PMLX 5/27/97
188

915 688 5200

April 30, 1997

State of New Mexico
Energy, Minerals and Natural Resources Department
Oil Conservation Division
2040 South Pacheco
Santa Fe, New Mexico 88505

Attention: Mr. Bill Lemay

RE: Request for Administrative Approval for Conversion to Injection of Empire Abo Unit Well C-48

Gentlemen:

Please find attached our Application for Authorization to Inject in the Empire Abo Unit Well C-48. We respectively request Administrative Approval. Included in our attachment are copies of the Proof of Notice and an Affidavit of Publication and the actual legal notice. Arco Permian is the only Abo operator within 1/2 mile of the proposed injection well.

Our maximum injection pressure request is based on the 0.2 psi per foot statewide yardstick.

Please call me at 915-688-5359 with any questions.

Sincerely,

Gary B Smallwood

Gary B. Smallwood
Sr. Engineer

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION
POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501

FORM C-108
Revised 7-1-81

APPLICATION FOR AUTHORIZATION TO INJECT

I. Purpose: ☐ Secondary Recovery ☒ Pressure Maintenance ☐ Disposal ☐ Storage
Application qualifies for administrative approval? ☒ yes ☐ no

II. Operator: ARCO Permian

Address: 600 N. Marienfeld Midland, TX 79702

Contact party: Gary B. Smallwood Phone: 915/688-5359

III. Well data: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary.

IV. Is this an expansion of an existing project? ☒ yes ☐ no
If yes, give the Division order number authorizing the project R-4549 As amended thru "H".

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review.

* VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
2. Whether the system is open or closed;
3. Proposed average and maximum injection pressure;
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.).

*VIII. Attach appropriate geological data on the injection zone including appropriate lithologic detail, geological name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such source known to be immediately underlying the injection interval.

IX. Describe the proposed stimulation program, if any.

* X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division they need not be resubmitted.)

* XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground source of drinking water.

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form.

XIV. Certification

I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

Name: Gary B. Smallwood Title Sr. Engineer

Signature: Gary B Smallwood Date: 4/17/97

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be duplicated and resubmitted. Please show the date and circumstance of the earlier submittal.

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate Division district office.

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; location by Section, Township, and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) the intended purpose of the injection well; with the exact location of single wells or the section, township, and range location of multiple wells;

(3) the formation name and depth with expected maximum injection rates and pressures; and

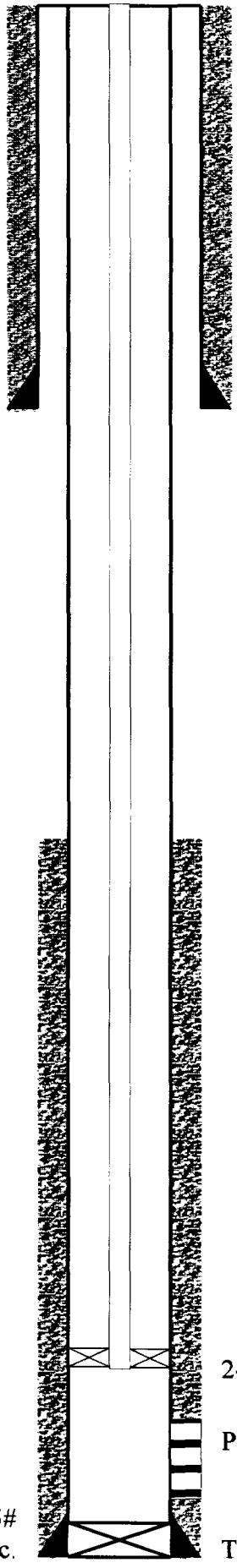
(4) a notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, P. O. Box 2088, Santa Fe, New Mexico 87501 within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

WELLBORE SCHEMATIC

INJECTION WELL DIAGRAM



Empire Abo Unit C-48

1980' FSL & 990 FEL (I)
Sec. 30, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-03192
Spudded 10/18/61
Completed 11/14/61

KB: 3642' **GL: 3631'**

Surface Casing 8 5/8" 24#
Cmt'd w/ 375 sx, Circ.

Shoe @ 765'

2-3/8" IPC tbg w/Baker Lok-Set Pkr. @ 6200'

Perfs @ 6250'-6340'

Production Casing 5-1/2" 14# & 15.5#
Cement w/425 sx, TOC @ 3367' calc.
Shoe @ 6360'

TD @ 6360' PBTD @ 6343'

DLK 04-04-97

INJECTION WELL DATA SHEET

ARCO Permian		Empire Abo Unit		
OPERATOR		LEASE		
C-48	1980 FSL & 990 FEL	30	17-S	29E
WELL NO.	FOOTAGE LOCATION	SECTION	TOWNSHIP	RANGE

Schematic

Tabular Data

Surface Casing

Size 8 5/8 " Cemented with 450 sx.

TOC Surface feet determined by circulated

Hole size 11

Intermediate Casing

Size _____ " Cemented with _____ sx.

TOC _____ feet determined by _____

Hole size _____

Long string

Size 5 1/2 " Cemented with 450 sx.

