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DETERMINATION OF THE OPTIMUM MASSIVE
HYDRAULIC FRACTURING DESIGN FOR THE
STIMULATION OF THE WASATCH AND MESAVERDE FORMATION

Monthly Report for November, 1977

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December, 1977

PREPARED FOR
THE
U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
NEVADA OPERATIONS OFFICE

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INTRODUCTION

During November 1977, the following work was accomplished:

- I. Natural Buttes Unit No. 18 produced a total of 18,092 MCF in 30 days for an average flow rate of 603 MCFD.
- II. Natural Buttes Unit No. 19 produced at an average rate of 17 MCFD for 17 days.
- III. Natural Buttes Unit No. 14 produced at an average rate of 562 MCFD for 30 days.
- IV. Natural Buttes Unit No. 20 produced at an average rate of 653 MCFD for 18 days.
- V. Natural Buttes Unit No. 21 is shut in, waiting on cased hole logging.
- VI. a. Natural Buttes Unit No. 22 was fraced on November 21, 1977.
b. Natural Buttes Unit No. 9 was cleaned out to 8959 PBTD and tubing and packer were run and set at 5492'. MHF was designed and is waiting to be fraced. Bids were received and are being evaluated.

DISCUSSION OF WORK PERFORMED

- I. Phase I: Natural Buttes Unit No. 18.
Produced well for 30 days. See attached production graph.
- II. Phase II: Natural Buttes Unit No. 19.
Produced well for 17 days. See attached production graph.
- III. Phase III: Natural Buttes Unit No. 14.
Produced well for 30 days. See attached production graph.
- IV. Phase IV: Natural Buttes Unit No. 20.
Produced well for 18 days. See attached production graph.
- V. Phase V: Natural Buttes Unit No. 21.
Drilled to TD of 8788'. See Appendix A for daily drilling reports. See Appendix B for core discriptions. See Appendix C for mud log daily reports. 5½" casing, 20 pound, N-80, 8rd casing was run and set at 8788'. 5½" casing was cemented with 15 barrels of CW-100, 2000 sacks 50-50 poz

with 6% gel, plus 18% Salt plus 0.5% D-45 TIC, plus 5 pounds per sack Gilsonite. Displaced plug with 2% KCl water. Bumped plug with 4,000 psi at 2:00 p.m. November 16, 1977. Cut off casing. Nipple down Blow Out Preventers and install tubing head. Clean mud tanks and release rig at 6:00 a.m. November 17, 1977.

VI. Phase VIa: Natural Buttes Unit No. 22.

A TDT log was run and perfs have been picked. A CBL log was also run on this well and showed top of cement at 5500'. Natural Buttes Unit No. 22 was fraced with the following:

3500 gallons 7½% HCl, 12,000 gallons 2% KCl water pad, 478,758 gallons YF4-PSD, plus 25,000 pounds 40-60 Ottawa Sand, 60,000 pounds 100 mesh sand, flushed with 125 barrels slick 2% KCl. ISIP - 2700 psig, 5 minutes SIP 2400 psig, 10 minutes SIP 2300 psig, 15 minutes SIP 2300 psig. Average frac pump rate - 45 Barrles per Minute. Average treating pressure 4900 psi. Maximum treating pressure 7100 psig. Maximum rate 55 Barrels per Minute. See Appendix D for treatment report.

Phase VIb: Natural Buttes Unit No. 9.

Moved in a workover rig and cleaned out to 8959'. An attempt to run a casing inspection log failed. Went in hole with packer and tubing to 5492'. MHF was redesigned to allow treatment to be pumped down tubing only. Bids are being evaluated and recommendations will be submitted to DOE (ERDA) in the near future.

FORCAST OF WORK FOR DECEMBER, 1977

- I. Phase I: Natural Buttes Unit No. 18.
Continue flowing well to sales.
- II. Phase II: Natural Buttes Unit No. 19.
Continue flowing well to sales.
- III. Phase III: Natural Buttes Unit No. 14.
Continue flowing well to sales.
- IV. Phase IV: Natural Buttes Unit No. 20.
Continue Flowing well to sales.
- V. Phase V: Natural Buttes Unit No. 21.
Plan to run the cased hole logs and will probably run one experimental logging tool, (Long Spaced Sonic on December 13, or 14th.)
- VI. Phase VIa: Natural Buttes Unit No. 22.
Flow well to clean up. Move in workover rig to clean out frac sand to allow all zones to clean up. Run Gamma Ray Tool to determine location of fraced intervals.
- Phase VIb: Natural Buttes Unit No. 9.
Bids are being evaluated and recommendations will be prepared and submitted to DOE (ERDA) for approval.

Table 1 Summary of MHF Treatments

Well	No. of Zones Perf.	Net Ft. of Pay	Average				Frac Job Size		Frac Length Ft.	Est. 1st Yr. Avg. Prod. Rate MCFD	
			Net Ft Per Zone	Ø	SW	% Sd	Type of Fluid	Gals of Gel			Pounds of Proppant
NATURAL BUTTES #18	18	224	12.5	10	48	88	VERSA FRAC	695,000	1,480,000	892	1200
NATURAL BUTTES #19	19	194	10.2	9.5	47	87	40# GUAR GUM	655,000	1,237,000	950	60
NATURAL BUTTES #14	15	271	10.0	9.9	49	65	YF4-PSD	544,000	1,082,000	879	600
NATURAL BUTTES #20	0	65	0.1	9.9	44	88.5	YF4-PSD	309,000	826,000	1150	800
NATURAL BUTTES #22	24	196	8.1	12.0	45	85.0	YF4-PSD	478,758	1,091,000		

TABLE NO. 2
PRODUCTION
NATURAL BUTTES NO. 14

<u>November 1977</u>	<u>MCFD</u>	<u>TP</u>
<u>WEEK ENDING</u>	Average	
11/8	587	450
11/15	570	450
11/22	478	450
11/29	599	450
12/1	615	400

