25 April, 2001

Description of NETL Plans for Sampling Gases Around Strata Production Well #4 as Part of Search for Leaks from Underground CO_2 Sequestration Project

This document may be used for requesting the appropriate permits from the Federal Bureau of Land Management and from the State of New Mexico. This document has been prepared for Bruce A. Stubbs, PE, Pecos Petroleum Engineering, Inc., P O Box 2885, Roswell, NM 88202. Herein is a description of the plans to be used by personnel from the USDOE National Energy Technology Center in Pittsburgh, PA in conducting research investigating CO_2 leakage from Strata Production's Well #4 which will serve as a test for a CO_2 sequestration site in collaboration with LANL and Sandia National Lab researchers.

Brief Description of NETL's research plans:

NETL researchers will be trying to determine if leakage of CO_2 is occurring from the geological reservoir which will be flooded with CO_2. During the injection of CO_2 into Well #4 a very small amount of easily detectable tracer compounds will be added to the CO_2. A series of holes at the surface will be drilled. These holes will be in a grid pattern surrounding the well. Sorbent materials will be placed into these shallow holes to absorb gases emanating from the Earth which may include tracer compounds which were added to the CO_2 as it was being injected over a one to two month period into the underground reservoir . The sorbent materials will be shipped to a laboratory for analysis to determine the presence of the tracer compounds and hence the presence of CO_2 leaking through the strata to the surface.

Any questions arising from this research plan should be addressed to one of the following:

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Part I. Layout of the Grid Pattern for Survey Holes.

A number of vertical holes will be bored into the surface of the earth around the wellhead. The holes will be no larger than 2 ½ inches in diameter and no more than 20 feet deep. A temporary casing of PVC plastic tubing will be set in place to keep the holes open during the three to four months during which gas sampling will take place. The wellhead will be the center of a circular grid pattern of holes. Holes of five feet depth will be bored at 50 meters, 100 meters, 150 meters, and 300 meters from the wellhead in each of the four major compass directions varying slightly if necessary to avoid roadways or obstacles. Holes of five feet depth will be bored at 150 meters from the wellhead at

#2

the NE, NW, SE, and SW compass directions. Four holes of twenty feet depth will be bored at 50 meters, 100 meters, 150 meters, and 300 meters from the wellhead in only one of the four major compass directions. In summary then, there will be 20 holes bored 5 feet deep and 4 holes bored 20 feet deep. The holes will be no larger than 2 ½ inches in diameter with PVC set in place to keep them from collapsing.

Part II. Material Safety Data Sheets for tracer chemicals

As the CO_2 is being pumped into the depleted oil reservoir at well #4 several chemical tracer compounds will be added to the CO_2 . These tracers will be searched for in subsequent analyses to indicate the possible leakage of CO_2 from the geologic strata. The chemical tracers will be perfluorocarbon compounds used in previous similar fluid tracking projects by researchers from Brookhaven National Laboratories and others. The chemical compounds are stable, inert, and non-toxic. The total volume of tracer chemicals to be used in this project will not exceed five liters. The following chemicals may be injected into Well #4 along with CO_2 to serve as tracer compounds:

Perfluorodimethylcyclobutane
Perfluoromethycyclopentane
Perfluoromethylcyclohexane
Perfluoro-1,2-dimethylcyclohexane
Perfluoro-1,3-dimethylcyclohexane
Perfluoro-1,4-dimethylcyclohexane
Perfluoroethylcyclohexane
Perfluoro-1,3,5-trimethylcyclohexane

The material safety data sheets for these chemicals are attached to this document.