TOC 3190 feet determined by calculated

Hole size 7 7/8

Total depth 6379

Injection interval

6250 feet to 6340 feet perf.
(perforated or open-hole, indicate which)

Tubing size 2 3/8 lined with IPC set in a
(material)

Baker Lok Set packer at 6200 feet
(brand and model)

(or describe any other casing-tubing seal).

Other Data

1. Name of the injection formation Abo

2. Name of Field or Pool (if applicable) Empire Abo

3. Is this a new well drilled for injection? ☐ Yes ☒ No

   If no, for what purpose was the well originally drilled? Oil production

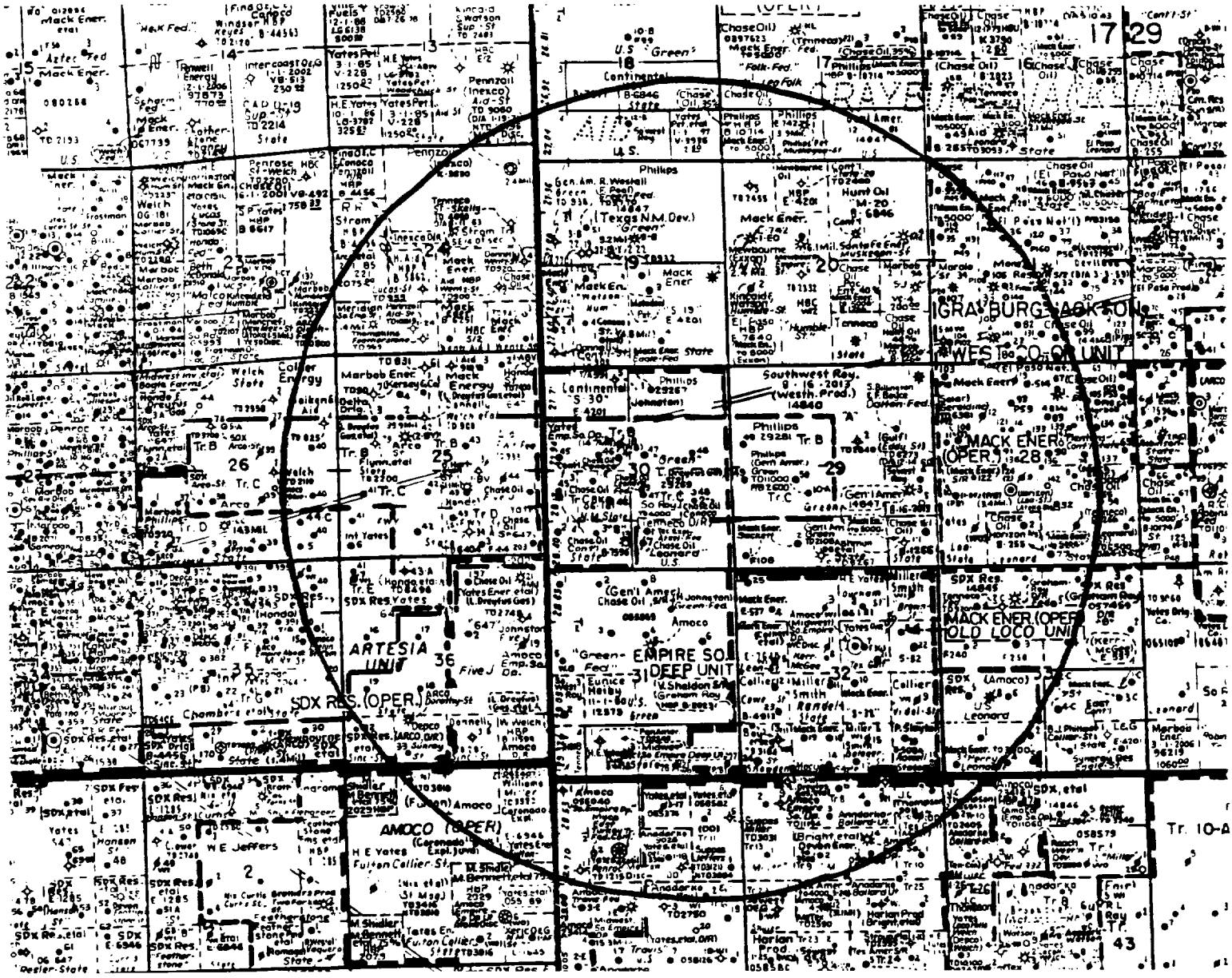
4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail (sacks of cement or bridge plug(s) used) No