TABLE NO. 3
PRODUCTION
NATURAL BUTTES NO. 18

<u>November 1977</u>	<u>MCFD</u>	<u>TP</u>
<u>WEEK ENDING</u>	Average	
11/8	592	550
11/15	592	500
11/22	600	500
11/29	629	500
12/1	600	500

TABLE NO. 4
 PRODUCTION
 NATURAL BUTTES NO. 19

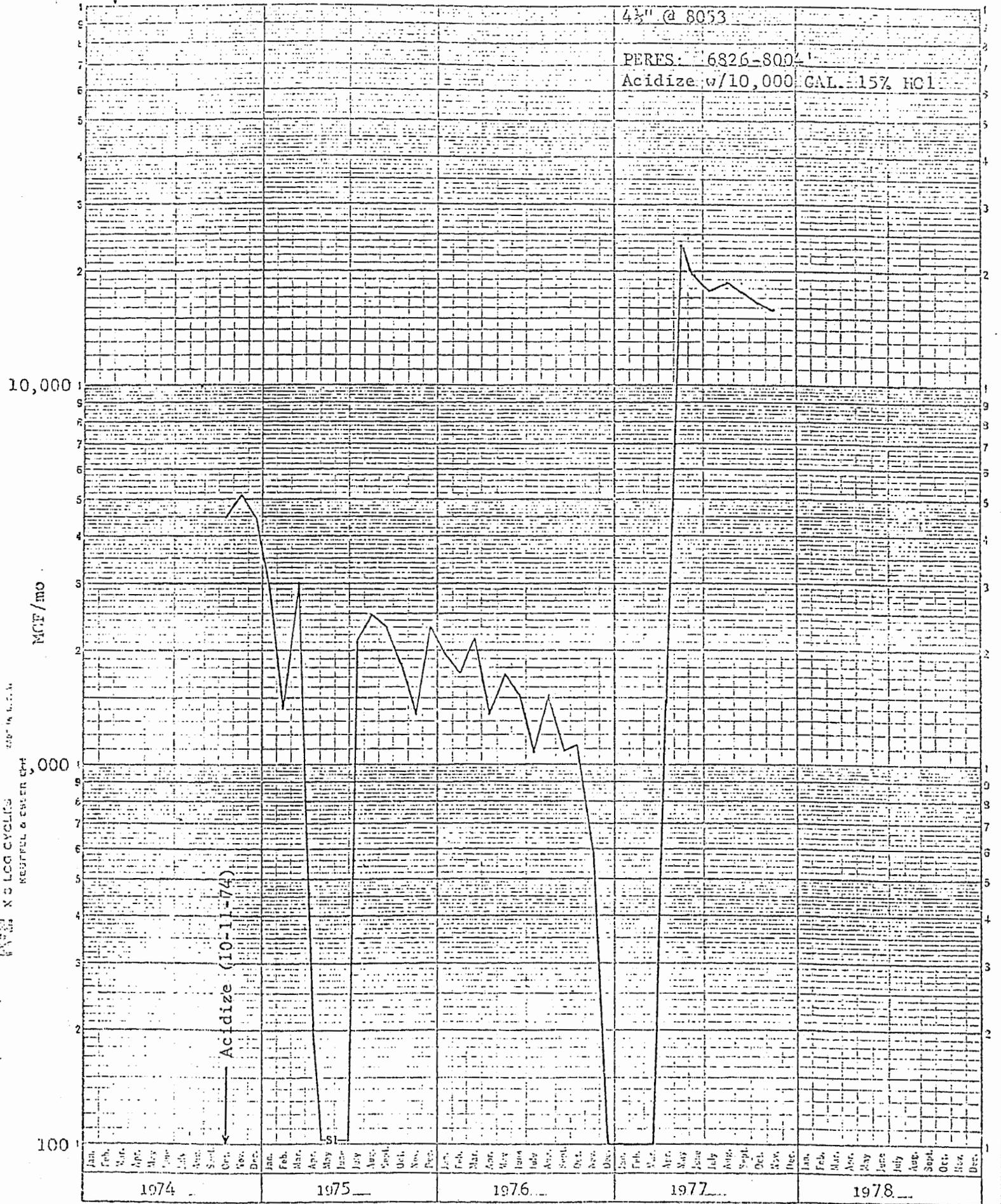
<u>November 1977</u>	<u>MCFD</u>	<u>TP</u>
<u>WEEK ENDING</u>	Average	
11/8	27	600
11/15	17	500
11/22	13	600
11/29	*	300
12/1	*	500

* Cannot buck line pressure.

TABLE NO. 5
PRODUCTION
NATURAL BUTTES NO. 20

<u>November 1977</u>	<u>MCFD</u>	<u>TP</u>
<u>WEEK ENDING</u>	Average	
11/8	730	0
11/15	0	50
11/22	658	650
11/29	637	550
12/1	615	500

NATURAL BUTTES NO. 14



5 YEARS BY MONTHS 40 00000
 X 3 LOG CYCLES
 REUSEFUL & EASIER COPY

NATURAL BUTTES NO. 18

4 1/2" @ 9140
 2 3/8" @ 8,969'
 PERES-- 6490-8954 (18 zones)
 FRAC-- 695,000 GAL Versagel &
 1,480,000# SD
 Frac Length-- 950'

