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BENCH MARK GEOLOGICAL SERVICES

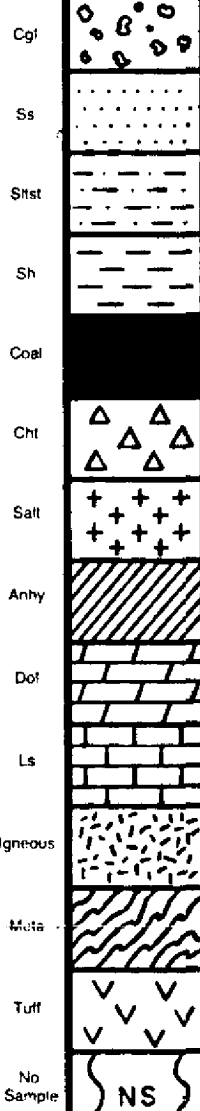
OIL CON. DIV. DIST. 3 HYDROCARBON WELL LOG

ABBREVIATIONS

CO — Circulate Out
CG — Connection Gas
CB — Core Bit
DC — Depth Correction
DS — Directional Survey
DST — Drill Stem Test
DTG — Down Time Gas
FC — Filter Cake
LAT — Logged After Trip
NB — New Bit
NDR — No Data Recorded
NR — No Returns
PP — Pump Pressure
RPM — Rotary Speed
SPM — Pump Strokes
TG — Trip Gas
TGR — Trip Gas Recycle
Vis — Viscosity
WL — Water Loss
WOB — Weight on Bit
Wt — Density Of Drill Fluid

LITHOLOGY MODIFIERS

// — Anhydritic
B — Bentonitic
+ — Calcareous
■ — Carbonaceous Coaly
△ — Dolomitic
F — Fossiliferous
Λ — Glauconitic
◊ — Oolitic
P — Pyritic
Λ — Siliceous



OPERATOR BLACKWOOD AND NICHOLS

WELL NE Blanco Unit 491

FIELD Basin Fruitland Coal

LOCATION sec 25 T1N 37W

CO/STATE Rio Arriba Co., New Mexico

ELEVATION KB 6282 ft. GL 6268 (ungrd)

SPUD DATE

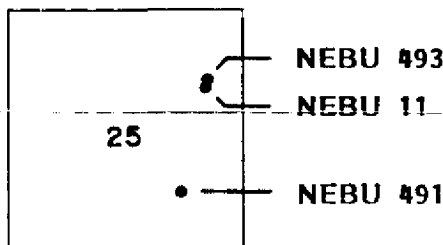
INTERVAL LOGGED 2887 - 3190 ft.

DATE LOGGED 4/24 thru 4/25/90

LOGGING GEOLOGISTS Randy Laney, Mike Mixter

INSTRUMENTATION FID Chromatograph and Total Gas Detector, Infrared CO₂ Detector

WELL LOCATION



LEGEND—GAS CURVES

TOTAL GAS	T
METHANE	1
ETHANE	2
PROPANE	3
ISO & N-BUTANE	4
OIL INDICATOR	$\frac{C_3 + C_4}{C_1}$ 0

HYDROCARBON ANALYSIS

TOTAL GAS			Reported in Units	
10	100	1000	10	100
GAS CHROMATOGRAPHY			Reported in PPM	
100	1000	10000	100	1000
OIL INDICATOR			Dimension Less	
0.01	0.1	1.0	0.01	0.1

7" casing set at 2887 ft.

5 ft. sample interval
Drilling with fresh water

100 units Total Gas = 1% methane
10 100 1000 units
100 1000 10,000 ppm

heavies 100 1000 ppm
CO₂ 1000 10,000 ppm

ONSET OF
FLARED GAS

total — C₁

NC₄ — C₂
C₃

carbon dioxide

NC₄

IC₄

NC₄

NC₄

NC₄

NC₄

NC₄

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NC₄

total 547 units
C₁ 23,660 ppm
C₂ 1,530 ppm
C₃ 720 ppm
IC₄ 63 ppm
NC₄ 126 ppm

CG

CG

total 391 units
C₁ 26,500 ppm
C₂ 1,020 ppm
C₃ 530 ppm

CG

total 344 units
C₁ 17,260 ppm
C₂ 860 ppm

CG

CG

NC₄

C₃

C₂

C₂

C₂

C₂

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Visual

Show

G F P T

Lithology

Interp

Lithology

Descriptions

and Remarks

Ss v lt gy brn, vf gr, sub ang-sub rd, fros, fair srt, v calc cement NS

Coal black, sub blocky -blocky w/ occ conch frac, pred vit, intbd w/ sub vit-res v carb Sh

Sh med-dk brn, sub platy, earthy-sub vit, v carb w/ coaly interbeds, silty in part

Ss gy wh, f-vf gr, well srt, sub rd-sub ang, smpl disagg, fros, v calc cement, NS

Coal black & brn blk, sub platy-blocky, 25% vit material-rest sub vit to resinous, mod carb

Sltst med brn, med-dk gy, sub blocky, firm, peppered w/ carb grs

Coal black & brn blk, sub platy-sub blocky, less vit than above, v carb & occ argillac, mod abnt amber resin fair quality coal

Ss med gy-gy wh, pred vf gr, sub ang, mod srt, smpl disagg, v calc cement, NS

Sltst med brn-dk gy, sub blocky, mod frm, v sli calc, flaked w/ carb material, mod sdy

Coal black, pred sub blocky-v few blocky w/ rr conch frac, 10-20% vit gen as finely striated, mod carb, tr pyr, amber resin, fair quality coal, best of well

Coal gen as, blk, sub blk, pred sub vit w/ little vit material, carb, mod-v abnt amber resin, fair quality

T/ P.C. Tongue 3085' Ss lt gy S&P, pred vf -f gr, sub rd-sub ang, well srt, smpl disagg, sli calc, clear qtz gr carb & glauc grs, tr pale gold flor, NC

Ss gy wh S&P, pred f gr, sub ang-sub rd, mod well srt, more fros qtz than above, sli more calc, carb & glauc grs, NF, NC

Sh med-dk brn, sub platy, earthy-sub resinous, frm, very carb, mod to very silty in part

Sltst med-dk brn, sub blocky, firm, very carb w/ coaly grs

Sh v dk brn, brn blk, sub blocky, resinous-sub vit w/ grainy text v carb-grading to shaley Coal, scattered blk vit coal lenses

T/ Main P.C. 3188' TD sample- Ss gy wh S&P, f gr, sub ang, mod srt, smpl disagg, sli calc, carb & glauc grs, NF, NC