



STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION



BRUCE KING
GOVERNOR

ANITA LOCKWOOD
CABINET SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEX. CO. 87504
(505) 827-5800

ADMINISTRATIVE ORDER DHC-931

Meridian Oil Company
P.O. Box 4289
Farmington, NM 87499-4289

Attention: Arden L. Walker, Jr.

RECEIVED
OCT 6 1993
OIL CON. DIV.
DIST. 3

*Rhodes "C" Well No. 100
Unit A, Section 30, Township 28 North, Range 11 West, NMPM,
San Juan County, New Mexico.
Basin Fruitland Coal and West Kutz Pictured Cliffs Pools*

Dear Mr. Walker:

Reference is made to your recent application for an exception to Rule 303-A of the Division Rules and Regulations to permit the subject well to commingle production from both pools in the wellbore.

It appearing that the subject well qualifies for approval for such exception pursuant to the provisions of Rule 303-C, and that reservoir damage or waste will not result from such downhole commingling, and correlative rights will not be violated thereby, you are hereby authorized to commingle the production as described above and any Division Order which authorized the dual completion and required separation of the two zones is hereby placed in abeyance.

In accordance with the provisions of Rule 303-C-4., total commingled oil production from the subject well shall not exceed 20 barrels per day, and total water production shall not exceed 40 barrels per day. The maximum amount of gas which may be produced daily from the well shall be determined by Division Rules and Regulations or by the gas allowable for each respective prorated pool as printed in the Division's San Juan Basin Gas Proration Schedule.

Assignment of allowable to the well and allocation of production from the well shall be in accordance with the allocation formula shown on Exhibit "A", attached hereto and made a part hereof. Any condensate production will be allocated entirely to the West Kutz Pictured Cliffs interval.

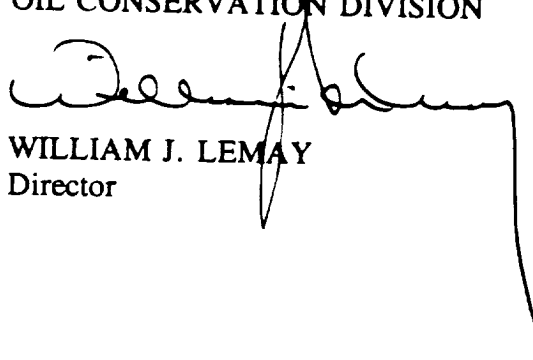
The operator is responsible for reporting the monthly gas production from the subject well to the Division utilizing the allocation formula adopted herein. An annual report shall be submitted by the operator to both the Aztec and Santa Fe offices of the Division showing the complete computations for the previous twelve-month period.

FURTHER: The operator shall notify the Aztec District Office of the Division upon implementation of the commingling process.

Pursuant to Rule 303-C-5, the commingling authority granted by the order may be rescinded by the Division Director if, in his opinion, conservation is not being best served by such commingling.

Approved at Santa Fe, New Mexico on this 27th day of September, 1993.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


WILLIAM J. LEMAY
Director

S E A L

WJL/BES/amg

cc: Oil Conservation Division - Aztec
U.S. Bureau of Land Management - Farmington

RHODES C #100

MONTHLY GAS PRODUCTION ALLOCATION FORMULA

GENERAL EQUATION

$$Q_t = Q_{ftc} + Q_{pc}$$

WHERE: Q_t = TOTAL MONTHLY PRODUCTION (MCF/MONTH)
 Q_{ftc} = FRUITLAND COAL (ftc) MONTHLY PRODUCTION
 Q_{pc} = PICTURED CLIFFS (pc) MONTHLY PRODUCTION (MCF/MONTH)

REARRANGING THE EQUATION TO SOLVE FOR Q_{ftc} :

$$Q_{ftc} = Q_t - Q_{pc}$$

ANY PRODUCTION RATE OVER WHAT IS CALCULATED FOR THE PICTURED CLIFFS (PC) USING THE APPLIED FORMULA IS FRUITLAND COAL (FTC) PRODUCTION.

PICTURED CLIFFS (PC) FORMATION PRODUCTION FORMULA IS:

$$Q_{pc} = Q_{pci} \times e^{-\{D_{pc} \times (t)\}}$$

WHERE: Q_{pci} = INITIAL PC MONTHLY FLOW RATE (CALCULATED FROM FLOW TEST)
 D_{pc} = PICTURED CLIFFS MONTHLY DECLINE RATE CALCULATED FROM:
 $D_{pc} = (Q_{pci} - Q_{pcabd}) / N_{p(pc)}$
 See Determination of Q_{pci} and PC Estimated Ultimate Recovery ($N_{p(pc)}$)
 $Q_{pcabd} = 300 \text{ MCF/M}$

WHERE: $N_{p(pc)}$ = PICTURED CLIFFS ESTIMATED ULTIMATE RECOVERY (EUR)
 $N_{p(pc)} = P \times 1.06 \text{ MMCF/PSI}^{**} \times R_f$
 P^* = INITIAL RESERVOIR PRESSURE (SIBHP)
 R_f = RECOVERY (FIELD ANALOGY): = 0.85
 ** DETERMINED FROM MATERIAL BALANCE (FIELD ANALOGY) AND VOLUMETRIC RESERVES (LOG ANALYSIS)

By calculating $N_{p(pc)}$ from SIBHP and determining Q_{pci} , D_{pc} can then be calculated utilizing the previously described parameters. See derivation of D_{pc} , item (c) on page 4.