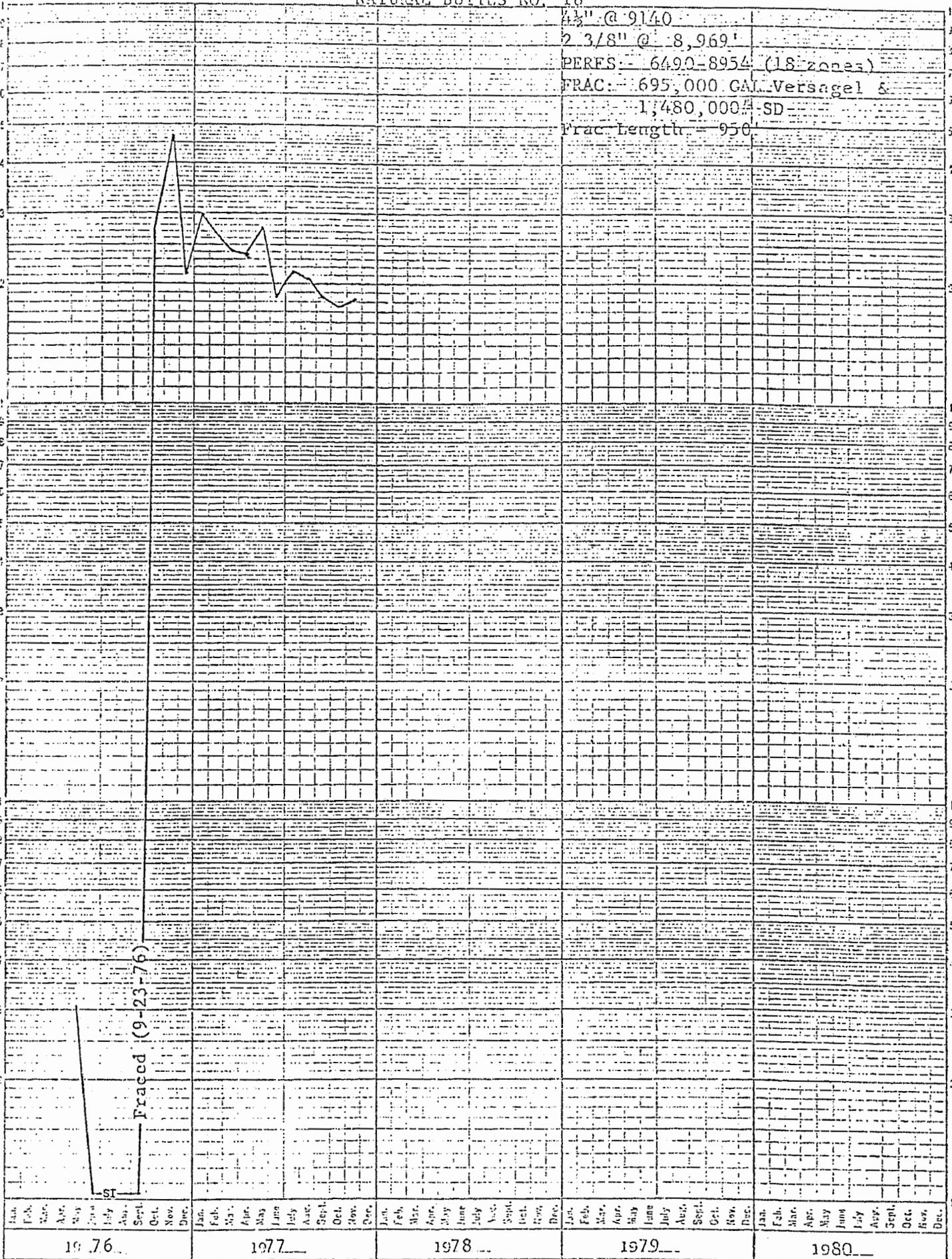
10,000

MCF/MO

1,000

100

LAST 5 YEARS BY MONTHS AC 6600
 2 1/2" X 3/8" LOG CYCLES
 NEWELL & ESSER CO.



Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976												1977												1978												1979												1980											

NATURAL BUTTES NO. 19

4 1/2" @ 9,697'
 2-3/8" @ 7,789'
 PERES: 7,220-9,664' (19 zones)
 Note: Zones 7,728-43' and
 7,632-36 isolated by use of
 packers.
 FRAC: 625,000 gallons fluid and
 1,207,000# SD