Part III. Rehabilitation Plan

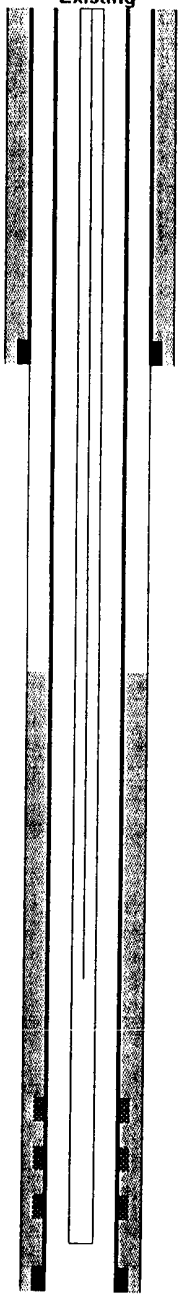
To restore the environment to its previous state before any of the research discussed above begins will require that all test bore holes, which as described above may be five feet deep or 20 feet deep, be filled back in with earth as completely as possible. The PVC tubing will be removed from the bore holes at the completion of the project and removed from the site. This will facilitate the collapse of the sidewalls of the holes, and earth will be tamped by hand back into the holes to fill them up as best possible. No vegetation will be significantly disrupted. No litter will be left on the site.

Part IV. Timing

NETL's portion of the sequestration project will coincide with the larger portion of the project being conducted by LANL and Sandia researchers. The approximate schedule will be to begin injecting CO_2, along with the chemical tracers, into Well #4 approximately September 1, 2001. The test holes as described above must therefore be in place before that date as gas sampling for leaks will commence when the injection begins. Gas sampling at the bore holes will continue for approximately two months and through the "soak" period of approximately one month. Most of the gas sampling will be

finished and the holes filled back in by January 1, 2002. A few, four at most, of the holes will remain open and available for gas sampling until April 1, 2002 when all gas sampling research should be completed and the bore holes filled back in completely unless it is found that some further useful information could be gathered from those gas sampling holes, in which case a formal request to extend the permitting period will be made by NETL researchers.

Existing



Stivason Federal #4
Strata Production Company
660 FSL & 760' FEL
Section 28, T19S-R34E
Lea County, New Mexico
Spud date: 6/13/89
API No.: 30-025-30629

12 1/4" Hole

8 5/8" 23 #/FT. @ 1330'
Cement w/ 450 sx. Lite & 200 sx. Premium
Circulated

TOC @ +/- 2600'

7 7/8" Hole

4508-4531'

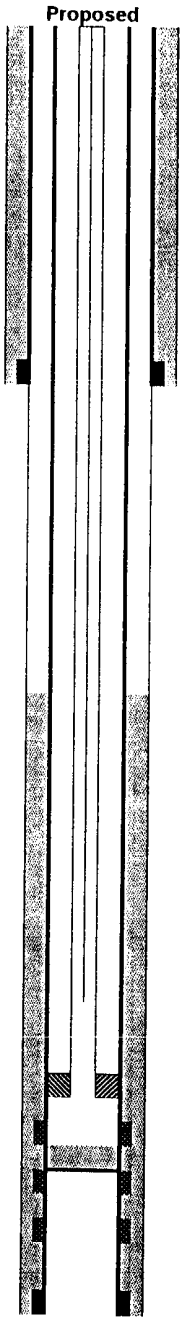
4668-4669'

4804-4805' & 4851-4861'

5 1/2"-15.5 #/ft. @ 5125'
Cement w/ 550 sx Premium Plus

#3

Proposed



8 5/8" 23 #/FT. @ 1330'
Cement w/ 450 sx. Lite & 200 sx. Premium
Circulated

TOC @ +/- 2600'