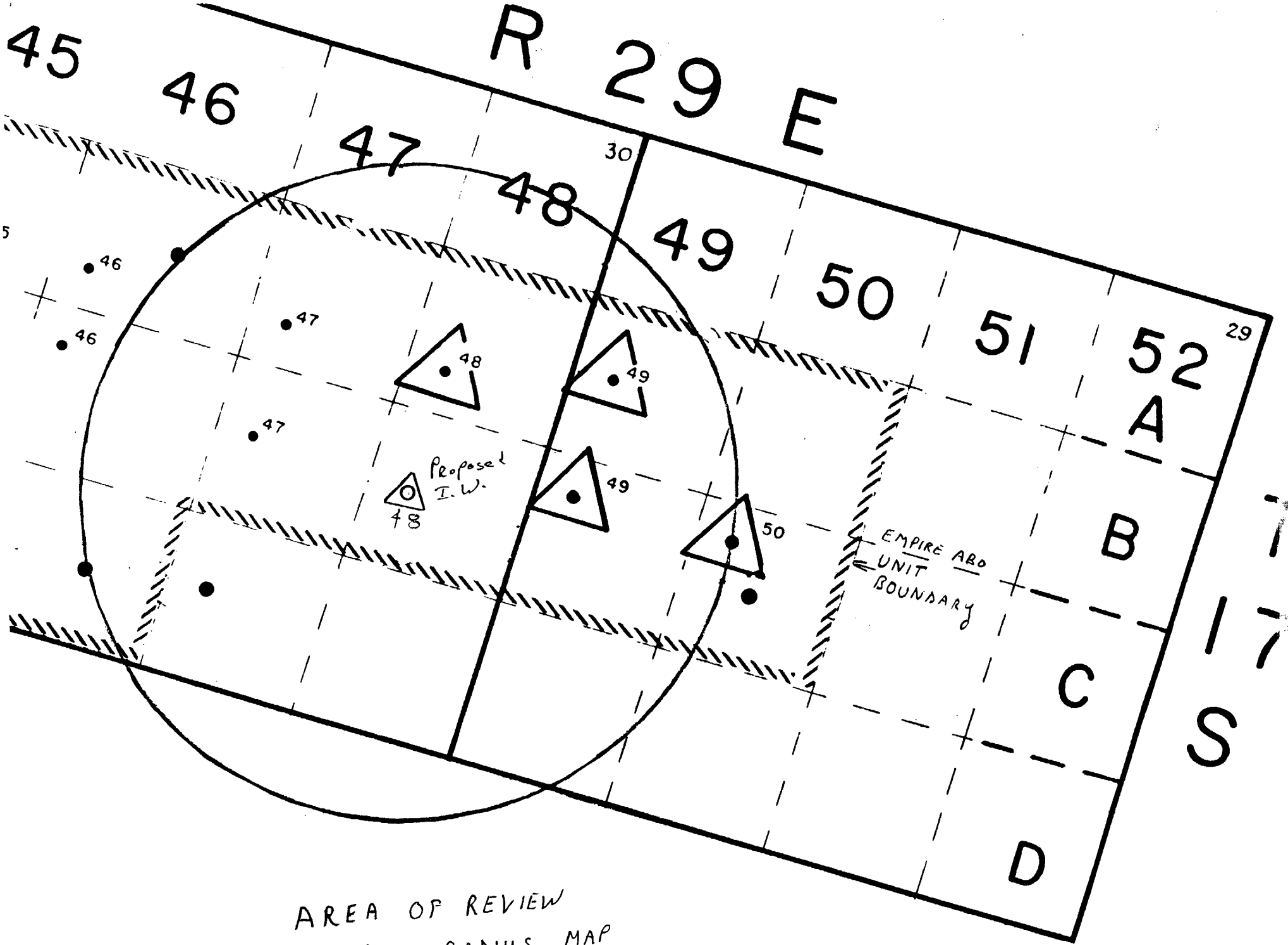
5. Give the depth to and name of any overlying and/or underlying oil or gas zones (pools) in this area.

   Queen 1650 San Andres 2360 Wolfcamp 7300

   Morrow 10300

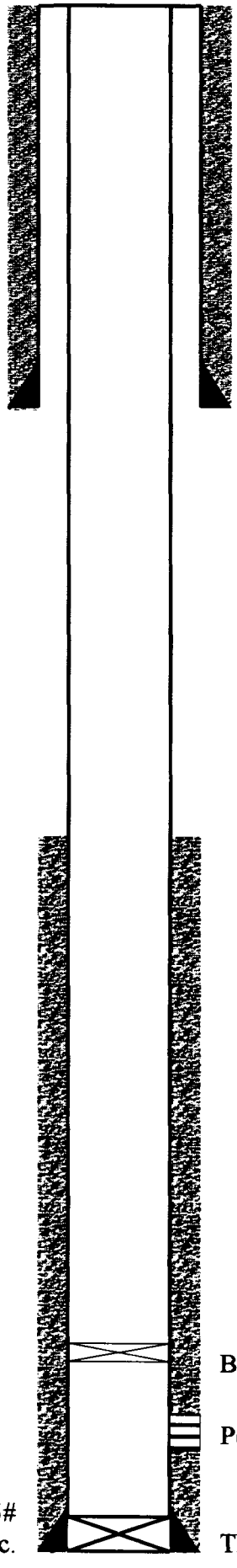
2 MILE RADIUS MAP
FOR
EAU C-48





AREA OF REVIEW
1/2 MILE RADIUS MAP

WELLBORE SCHEMATIC



Empire Abo Unit C-48

1980' FSL & 990 FEL (I)
Sec. 30, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-03192
Spudded 10/18/61
Completed 11/14/61

KB: 3642' **GL: 3631'**

Surface Casing 8 5/8" 24#
Cmt'd w/ 375 sx, Circ.