1000
 100

Fraccd 9-22-76

Workover - water producing zones isolated



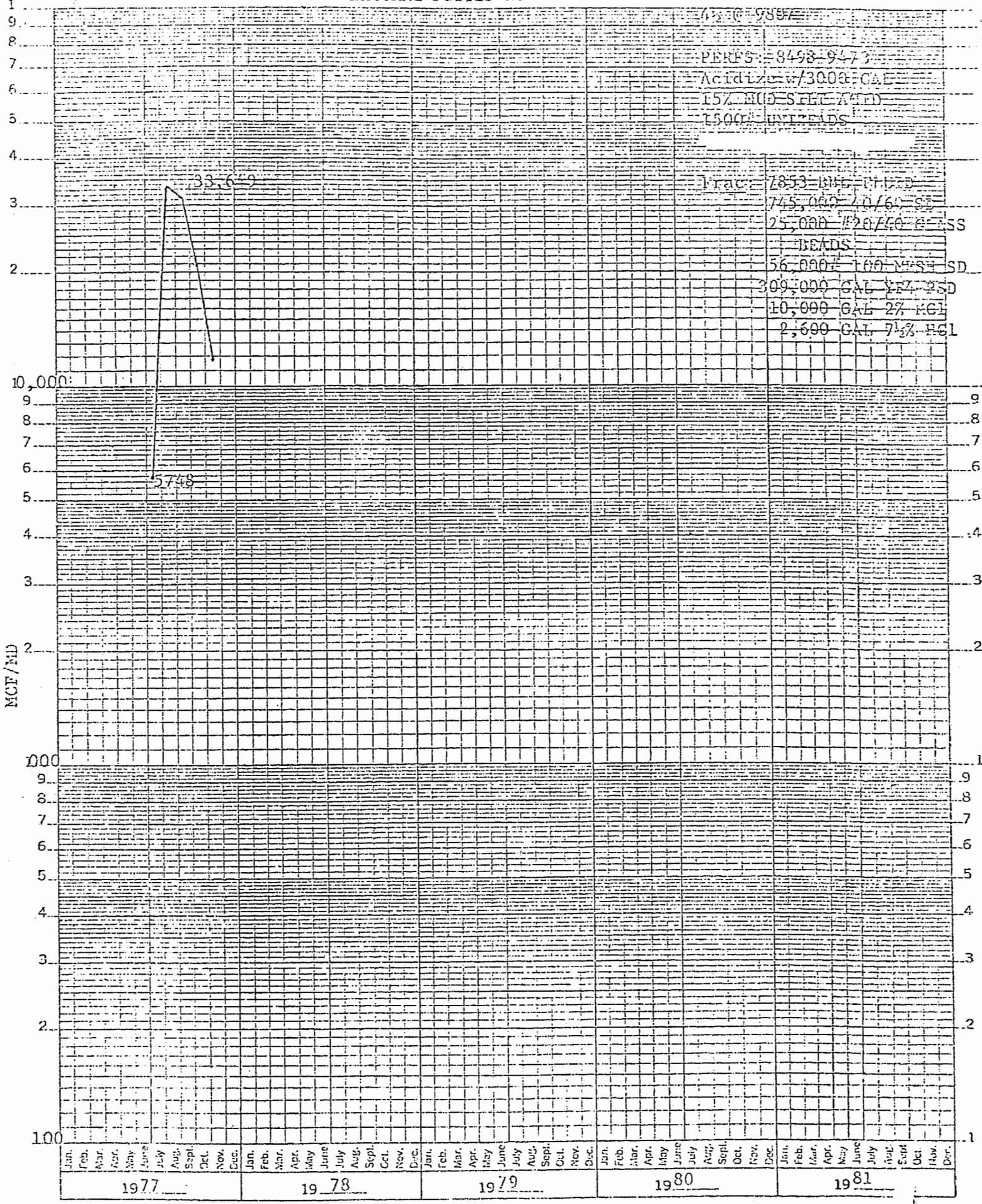
5 YEARS CYCLIC 40 0000
 X 3 LOG CYCLES
 NEWELL A. BERRY CO.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec												
19 76												1977												19												19											

NATURAL BUTTES NO. 20

4-C 6690

LOG 5 YEARS BY MONTROSE LOG CYCLES
K&L SERVICE & OIL CO. MADE IN U.S.A.



4-C 6690
PERFS = 8498-9473
Acidize w/3000 GAL
15% MUD-SLURRY ACID
1500 UNITS/BEADS
Fract: 7853 GAL PERFOR
745,000 GAL/60 SS
25,000 GAL/40 G-SS
BEADS
56,000 GAL/100 MESH SD
309,000 GAL 12% SDS
10,000 GAL 2% HCL
2,600 GAL 7 1/2% HCL

APPENDIX "A"

CHRONOLOGICAL OF DRILLING OF

NATURAL BUTTES NO. 21

From November 1 through November 21, 1977

CICE 21-15-10-22 (NBU)

Bitter Creek Field

Uintah County, Utah

AFE: 14716 WI: 100%

ATD: 8800' SD: 4-9-77

CICE, Oper.

13-3/8" @ 89'; 9-5/8" @ 2531

MW 10.3#, 32 secs, 7.6 cc.

11-1-77

Circ & cond hole @ 8400'

Circ. build mud wt & vis. Start coring. Bit plgd - attempt to unplug same; TOOH w/wet string. Mud @ 10.5 in - 10.4 out.

Well started flowing. Stood core tools in derrick; TIH w/bit & bit sub.; Circ out gas. Build mud wt & vis.

MW 10.8#, 36 secs, 8 cc.

TD: 8446'

11-2-77

Coring core #12 (11' - 5 hrs)

Circ & cond mud & unplug suction on pump #2.

TOOH w/bit to core; Pump repair; Change rotating head;

Dump core - full recovery of core #11. Cut 13.4';

Rec. 14'. 8422' - 8432.4' shale; 8432.4' - 8436' sand:

lt. gry, vry slty, thin shale streaks. Unplug monel

collar & core barrel; RUEastman & core barrel; TIH to

core #12; Wash to bottom; Coring from 8436' on core #12;

Trip Gas: 2560 un, BGG 120 un.

MW 10.9#, 34 secs, 10.8 cc.

TD: 8466'

11-3-77

TIH w/core BBL for core #13 (20' - 11-3/4 hrs)

Coring 2000un BGG; circ & cond mud build wt; Pump

repair; TOOH w/core; LD jar & monel; LD core, full

31' rec 8435' - 8466'; reload Eastman tools; TIH for

core #13; Trip - 225un.

Sand intervals: 8435.4 - 8438.0' - 2.6'

8439.2 - 8441.6' - 2.4'

8442.5 - 8448.3' - 5.8'

8463.7 - 8464.7' - 1.0'

Total Sand 11.8'

MW 11.0#, 37 secs, 12.5cc.

TD: 8507'

11-4-77

TOOH w/core. TIH & inst rot head; wash to btm;

circ out gas; coring #13, 8466' to 8507'; Circ;

TOOH w/core #13; BGG - 150 to 300 un; Trip - 2500 to

3000 un.

MW 11.2#, 34 secs, 10.4cc.

Bitter Creek Field
Uintah County, Utah
APE: 14716 WI: 100%
ATD: 8800' SD: 4-9-77
CIGE, Oper.
13-3/8" @ 89'; 9-5/8" @ 2531'

TD: 3562' Coring #14. Coring; TOH; Dump core; LD core;
11-5-77 LD core Bbl & monel DC; PU BH -- DC & bit -- TIH;
TOH LD BH-DC; PU core Bbl & monel DC & Eastman
tools; TIH well kicking; Cir gas out; Coring.