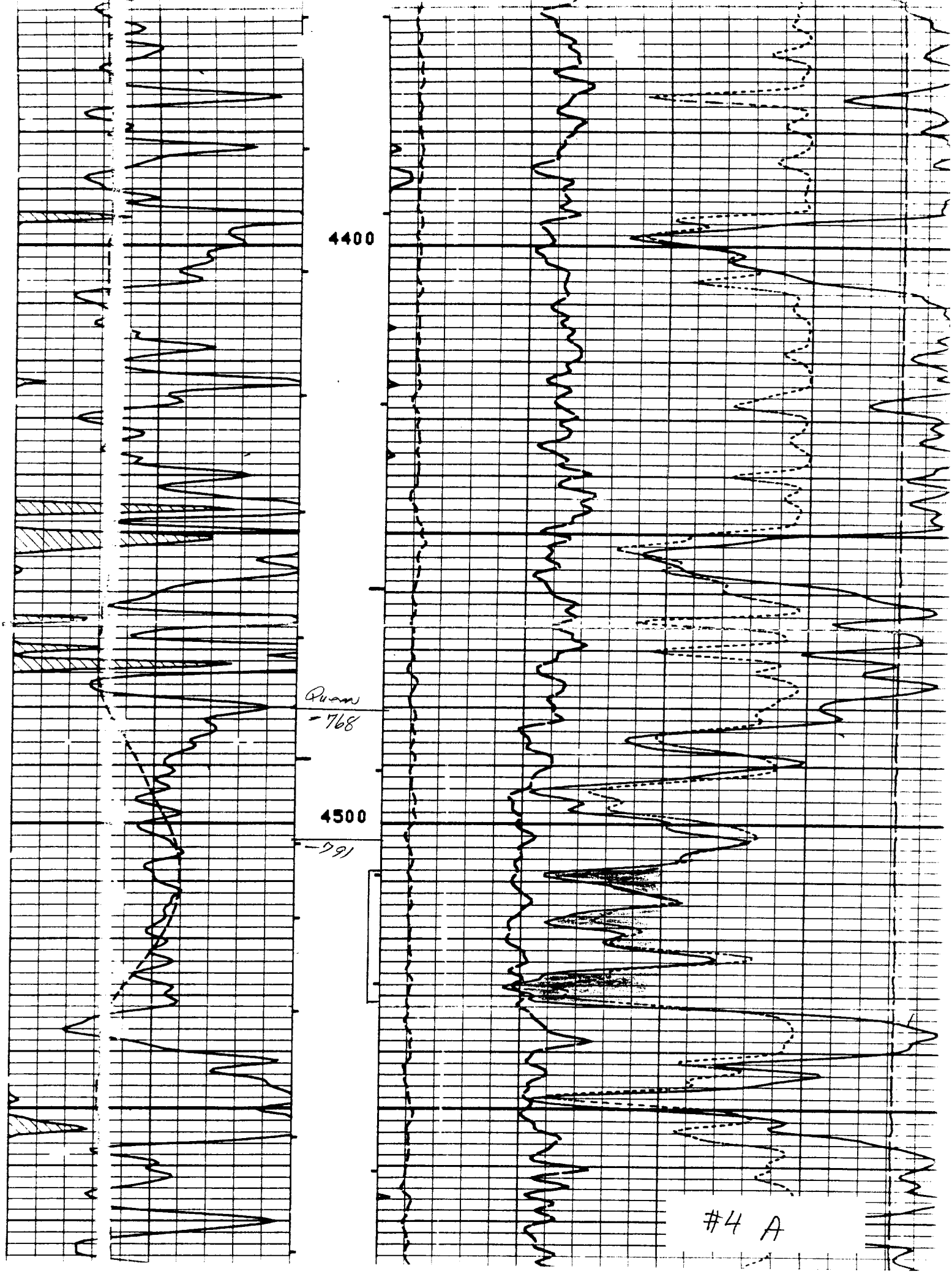
2 3/8"-4.7 #/FT. Plastic Coated Tubing