Shoe @ 765'

Baker CIBP @ 5995'

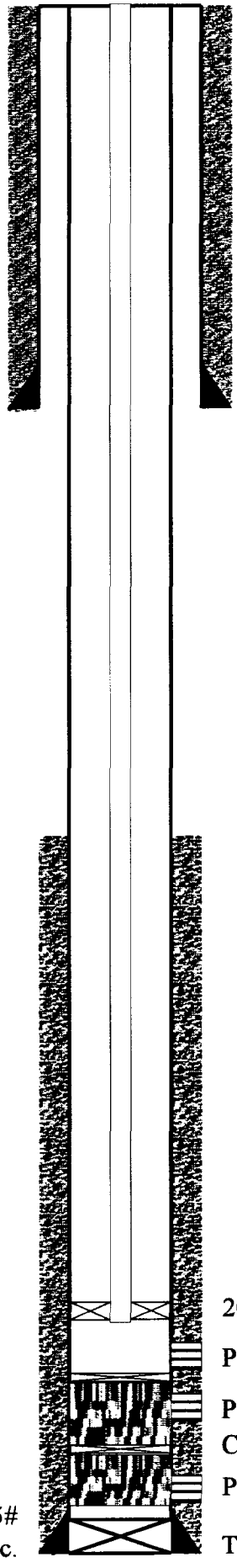
Perfs @ 6256'-66' (2 spf - open)

Production Casing 5-1/2" 14# & 15.5#
Cement w/425 sx, TOC @ 3367' calc.
Shoe @ 6360'

TD @ 6360' PBTD @ 6343'

DLR 03-21-97

WELLBORE SCHEMATIC



Empire Abo Unit C-47

2150' FSL & 2310' FEL (J)
Sec. 30, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-03193
Spudded 09/30/61
Completed 10/16/61

KB: 3657' **GL: 3646'**

Surface Casing 8 5/8" 24#
Cmt'd w/450 sx, Circ.
Shoe @ 760'

200 jts 2-7/8" J-55, TAC @ 6150', SN @ 6153'

Perfs @ 6167'-69', 6175'-77' (2 spf - open)

Perf @ 6244'-45' sqz'd w/150 sx, Ret @ 6234'
Cmt Ret. @ 6255' sqz'd 200 sx cmt

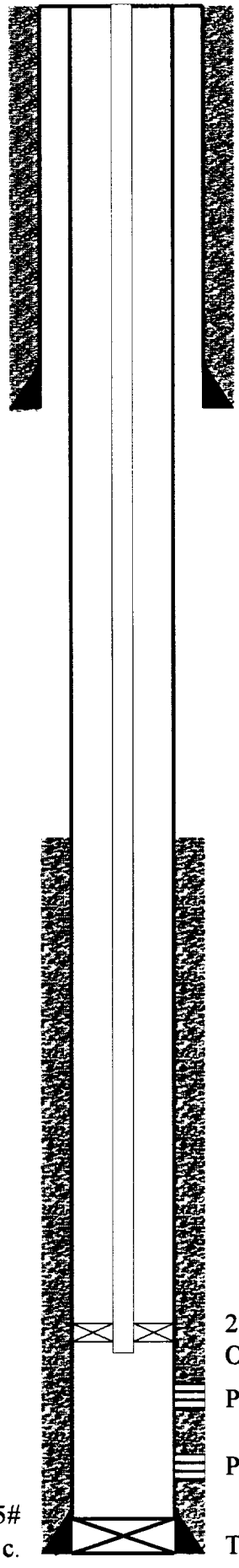
Perfs @ 6270'-6280' (2 spf - open)

Production Casing 5-1/2" 14# & 15.5#
Cement w/450 sx, TOC @ 3190' calc.
Shoe @ 6359'

TD @ 6379' PBTD @ 6217'

DLK 03-21-97

WELLBORE SCHEMATIC



Empire Abo Unit C-49

2310' FSL & 330' FWL (L)
Sec. 29, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-03185
Spudded 01/14/62
Completed 01/27/62

KB: 3641' **GL: 3631'**

Surface Casing 8 5/8" 28#
Cmt'd w/225 sx, Circ.
Shoe @ 778'

201 jts 2-7/8" J-55 IPC tbg EOT @ 6229'
Otis J-Latch Pkr @ 6226'

Perfs @ 6247'-57' (4 spf - open)

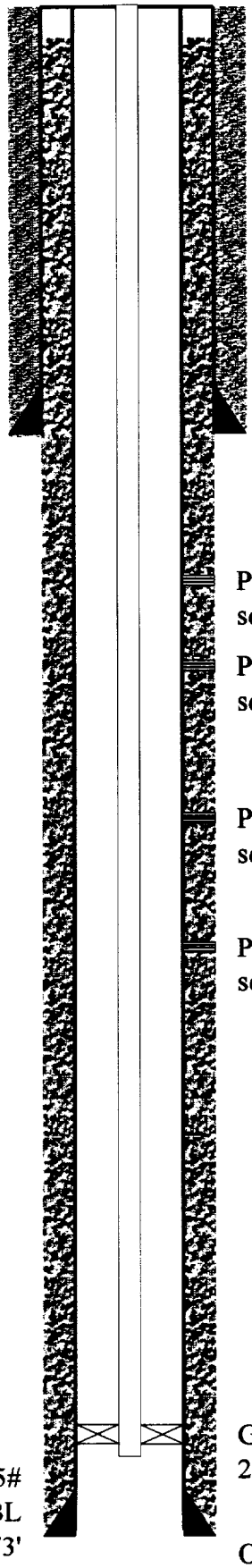
Perfs @ 6272'-82' (1 spf - open)