MW 11.5#, 37 secs, 13.2 cc.

TD: 8557' CORING #14. (35' - 23 hrs).
11-6-77 Coring; Conn - had to work down.
Conn gas 80 un.
BGG 30 - 50 un.

MW 12.5#, 39 secs, 10.2 cc.

TD: 8592' Drilling (35' - 10-1/4 hrs). (7' coring, 28' Drilling).
11-7-77 Coring #14. Cut 57.3'; Made full recovery. Core #14, 8507.4' -
8564.7'; Sand intervals @ 8534.2' - 38', 8548.8' - 49.6', 8553.8'
- 54.8'. (Total sand 5.6'); Circ.; TOOH; LD jars, Monel collar
& 2 Stabilizers; Dump core #14. LD Core Barrel & check BOP's.
PU bit #8 & checking rot. head.; TIH w/bit #8; Wash to btm;
Drilling; Circ out gas - 2400 un.

MW 12.7#, 47 secs, 15 cc.

TD: 8697' Drilling (105' - 23-3/4 hrs); Drilling; Rig Service;
11-8-77 Drilling; BGG 5 un; Connection 20 un.

MW 12.6#, 46 secs, 12.8 cc.

TD: 8762' Drilling (65' - 24 hrs). Drilling; Rig service BOP
11-9-77 check; Drilling.

MW 12.7#, 45 secs, 10.2cc.

TD: 8800' TOOH to log. Drilling (38' - 15 1/2 hrs). Rig service &
11-10-77 clean mud pit; circ to log; TOOH; Schlumberger on
location.

MW 12.7#, 44secs, 10.4cc.

TD: Logging w/Schlumberger. RU Schlumberger;
8800' Run #1 -- DLL and Micro SFL
11-11-77 Run #2 -- FDC - CNL w/caliper
Run #3 -- BHC Sonic w/GR
Run #4 -- Long spaced sonic
Driller TD 8800'; SLM TD 8791.6'; Log TD 8788'; Released
mud logging unit 11-10-77; 5 1/2" csg on location.

MW 12.6, 44 secs.

GE 21-15-10-22 (NBU)

Utter Creek Field

Utah County, Utah

WI: 19355 WI: 100%

TD: 8800' SD: 4-9-77

GE, Oper.

Anderson Drilling, Contr.

3-3/8" @ 89', 9-5/8" @ 2531'

TD: 8788' Circ. out gas & cond. hole.
11-12-77 Logging w/Schlumberger; DLL, MSL, CNL-FDC, BHC-SONIC-GR, long spaced sonic & 4 arm Dipmeter FIL (Caliper was off); Cut drilling line; TIH; Stop in 8788.43'; Circ. out gas & Cond. mud
MW 12.6#, 46 sec.

TD: 8788'
11-13-77 Log w/DA. Circ out gas; 700 A; RU log/w Dresser;
(1) DLL; (2) CNL, EDC caliper; (3) l.
MW 12.7#, 44 secs, 12 cc.

TD: 8788'
11-14-77 Logging w/Dresser. Logging:
Run #3 -- Micro-lateral
Run #4 -- BHC-Ac w/caliper and GR
Run #5 -- Spectralog
Dowell has RFC cement on location.
MW 12.6#, 42 secs, 12 cc.

Pittek Creek Field
Uintah County, Utah
AFE: 19355 WI: 100%
ATD: 8800' SD: 4-9-77
CIGE, Oper.
Anderson Drilling, Contr.
13-3/8" @ 89', 9-5/8" @ 2531'

TD: 8788' TIH w/bit to cond. mud -- prep to run csg.
11-15-77 Logging w/Dresser; Finished logging: Run #5: Spectralog,
Run #6: DD-NNL, Run #7: Dip Log & FIL; TIH w/bit to cond
mud. Prep to run csg. Dowell has all cement on location.
1665 sx RFC; 2000 sx POZ.

MW 12.6#, 45 secs, 12 cc.

TD: 8788'
11-16-77 Running 5-1/2" csg. TIH w/bit; Cond mud; RU & LD DP & DC;
RU Parish casing tools; Running csg 5-1/2" 20# N-80, Rg.-3,
LT & C; PU approx. 6000'.

MW 12.7#, 46 secs, 12.4 cc.

PBTD: 8742' Released rig @ 6:00 a.m. 11-17-77 -- WOC. Run
TD: 8788' 5-1/2" csg 209 jts 20#, N-80, Rg. 3 LT & C w/float shoe
11-17-77 @ 8788' and FC @ 8742'; Centralizers 15' above shoe and
every 3rd jt for a total of 40 centralizers; Circ;
Cementing w/Dowell; Pumped 15 bbls. CW-100 followed
w/2000 sx 50-50 POZ w/6% Gel-18% salt -- 0.5 D 45 TIC --
5#/sx Gilsonite followed w/1670 sx RFC 10% D 53 w/5#/sx
Gilsonite; Displace plug w/2% KCl wtr; Bumped plug w/4000
psi @ 2:00 p.m. 11-16-77; Plug held ok; Circ cement w/500
sx RFC to mix; Lost all returns on full plug displacement;
Set slips (total wt was 170,000#).

NOTE: Filled annulus w/15 bbls mud prior to setting slips.
Fluid level in annulus dropping slowly.

ND BOP: Cutt off 5-1/2" csg; ND & set out BOP and install
tbg head; Clean mud tanks; Rig released @ 6:00 a.m.
11-17-77.

NOTE: Cement Wts: POZ 13.9#/gal -- 1.64 ft³/sx; Volume
584 bbls.
RFC 14.2#/gal -- 1.62 ft³/sx; Volume
481 bbls.