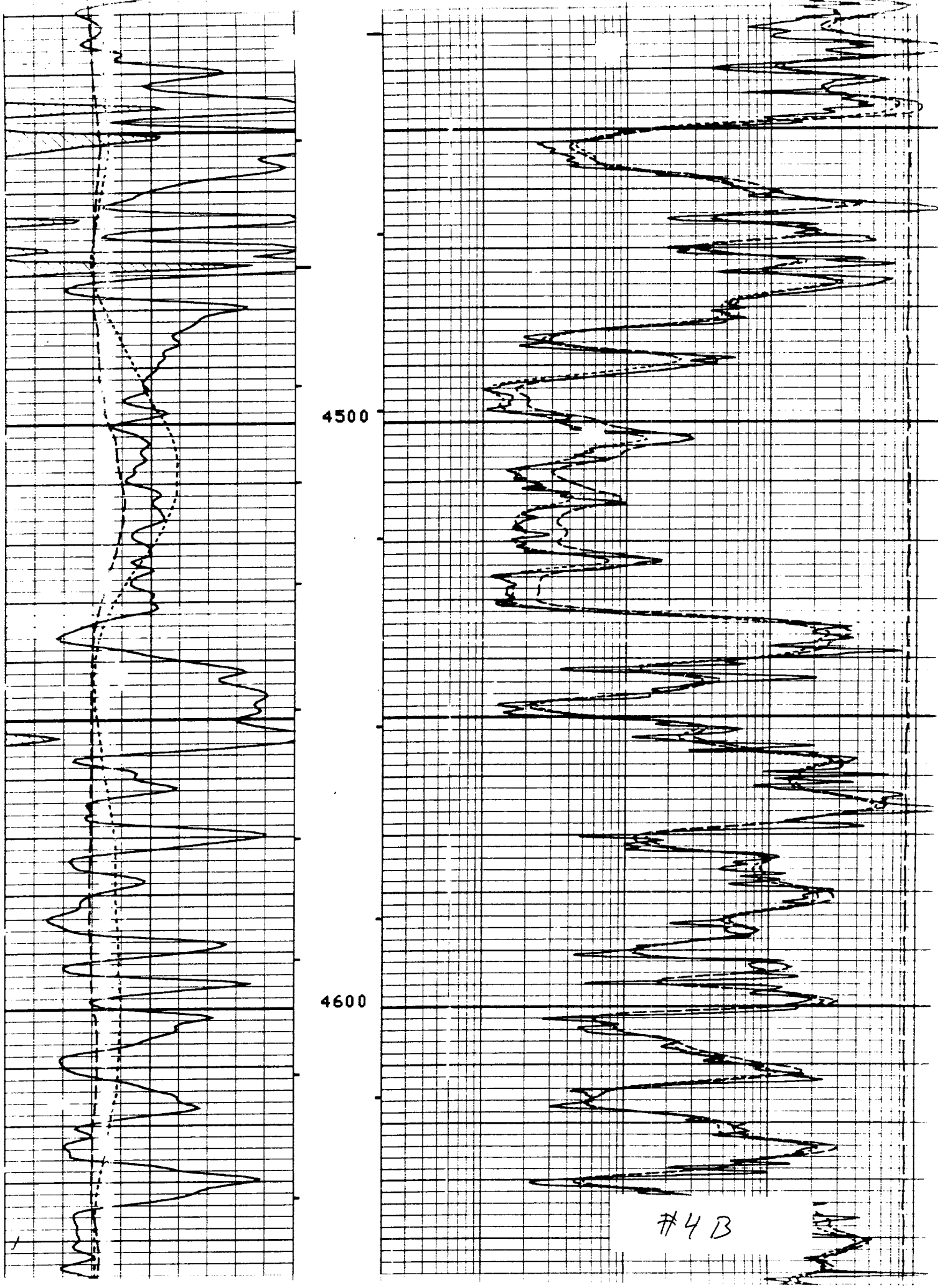
Plastic Coated Baker Model "R" Packer @ 4460'