Production Casing 5-1/2" 14# & 15.5#
Cement w/570 sx, TOC @ 2280' calc.
Shoe @ 6294'

TD @ 6294' PBTD @ 6290'

DLK 03-21-97

WELLBORE SCHEMATIC



Empire Abo Unit C-50

2310' FSL & 1650' FWL (K)
Sec. 29, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-03184
Spudded 02/19/62
Completed 03/09/62

KB: 3620' **GL: 3610'**

Surface Casing 8 5/8" 28#
Cmt'd w/225 sx, Circ.
Shoe @ 760'

Perf 4 holes @ 2290'
sqz'd 500 sx cmt to 300' by TS

Perf 4 holes @ 3130'
sqz'd 750 sx cmt to 2294' by TS

Perf 4 holes @ 3480'
sqz'd 700 sx cmt to 3140' by TS

Perf 4 holes @ 4890'
sqz'd 700 sx cmt to 3490' by TS

Guiberson KV-30 Pkr @ 6184'
200 jts 2-3/8" J-55 tbg @ 6188'

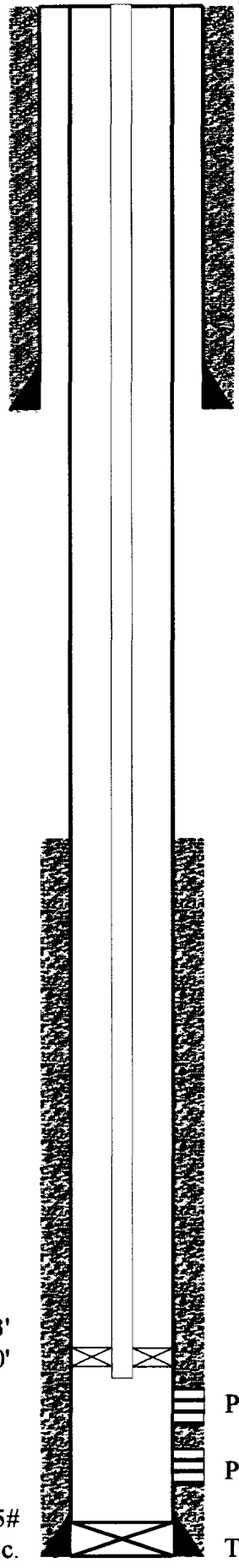
Production Casing 5-1/2" 15.5#
Cement w/160 sx, TOC @ 4890' CBL
Shoe @ 6273'

Open Hole @ 6273'-6289'

TD @ 6289' PBTD @ 6273'

DLK 03-31-97

WELLBORE SCHEMATIC



Empire Abo Unit B-47

2310' FNL & 3210' FEL (G)
Sec. 30, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-03197
Spudded 01/01/68
Completed 06/08/68

KB: 3653' **GL: 3643'**

Surface Casing 8 5/8" 28#
Cmt'd w/ 250 sx, Circ.

Shoe @ 800'

193 jts. 2-7/8" J-55 tbg @ 6233'
TAC @ 6100'

Perfs @ 6165'-6221' (2 spf - open)

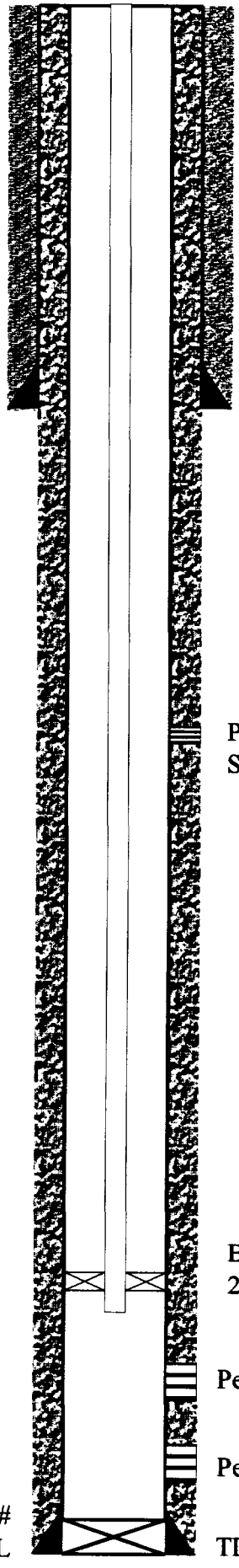
Perfs @ 6272'-6286' (2 spf - open)

Production Casing 5-1/2" 14# & 15.5#
Cement w/566 sx, TOC @ 2327' calc.
Shoe @ 6313'

TD @ 6313' PBTD @ 6299'

DLK 03-21-97

WELLBORE SCHEMATIC



Empire Abo Unit B-48

2310' FNL & 990' FEL (H)
Sec. 30, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-03195
Spudded 12/08/61
Completed 12/23/61

KB: 3643' **GL: 3633'**

Surface Casing 8 5/8" 28#
Cmt'd w/ 225 sx, Circ.