MW 12.6#, 46 secs.

PBTD: 8742'
TD: 8788'
11-18-77 RD rotary tools.

PBTD: 8742'
TD: 8788'
11-19-77 WOC; RD RT; WOC

PBTD: 8742'
TD: 8788'
11-20-77 WOC

PBTD: 8742' 11-21-77 (Report omitted in error) WOC.
TD: 8788'

APPENDIX "B"

NATURAL BUTTES UNIT NO. 21

<u>DEPTH INTERVAL</u>		<u>CORE DESCRIPTION</u>
<p>Core #1: 4389' - 4451' <u>Recovered 54'</u></p>		
4389.0'	- 4403.3'	Shale, lt gray, silty, sl calc.
4403.3'	- 4415.8'	SS, lt gray, silty, VFG-FG sl calc, fair drilling, SA-SR moderately well sorted. SS becoming slight red tint toward base & finer grained
4415.8'	- 4424.2'	Shale, lt gray, some lt red tint, V silty, gradational, with overlying sand, calc, has some very thin sandy patches. Lt gray & lt red colors gradational, becoming more lt red at base.
4424.2'	- 4428.1'	Shale, gray, calc silty
4428.1'	- 4432.0'	Siltst, lt gray to lit red shades, sl calc, clayey
4432.0'	- 4434.7'	Siltst to VFG SS, very lt gray calc, WS, SA-SR, tite.
4434.7'	- 4441.8'	Shale, lt gray, calc, silty.
4441.8'	- 4443.0'	SS, lt gray, VFG, very silty, WS SA, <u>tite.</u>
<p>Core #2: 4452' - 4508.5' <u>Recovered 58'</u></p>		
4452.0'	- 4454.6'	Lt gray shale, silty, non-calc.
4454.6'	- 4461.7'	Lt gray SS, VFG, sl calc, very silty, WS, SA, poor to fair drilling, gradational with overlying shale
4461.7'	- 4463.5	Shale, gray, non-calc, silty, gradational above & below.

<u>DEPTH INTERVAL</u>		<u>CORE DESCRIPTION</u>
4463.5'	- 4490.5'	SS, lt gray, very silty, VFG gradational, sl calc, fair drilling, WS, SA grades into underlying shale.
4490.5'	- 4510.0'	Shale, gray, sl calc, locally silty
Core #3: 6350' - 6383' <u>Recovered 33'</u>		
6350.0'	- 6368.0'	Shale, dark gray, sl calcareous locally carbonaceous or coaly, especially 6365' - 6357'.
6368.0'	- 6369.0'	Sandstone, very fine grained, light gray, slightly calcareous, clay rich, tite, subangular, <u>wet</u> .
6369.0'	- 6382.0'	Shale, dark gray, locally silty in patches, burrows present.
6382.0'	- 6383.0'	Sandstone, white to light gray, very fine grained to fine grained, clay rich, slightly calcareous, fair porosity, thin gray shale interbeds. local fractures in whole core. Frac vertical. No coring time breaks, gas units 200 to 360 with no significant shows. No conn. gas. 2' flare while coring. 3100 to 68000 ppm gas MW 9.4 to 9.6# during coring.
Core #4: 6382.8' - 6413.6' <u>Recovered 26.0' (Bbl. jammed)</u>		
6382.8'	- 6383.5'	Ss, very fine grained, white to light gray, slightly calcareous, poor porosity, tite.
6383.5'	- 6405.7'	Shale, medium to dark gray, coaly locally,
6405.7'	- 6408.2'	Ss, very fine grained, white to light gray, slightly calcareous, poor porosity, clay filled locally coaly locally & bedded, burrows.

<u>DEPTH INTERVAL</u>		<u>CORE DESCRIPTION</u>
6408.2'	- 6408.8'	Siltstone, grading into red above Sperry orient. equipment failed.
Core #5: 6413.6' - 6452.4'		
<u>Recovered 35.3'</u>		
6413.6'	- 6414.7'	Siltstone, light gray, locally sandy
6414.7'	- 6423.3'	Shale, medium to dark gray, coaly, slightly calcareous
6423.3'	- 6425.5'	Sandstone, very fine grained to siltstone, light gray, slightly calcareous, hard & tite, poor porosity.
6425.5'	- 6448.9'	Shale, medium to dark gray, very silty to locally sandy, locally very coaly, horizontal fractures and burrowed.
No core time breaks -- BGG gas units varied from 40 to 280 units.		
Core #6: 6452.4' - 6478.7'		
<u>Recovered 24.7'</u>		
6452.4'	- 6460.2'	Shale, light to dark gray, very silty, locally slightly calcareous locally coaly, some burrows
6460.2'	- 6461.1'	Sandstone, very fine grained, white to light gray, silty, well sorted, poor to fair porosity, locally thin shaly intervals, some clay fill, tite.
6461.1'	- 6470.6'	Shale, light gray, very silty, grading to overlying sandstone, slightly calcareous, burrowed.
6470.6'	- 6477.1'	Sandstone, very fine grained to fine grained, well sorted, light gray fair porosity, fair perm., very little clay fill, slightly calcareous, some horizontal fractures and burrows. Much fine grained at base where tite. (This was best sand in this overall interval) (Also slight gas increase 400 to 480 to 280 in interval).

DEPTH INTERVALCORE DESCRIPTION

Core #7: 6478.7' - 6509.0'

Recovered 31.4'

6478.7'	-	6489.8'	Shale, light to dark gray, silty, locally coaly, slightly calcareous, horizontal fractures, burrowed.
6489.8'	-	6507.9'	Sandstone, very fine grained to fine grained, white to light gray, well sorted, poor to fair porosity and and perm., some clay fill, some very thin dark shale interbeds, cross bedded locally, hair line horizontal fractures.
6507.9'	-	6510.4'	Shale, as above.