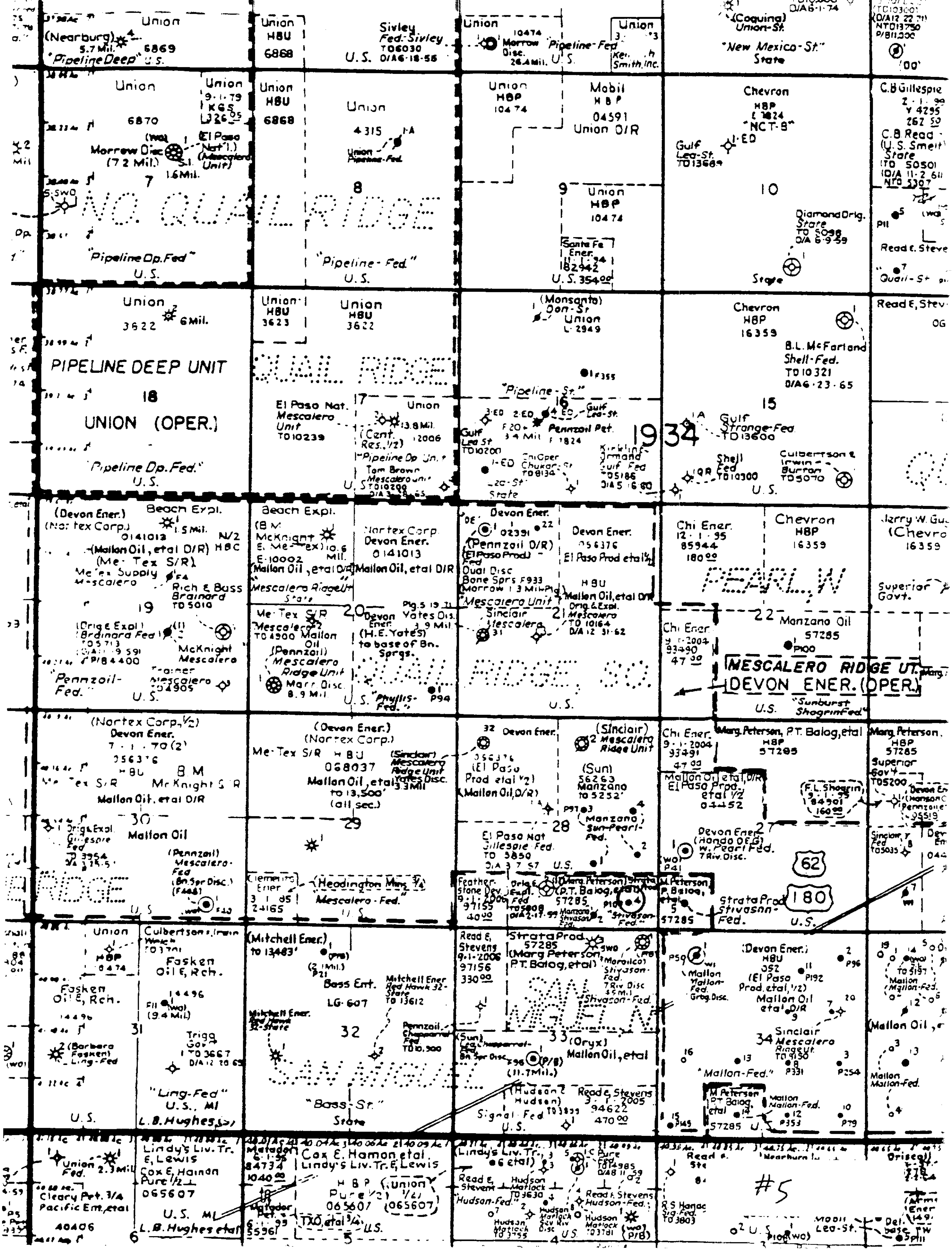
4508-4531'
CIBP @ 4650 w/ 20' of cement on top
4668-4669'

4804-4805' & 4851-4861'