Perf 4 shots @ 1608'-10'
Sqz'd 600 sx cmt to surface

Baker Lok-Set Pkr @ 6115'
203 jts. 2-7/8" IPC tbg. @ 6157'

Perfs @ 6183'-88' & 6206'-13' (2 spf - open)

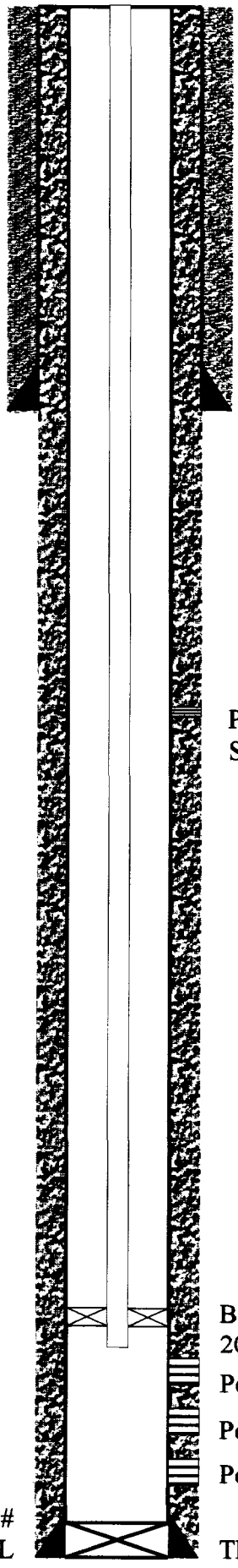
Perfs @ 6265'-6277' (4 spf - open)

Production Casing 5-1/2" 15.5#
Cement w/566 sx, TOC @ 2000' by CBL
Shoe @ 6306'

TD @ 6306' PBTD @ 6295'

DLK 03-21-97

WELLBORE SCHEMATIC



Empire Abo Unit B-49

1980' FNL & 330' FWL (E)
Sec. 29, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-03180
Spudded 02/01/62
Completed 02/16/62

KB: 3630' **GL: 3620'**

Surface Casing 8 5/8" 24#
Cmt'd w/ 225 sx, Circ.

Shoe @ 786'

Perf 4 holes @ 1980'
Sqz'd 700 sx cmt, circ. to surface

Baker Lok-Set Pkr @ 6157'
203 jts. 2-3/8" IPC tbg. @ 6157'

Perfs @ 6224'-6242' (2 spf - open)

Perfs @ 6256'-6266' (4 holes - open)

Perfs @ 6282'-6292' (2 spf - open)

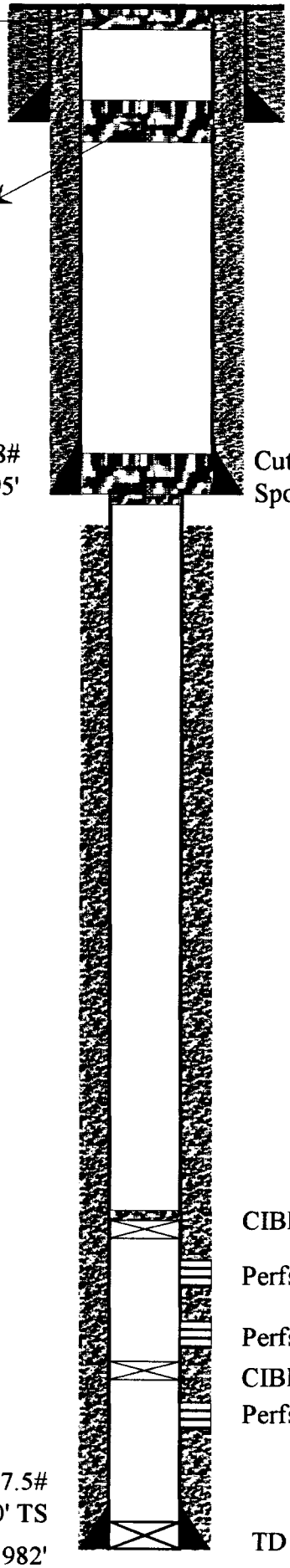
Production Casing 5-1/2" 14# & 15.5#
Cement w/570 sx, TOC @ 2000' CBL

Shoe @ 6300'

TD @ 6398' PBTD @ 6295'

DLK 03-21-97

WELLBORE SCHEMATIC



Spot 100' cmt plug @ surface

Surface Casing 12-3/4" 34#
Cmt'd w/475 sx, Circ., Shoe @ 400'

Spot cmt plug 375' to 475'

Empire South Deep Unit #07

760' FSL & 2310' FEL (O)
Sec. 30, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-21545
Spudded 05/26/75
Completed 10/02/75

KB: 3618' **GL: 3637'**

Surface Casing 8 5/8" 24# & 28#
Cmt'd w/950 sx, Circ., Shoe @ 2895'