Drilling break 6489 - 6505'. 30" down to 12 min. Gas 100 to 140 units, but not significant.

Core #8: 7400' - 7452.6'

Recovered 42.6'

7400.0'	-	7402.9'	Shale, light to dark gray, very coaly, locally silty, locally sandy, horizontal fractures.
7402.9'	-	7404.0'	Sandstone, very fine grained, silty, clayey, locally carbonaceous, tite.
7404.0'	-	7423.4'	Shale, as above.
7423.4'	-	7427.8'	Sandstone, as above.
7427.8'	-	7428.5'	Shale, as above.
7428.5'	-	7432.3'	Sandstone, as above.
7432.3'	-	7442.6'	Shale, as above.

Total, 9' sandstone.

Core #9: 7452.6' - 7495.9'

Recovered 43.3'

7452.6'	-	7469.7'	Shale, coarse, medium to light gray, silty, coaly, locally sandy.
7469.7'	-	7471.4'	Sandstone, white to light gray, very fine grained, silty, coaly, tite.

<u>DEPTH INTERVAL</u>		<u>CORE DESCRIPTION</u>
7471.4'	- 7473.4'	Shale, as above.
7473.4'	- 7477.0'	Sandstone, as above, very shaley, locally coaly.
7477.0'	- 7480.7'	Shale, as above.
7480.7'	- 7483.0'	Sandstone, as above.
7483.0'	- 7495.9'	Shale, as above.
Total 7' sandstone.		
Core #10: 7495.9' - 7555.0'		
<u>Recovered 60.6'</u>		
7495.9'	- 7529.7'	Shale, medium to drak gray, very coaly, silty, locally sandy, few horizontal fractures.
7529.7'	- 7530.7'	Sandstone, very fine grained, light gray, very silty, tite.
7530.7'	- 7556.5'	Shale, as above.
Core #11: 8422' - 8435.4'		
<u>Recovered 14.0'</u>		
8422'	- 8432.4'	Shale, light gray to blakk, very coaly, silty, locally sandy, many horizontal and vertical fractures.
8432.4'	- 8436.0'	Sand, light greay, very fine grain, very silty, horizontal cross bedded, thin shaley streaks.
Core #12: 8435.4' - 8466.0'		
<u>Recovered 31'</u>		
8435.4'	- 8438.0'	Sand, Light to medium gray, very fine grean, silty, shaley, salt & pepper, tight.
8438.0'	- 8439.2'	Shale, medium to dark gray, locally very coaly, silty.

<u>DEPTH INTERVAL</u>		<u>CORE DESCRIPTION</u>
8439.2'	- 8441.6'	Sand, light to medium gray, very fine grain, silty, shaley, salt & pepper, tight, horizontal cross beds.
8441.6'	- 8442.5'	Shale, medium to dark gray, not coally.
8442.5'	- 8448.3'	Sandstone, light to medium gray, very fine grain, silty tight, thin shaley intervals.
8448.3'	- 8463.7'	Shale, medium to dark gray, locally very sandy, not coally, interbedded with thin sand beds.
8463.7'	- 8464.7'	Sandstone, light to medium gray, very fine grain, silty, tight, thin shaley intervals
8464.7'	- 8466.4'	Shale, medium to light gray, locally very sandy, not coally.
Core #13: 8466' - 8507.4'		
<u>Recovered 41.4'</u>		
8466'	- 8467.5'	Shale, light to medium gray, silty, not coally.
8467.5'	- 8469.2'	Sandstone, very fine grain, salt & pepper, well sorted, locally shaley, tight, becoming more shaley at base
8469.2'	- 8485.5'	shaley light to medium gray, silty, interbedded with sand, horizontal fracture, vertical fracture, locally coally.
8485.5'	- 8486.5'	Sandstone, very fine grain, salt & pepper, well sorted, locally shaley, tight, becoming more shaley at base.
8486.5'	- 8491.2'	Shale, light to medium gray, silty, locally thin sandy intervals.
8491.2'	- 8495.7'	Sandstone, very fine grain, salt & pepper, well sorted, locally shaley, tight, becoming more shaley at base.
8495.7'	- 8504'	Coal, very shaley.

<u>DEPTH INTERVAL</u>		<u>CORE DESCRIPTION</u>
8504'	- 8507.4'	Shale, light to medium gray, silty, locally coally.
Core #14: 8507.5' - 8564.7' <u>Recovered 57.3'</u>		
8507.4'	- 8534.2'	Shale, light to medium gray, silty, local coal near top, locally sandy, horizontal, vertical fracture.
8534.2'	- 8538'	Sandstone, very fine grain, salt & pepper, well sorted, locally shaley, tight, becoming more shaley at base.
8538'	- 8548.8'	Shale, light to medium gray, silty, locally coally.
8548.8'	- 8549.6'	Sandstone, very fine grain, salt & pepper, well sorted, locally shaley, tight, becoming more shaley at base.
8549.6'	- 8553.8'	Shale, light to medium gray, silty, local coal.
8553.8'	- 8554.8'	Sandstone, very fine grain, salt & pepper, well sorted, locally shaley, tight, becoming more shaley at base.
8554.8'	- 8564.7'	Shale, light to medium gray, silty, local coal.