5 1/2"-15.5 #/ft. @ 5125'
Cement w/ 550 sx Premium Plus


4400
Quan
-768
4500
-791
#4 A


4500
4600
#4B



Union
(Nearburg)
5.7 Mil.
6869
"Pipeline Deep" U.S.
Union HBU 6868
Sivley Fed.-Sivley TO6030 D/A6-18-56
U.S.
Union
10474
Morrow Disc.
26.4 Mil.
"Pipeline-Fed."
U.S.
Union
Kenneth Smith, Inc.
(Coquina) Union-St.
"New Mexico-St."
State
Union 6870
Union 9-1-79 KGS
Morrow Disc. (7.2 Mil.)
El Paso Nat'l. (Mescalero Unit)
1.6 Mil.
7
Union HBU 6868
Union 4315
Union Pipeline-Fed.
8
NO. QUAIL RIDGE
"Pipeline Dp. Fed."
U.S.
"Pipeline-Fed."
U.S.
Union HBP 10474
Mobil HBP 04591 Union O/R
9
Union HBP 10474
Santa Fe Ener. 11-1-94 182942
U.S. 354.00
Chevron HBP "NCT-B"
Gulf Lea-St. TO13689
10
Diamond Drlg. State TO 5098 D/A 6-9-59
State
C.B. Gillespie
C.B. Read (U.S. Smelt) State
Read & Steve
Quail-St.
Union 3622 6 Mil.
Union HBU 3623
Union HBU 3622
PIPELINE DEEP UNIT
18
UNION (OPER.)
"Pipeline Dp. Fed."
U.S.
QUAIL RIDGE
El Paso Nat. Mescalero Unit TO10239
17
Union
13.8 Mil.
(Cent. Res. 1/2)
12006
Pipeline Dp. Unit
Tom Brown Mescalero Unit TO10200
U.S.
(Monsanto) Don-St.
Union L-2949
"Pipeline-St."
16
Gulf Lea-St.
Pennzoil Pet.
Gulf Lea St. TO10200
Kirkling Ormand Gulf Fed. 05186
State
1934
Chevron HBP 16359
B.L. McFarland Shell-Fed. TO10321 D/A6-23-65
15
Gulf Strange-Fed. TD13600
Shell Fed. TO10300
Culbertson & Irwin Burton TO5070
U.S.
Read & Stev
(Devon Ener.)
(Nortex Corp.)
0141013
Beach Expl.
1.5 Mil.
N/2 HBC
(Mallon Oil, etal O/R)
(Me-Tex S/R)
Me-Tex Supply Mescalero
Rich & Bass Brainard TO5010
19
(Drlg. & Expl.) Brainard Fed.
McKnight Mescalero
"Pennzoil-Fed."
Trainer Mescalero
U.S.
Beach Expl.
(B.M. McKnight)
E-10002
Nortex Corp. Devon Ener. 0141013
(Mallon Oil, etal O/R)
Mallon Oil, etal O/R
Mescalero Ridge Unit State
20
Me-Tex S/R
Mescalero
TO4900
Mallon Oil
(Pennzoil)
Mescalero Ridge Unit
Marr Disc. 8.9 Mil.
Devon Ener.
Yates Dis. 3.9 Mil.
(H.E. Yates) to base of Bn. Sprgs.
"Phyllis-Fed."
U.S.
Devon Ener.
(Pennzoil O/R)
(El Paso Prod.) Fed.
Quail Disc. Bone Sprs. F933
Morrow 1.3 Mil.
"Mescalero Unit"
Sinclair Mescalero
21
Devon Ener.
El Paso Prod. etal 1/2
HBU
Mallon Oil, etal O/R
Mescalero TO10164 D/A 12-31-62
QUAIL RIDGE, SO.
U.S.
Chi Ener. 12-1-95 85944 180.00
Chevron HBP 16359
PEARL, W.
22
Manzano Oil 57285
Chi Ener. 9-1-2004 93490 47.00
MESCALERO RIDGE UT.