Cut 5-1/2" csg @ 2890'
Spot cmt plug 2944' to tag @ 2730'

CIBP @ 7810' w/35' cmt, Tag TOC @ 7775'

Perfs @ 7863'-78' (2 spf - open)

Perfs @ 8812'-30' (2 spf - open)

CIBP @ 9170'

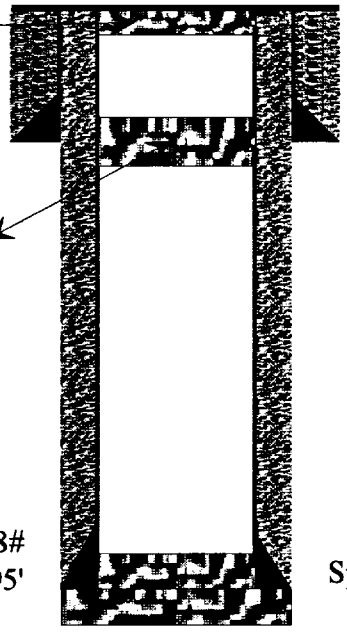
Perfs @ 9220'-9389' (2 spf - open)

Production Casing 5-1/2" 15# & 17.5#
Cement w/2220 sx, TOC @ 3230' TS
Shoe @ 10,982'

TD @ 10,982' PBTD @ 8695'

DLK 03-31-97

WELLBORE SCHEMATIC



Spot 10' cmt plug @ surface

Surface Casing 12-3/4" 34#
Cmt'd w/475 sx, Circ., Shoe @ 400'

Spot cmt plug 350' to 450'

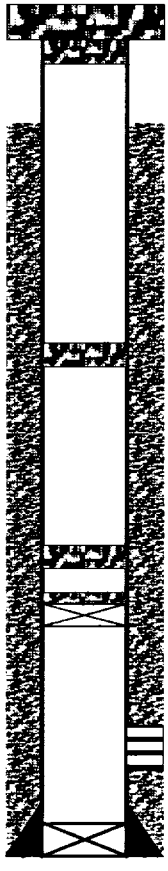
Surface Casing 8 5/8" 24# & 28#
Cmt'd w/950 sx, Circ., Shoe @ 2895'

Empire South Deep Unit #18

1980' FNL & 1980' FWL (F)
Sec. 30, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-22400
Spudded 04/08/78
Completed 06/22/78

GL: 3643.4'

Spot cmt plug 2850' to 2955'



Cut 5-1/2" csg @ 3630'
Spot cmt plug 3680' to tag @ 3551'

100' cmt plug 5900'-6000'

100' cmt plug 7200'-7300'

CIBP @ 7785' w/35' cmt

Perfs @ 10,722'-758' (2 spf - open)

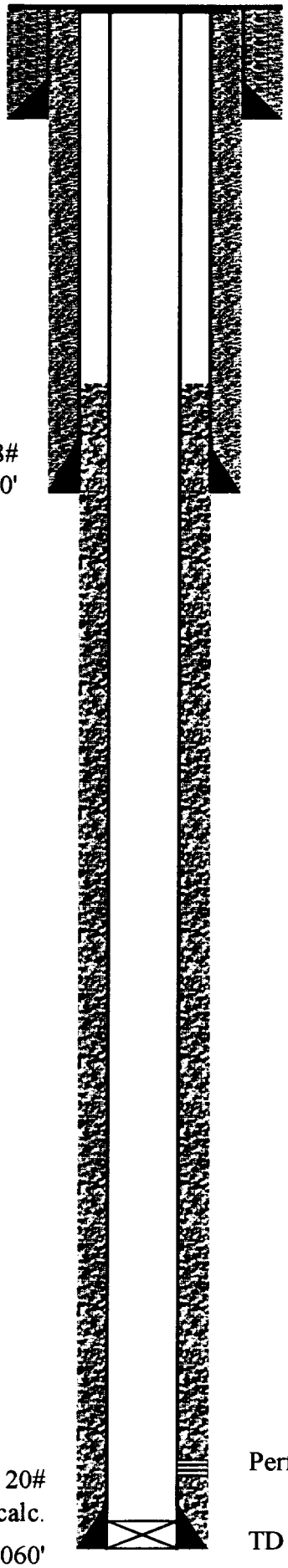
Production Casing 5-1/2" 14# & 15.5#
Cement w/1525 sx, TOC @ 4010' TS

Shoe @ 11,010'

TD @ 11,010' PBTD @ 10,968'

DLK 03-31-97

WELLBORE SCHEMATIC



Empire South Deep Unit #13

660' FSL & 1980' FWL (N)
Sec. 30, T-17-S, R-29-E,
Eddy County, NM
API: 30-015-22000
Spudded 01/31/77
Completed 04/07/77

GL: 3646'

Surface Casing 12-3/4" 34#
Cmt'd w/250 sx, Circ., Shoe @ 327'

Surface Casing 8 5/8" 24# & 28#
Cmt'd w/1200 sx, Circ., Shoe @ 2900'

Production Casing 5-1/2" 17# & 20#
Cement w/1200 sx, TOC @ 2609' calc.
Shoe @ 11,060'

Perfs @ 10,665'-677' (4 spf - open)

TD @ 11,060' PBTD @ 6XXX'

DLK 03-31-97

C-108

Part VII

1. The proposed average and maximum daily injection rate is 5000 BWPD.
2. The system is closed.
3. The proposed average and maximum injection pressure is 1240 psig.
4. The source is produced water.
5. The zone of injection produces within one mile of the proposed injection well.

