIR LINE ON CATHEAD (.25). TRIP IN WITH TEST TOOLS (2.75). D.S.T. #1- 10,30,60,90 MIN. (3). TRIP OUT- REVERSE CIRC TO PIT (4). BREAK DOWN AND LOAD OUT TEST TOOLS (.75). P/U MUD MOTOR & SHOCK SUB THEN TRIP IN WITH PREVIOUS BIT #6 (3). DRILL (4.25).

CHRONOLOGICAL HISTORY (P. 3)

DATE	7:00AM DEPTH	FTG MADE (24 HRS)	PRESENT OPERATIONS	ACTIVITY DURING PREVIOUS 24 HOUR PERIOD
4-25-92	7894'	438'	SURVEYING	RIG SERVICE (.25). DRILL (2.5). CLEAN SUCTION PIT (.25). DRILL (5.25). RIG SERVICE (.25). DRILL (15.5).
4-26-92	7988'	94'	REAMING	RIG SERVICE AND SURVEY @ 7858'- 1-3/4 DEG. (1). DRILL (7). RIG SERVICE (.25). DRILL (2.25). DROP SURVEY AND TRIP FOR BIT #8 (5.5). CUT & SLIP 150' OF DRILLING LINE AND MEASURE BLOCKS SHEAVE DEPTH (1). TRIP IN AND FILL PIPE (2.25). REAM OUT OF GAUGE HOLE FOR 156' (4.75).
4-27-92	8420'	432'	DRILLING	REAMING OUT OF GAUGE HOLE (2.5). RIG SERVICE-CLEAN #2 MUD TANK (.25). DRILL (2.25). RIG REPAIR-#2 DRAWWORKS CLUTCH OVERHEATING (.25). DRILL (.75). RIG REPAIR-REPLACE AIR LINE TO #2 MOTOR CLUTCH (1). DRILL (1.5). RIG SERVICE (.25). DRILL (15.25).
4-28-92	8636'	216'	CORING	DRILL (7.5). CIRCULATE FOR SAMPLES AND TO CONDITION HOLE FOR LYONS SAND CORE (1.5). SURVEY AND TRIP OUT- S.L.M. (5.5). P/U CORE BARREL (2). TRIP IN WITH CORE #1 (2.5). REAM 90' (2). DROP BALL, SET PUMP STROKES, CORING (3).
4-29-92	8677'	41'	CORING	CORE LYONS SAND (24). NOTED TRACES OF OIL ON PITS WHILE CORING 8638'-8654' INTERVAL.
4-30-92	8767'	90'	DRILLING	CORING (2.25). TRIP OUT (1.75). RIG SERVICE (.25). TRIP OUT (2.75). LAY DOWN 57' OF CORE (1). LAY DOWN CORE BARREL (.5). P/U MUD MOTOR AND SHOCK SUB THEN TRIP IN WITH BIT #8RR (3). REAM 185' TO BOTTOM (2.75). DRILL (1.25). WIRELINE SURVEY. TIMER WENT OFF BEFORE BOTTOM WAS REACHED. RECORDED 1 DEG. DEVIATION AT 6280'(1.25). DRILL (2). WIRELINE SURVEY. ONLY REACHED 7850'. 1-3/4 DEG. (1). DRILL (2.25). WIRELINE

CHRONOLOGICAL HISTORY (P.4)

DATE	7:00AM DEPTH	FTG MADE (24 HRS)	PRESENT OPERATIONS	ACTIVITY DURING PREVIOUS 24 HOUR PERIOD
------	-----------------	----------------------	-----------------------	--

SURVEY. ONLY GOT TO 8600'-7 DEG.
DEVIATION (1.5).

5-1-92	8775'	8'	LOGGING	DRILL (.25). CIRCULATE & CONDITION FOR E-LOGS (2)..SURVEY-MISRUN DUE TO TIMER CLOCK UNSCREWING (.25). TRIP OUT FOR E-LOGS (3.5). ELECTRIC LOGGING BY ATLAS WIRELINE.
--------	-------	----	---------	--