DEVON ENER. (OPER.)
U.S.
"Sunburst Shogrin Fed."
Jerry W. Gu
(Chevro
16359
Superior Govt.
(Nortex Corp. 1/2)
Devon Ener.
7-1-70 (2)
B.M. McKnight S/R
Me-Tex S/R
Mallon Oil, etal O/R
30
Mallon Oil
Drlg. & Expl. Gillespie Fed.
(Pennzoil) Mescalero-Fed. (Bn. Spr. Disc.)
U.S.
(Devon Ener.)
(Nortex Corp.)
Me-Tex S/R
HBU
068037
Mallon Oil, etal to 13,500' (all sec.)
(Sinclair) Mescalero Ridge Unit
Yates Disc. 3.3 Mil.
29
Clements Ener.
(Headington Min. 3/4)
Mescalero-Fed.
U.S.
Devon Ener.
(El Paso Prod. etal 1/2)
(Mallon Oil, O/R)
(Sinclair) Mescalero Ridge Unit
(Sun) 56263 Manzano to 5252'
28
Manzano Sun-Pearl-Fed.
El Paso Nat. Gillespie Fed. TO 5850
U.S.
Featherstone Dev. 9-1-2006 97155 40.00
(Marg. Peterson) (P.T. Balog, etal)
57285
"Shivason-Fed."
Chi Ener. 9-1-2004 93491 47.00
Marg. Peterson, P.T. Balog, etal
HBP 57285
Mallon Oil, etal O/R
El Paso Prod. etal 1/2 04452
(F.L. Shogrin)
27
Devon Ener. (Hondo O.E.G.) W. Pearl Fed. 7 Riv. Disc.
62
180
Strata Prod. Shivason-Fed.
U.S.
Marg. Peterson HBP 57285
Superior Govt. TO5200
Union HBP
Culbertson & Irwin
Fasken Oil & Rch.
Fasken Oil & Rch.
(9.4 Mil.)
31
(Barbara Fasken) Ling-Fed.
Trigg Govt. TO3667
"Ling-Fed."
U.S., MI
L.B. Hughes (S)
U.S.
(Mitchell Ener.) to 13483'
Bass Ent.
LG-607
Mitchell Ener. Red Hawk 32-State TO13612
Mitchell Ener. Red Hawk 32-State
32
Pennzoil Chaparral Fed. TO10,500
"Bass-St."
State
SAN MIGUEL
Read & Stevens 9-1-2006 97156 330.00
Strata Prod. 57285 (Marg. Peterson, P.T. Balog, etal)
Shivason-Fed. 7 Riv. Disc.
Shivason-Fed.
(Sun) Chaparral-Fed.
33
(Oryx) Mallon Oil, etal
(11.7 Mil.)
(Hudson & Hudson)
Read & Stevens 3-1-2005 94622 470.00
Signal-Fed.
U.S.
(Devon Ener.) HBU
(El Paso Prod. etal 1/2)
Mallon Oil etal O/R
Mallon Mallon-Fed. Grbg. Disc.
34
Sinclair Mescalero Ridge Ut.
"Mallon-Fed."
M. Peterson P.T. Balog, etal 57285
Mallon Mallon-Fed.
U.S.
Mallon Oil
Mallon Mallon-Fed.
Union Fed. 2.3 Mil.
Cleary Pet. 3/4
Pacific Em. etal
40406
U.S. MI
Lindy's Liv. Tr. & Lewis
Cox & Hamon
Pure 1/2
065607
L.B. Hughes etal
6
Matador
84734
Cox & Hamon etal
Lindy's Liv. Tr. & Lewis
HBP
Pure 1/2
065607
(Union 1/2) (065607)
TXO, etal 3/4
U.S.
5
Lindy's Liv. Tr.
Read & Stevens
Hudson Matlock
"Hudson-Fed."
Read & Stevens Hudson-Fed.
Hudson Matlock
U.S.
4
Read & Stevens
#5
R.S. Hanks St.-Fed.
Mobil Lea-St.
U.S.
Oriscoll