FORM C-108
PART VIII
GEOLOGICAL DATA

The Empire Abo Field produces from a transgressive, carbonate, barrier reef buildup of lower Leonardian (Permian) age. This reef is one of several in a long trend flanking the northern edge of the Delaware Basin. The reef grew from southwest to northeast. It is approximately 12.5 miles long and 1.5 miles wide. Parallel to the reef trend, the reef dips 1 degree from southwest to northeast. Perpendicular to this trend the reef dips sharply at 10 to 20 degrees from crest to fore-reef, or north to south. The average depth of the reef is 5800 feet and the average thickness is 300 feet.

The trapping mechanism at Empire Abo is both stratigraphic and structural. The reef dips below the oil water contact to the south and east. Permeability pinch outs to the north and west occur as a result of carbonate muds, green shales and anhydrite inclusions.

Porosity development is erratic and cannot be correlated between wells. Development is the result of leaching of abundant detrital fossil fragments, dolomitization and recrystallization. The most prolific porosity development is found in the reef core. There is no apparent intercrystalline porosity.

Vertical fracturing, which contributes to the gravity drainage mechanism of the reservoir, is apparently due to local slumping as well as large scale setting and some tectonic activity. Fracture orientation is generally 0 to 45 degrees from vertical and is parallel to the reef trend. These fractures apparently link up the erratic porosity development and provide excellent communication in the reservoir.

There are no known fresh water aquifers overlying the proposed zone or immediately underlying the injection interval.

Part IX
Proposed Stimulation

It is proposed to selectively perforate the Abo Reef from approximately 6250' to 6340' and open this interval by acidizing with as much as 10,000 gals. of 15% Hcl acid. Depending on the injectivity of the well, fracture treatments may be used to further stimulate the formation.

Part X
Logging Data

Well logs were filed upon initial completion.

Part XI
Fresh Water Analysis

There are no known fresh water wells within one mile of the proposed injection well.

Part XII
Disposal Wells

Not applicable. Application is not for a disposal well.

Proof of Notice

SENDER: Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.
1. ☐ Show to whom delivered, date, and addressee's address. *(Extra charge)* 2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:	4. Article Number
Bogle Farms, Ltd. P.O. Box 460 Dexter, NM 88230	P 080 147 503 Type of Service: ☐ Registered ☐ Insured ☑ Certified ☐ COD ☐ Express Mail ☑ Return Receipt for Merchandise Always obtain signature of addressee or agent and DATE DELIVERED.
5. Signature – Addressee X Mary Torres	8. Addressee's Address *(ONLY if requested and fee paid)*
6. Signature – Agent X Mary Torres	
7. Date of Delivery 4-18-97	

PS Form **3811**, Apr. 1989 EAU C-48 *U.S.G.P.O. 1989-238-815 **DOMESTIC RETURN RECEIPT**

Return to G. Smallwood - 23 MIO
P 080 147 503

Receipt for Certified Mail
No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

EAU C-48

Sent to Bogle Farms, Ltd.	
Street and No. P.O. Box 460	
P.O., State and ZIP Code Dexter, NM 88230	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$3.21
Postmark or Date 4-17-97	

PS Form **3800**, June 1991

Affidavit of Publication

No. 15828

STATE OF NEW MEXICO,

County of Eddy:

Gary D. Scott being duly sworn, says: That he is the Publisher of The Artesia Daily Press, a daily newspaper of general circulation, published in English at Artesia, said county and state, and that the hereto attached Legal Notice

was published in a regular and entire issue of the said Artesia Daily Press, a daily newspaper duly qualified for that purpose within the meaning of Chapter 167 of the 1937 Session Laws of days" the state of New Mexico for 2 consecutive weeks on the same day as follows:

First Publication April 25, 1997

Second Publication April 27, 1997

Third Publication

Fourth Publication

Gary D. Scott

Subscribed and sworn to before me this 28th day of April 19 97

Barbara Ann Bass

Notary Public, Eddy County, New Mexico

My Commission expires September 23, 1999

Copy of Publication

LEGAL NOTICE

ARCO Permian proposes to convert Empire Abo Unit well C-48 to water injection. The well is located 1980' FSL and 990' FEL of section 3-17S-29E in Eddy Co., New Mexico. The zone of injection is the Abo at 6250'. The maximum expected injection rate and pressure is 5000 BWPD and 1240 psig. respectively. For information contact:
Gary B. Smallwood
ARCO Permian
PO Box 1610
Midland, TX 79702
phone: 915-688-5359
Interested parties must file any objections or requests for hearing with the:
Oil Conservation Division
PO Box 2088
Santa Fe, New Mexico 87501
Filings must be made within 15 days.
Published in the Artesia Daily Press, Artesia, N.M. April 25, 27, 1997.

Legal 15828