CORE SUMMARY

Natural Buttes Unit No. 21

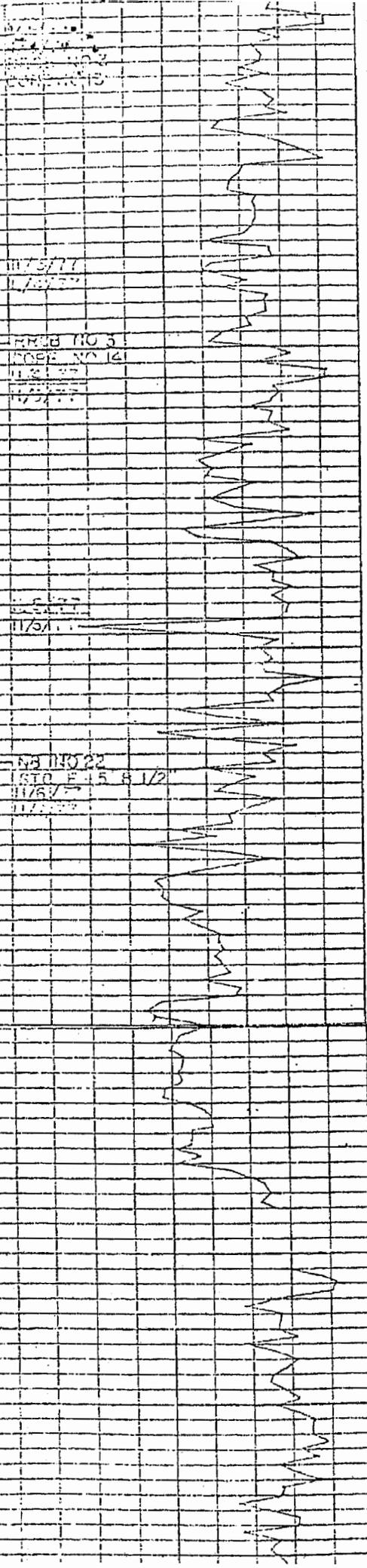
Cut 14 Cores with following recovery;

	<u>RECOVERY</u>			
	<u>Cored</u>	<u>Recovered</u>	<u>Sand</u>	<u>% Sand</u>
Wasatch	118.5	112	47.8	42.7
Mesaverde (Total)	(456.9)	(440.6)	(79.2)	(18.0)
Upper	159.2	150.4	33.1	22.0
Middle	155.0	146.5	17.9	12.2
Castlegate	142.7	143.7	28.2	19.6
Total Core	575.4	552.6	127.0	23.0

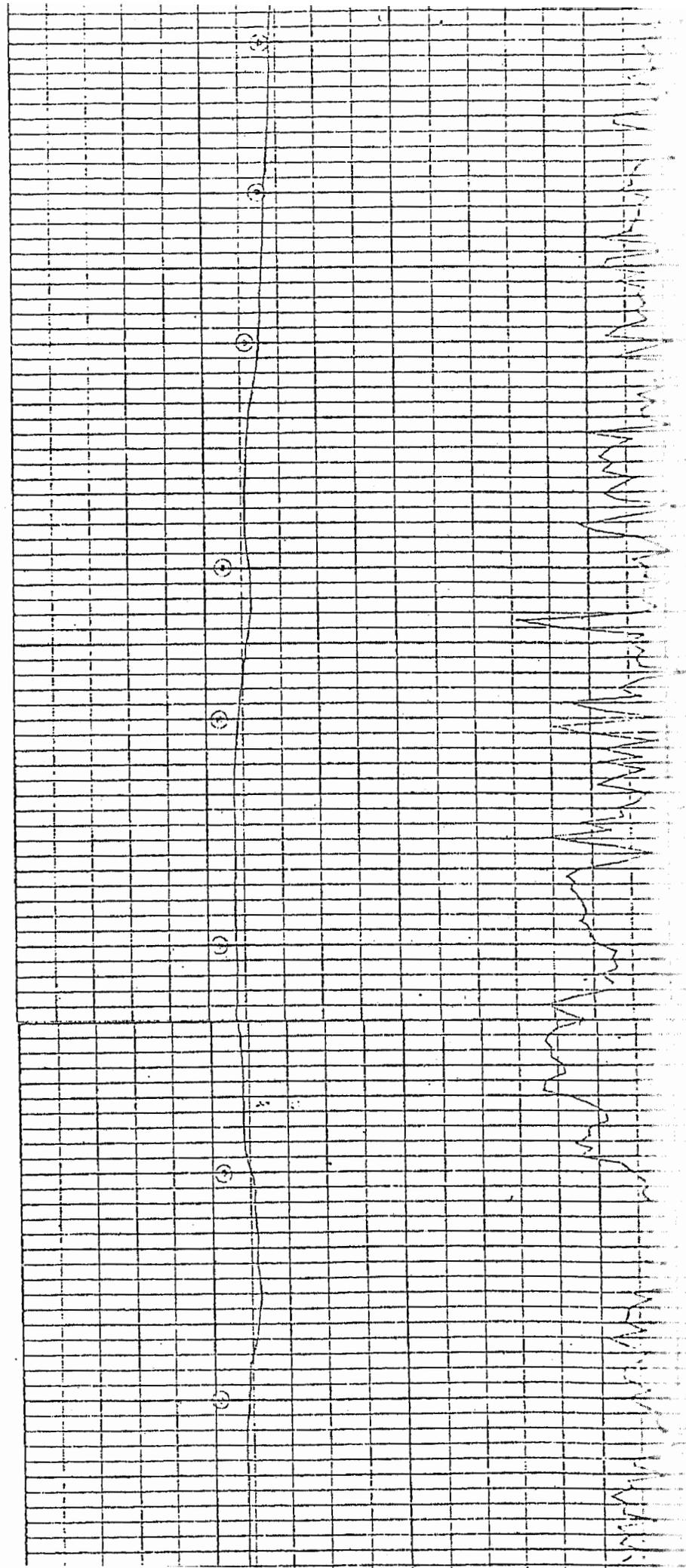
APPENDIX "C"

DAILY MUD LOG REPORTS

NO. 141
DATE 11/27/77
TIME 11:57 AM



80
8500
20
40
60
80
8600
20
40
60



NATURAL BUTTES UNIT NO. 21 MUD LOG