THUS: $Q_{ftc} = Q_t - Q_{pci} \times e^{-\{D_{pc} \times (t)\}}$
 WHERE: (t) IS IN MONTHS

REFERENCE: Thompson, R. S., and Wright, J. D., "Oil Property Evaluation", pages 5-2, 5-3, 5-4.



STATE OF NEW MEXICO
ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
AZTEC DISTRICT OFFICE

1000 RIO BRAZOS ROAD
AZTEC, NEW MEXICO 87410
(505) 334-6178

Date: 9-8-93

ATTN: BEN STONE

Oil Conservation Division
P.O. Box 2088
Santa Fe, NM 87504-2088

RE: Proposed MC _____
Proposed NSL _____
Proposed WFX _____
Proposed NSP _____

Proposed DHC X _____
Proposed SWD _____
Proposed PMX _____
Proposed DD _____

Gentlemen:

I have examined the application received on 7-26-93
for the MERIDIAN OIL INC. RHODES C#100
OPERATOR LEASE & WELL NO.

A-50-28N-100 and my recommendations are as follows:
UL-S-T-R

Approve

Yours truly,

Eric Bush

MERIDIAN OIL

August 19, 1993

New Mexico Oil Conservation Division
Attn: Mr. Bill LeMay
P. O. Box 2088
310 Old Santa Fe Trail
Santa Fe, New Mexico 87501



RE: Rhodes C #100
Unit A, Section 30, T28N, R11W
San Juan County, New Mexico
Downhole Commingling Request

Dear Mr. LeMay:

Meridian Oil Inc. is applying for an administrative downhole commingling order for the referenced well in the West Kutz Pictured Cliffs and the Basin Fruitland Coal fields. The ownership of the zones to be commingled is common. The offset operators to this well are BHP Petroleum, R & G Drilling Company, Inc., and M & G Drilling Company. The Bureau of Land Management and the above mentioned operators have received notification of this downhole commingle.

The Fruitland Coal and Pictured Cliffs wells producing in this area operated by Meridian and others are marginally productive. Based on offset production in this area, drilling of separate wells and dual completions to produce the Fruitland Coal and Pictured Cliffs are not economically justified. The only economical way to recover the Fruitland Coal and Pictured Cliffs reserves in this drill block is to downhole commingle production from both zones in this well.

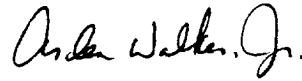
It is proposed to complete the Pictured Cliffs formation and establish production. It is then proposed to set a bridge plug above the Pictured Cliffs, perforate and stimulate the Fruitland Coal, and test its production. The bridge plug will then be removed, and both zones produced through a single string of tubing. The reservoir characteristics of each of the subject zones are such that underground waste will not be caused by the proposed commingling. Neither producing interval makes oil, and only minimal amounts of similar water are produced in the offset wells. The shut-in pressures for the Pictured Cliffs and Fruitland Coal are 405 and 320 psi, respectively.

The allocation of the commingled production will be calculated using the attached allocation formula. This formula is based on offset Pictured Cliffs production performance (material balance) and volumetrics, and uses accepted Reservoir Engineering methods to allocate the Pictured Cliffs reserves. This addresses the Fruitland Coal producing characteristics of early life inclining production rates.

New Mexico Oil Conservation Division
Mr. Bill LeMay
Rhodes C #100
Downhole Commingling Request
Page Two

Approval of this commingling application will allow for the prevention of wasted resources and protection of correlative rights. The offset (Rhodes #101, SW/4 Sec. 30, T28N, R11W, has already received administrative approval NMOCD Order #R-9920). Included with this letter are plats showing ownership of offsetting leases for both the Pictured Cliffs and Fruitland Coal, a copy of letters to the BLM and offset operators, wellbore diagrams, pertinent data sheet, and an allocation formula.

Sincerely,



Arden L. Walker, Jr.
Regional Production Engineer



KAS:tg
Attachments

cc: Frank T. Chavez - NMOCD/Aztec

Pertinent Data Sheet - Rhodes C #100

Location: 805' FNL, 1055' FEL, Section 30, T28N, R11W, San Juan County, New Mexico

Field: Basin Fruitland Coal/West Kutz Pictured Cliffs **Elevation:** 5892' GL

TD: 2026'
PBTD: 1992'

GWI: 100.00%

NRI: 82.50%

DP #: 36957A PC

DP #: 36957B FTC

Completed: N/A

Casing Record:

<u>Hole Size</u>	<u>Csg Size</u>	<u>Wt. & Grade</u>	<u>Depth Set</u>	<u>Cement</u>	<u>Top/Cement</u>
12 1/4"	8 5/8"	24.0# K-55	222'	160 sxs	Surface/Circ
7 7/8"	4 1/2"	10.5# K-55	2026'	553 sxs	Surface/Circ

Lead: 453 sxs Class B 65/35 POZ w/ 2% CaCl₂, 6% gel, 5 lb/sxs Gilsonite, 1/4 lb/sx Flocele (811 cf).
Tail: 100 sxs Class B Neat w/ 2% CaCl₂ (118 cf).

Tubing Record: N/A

Formation Tops:

Ojo Alamo:	624'
Kirtland:	695'
Fruitland:	1495'
Pictured Cliffs:	1760'

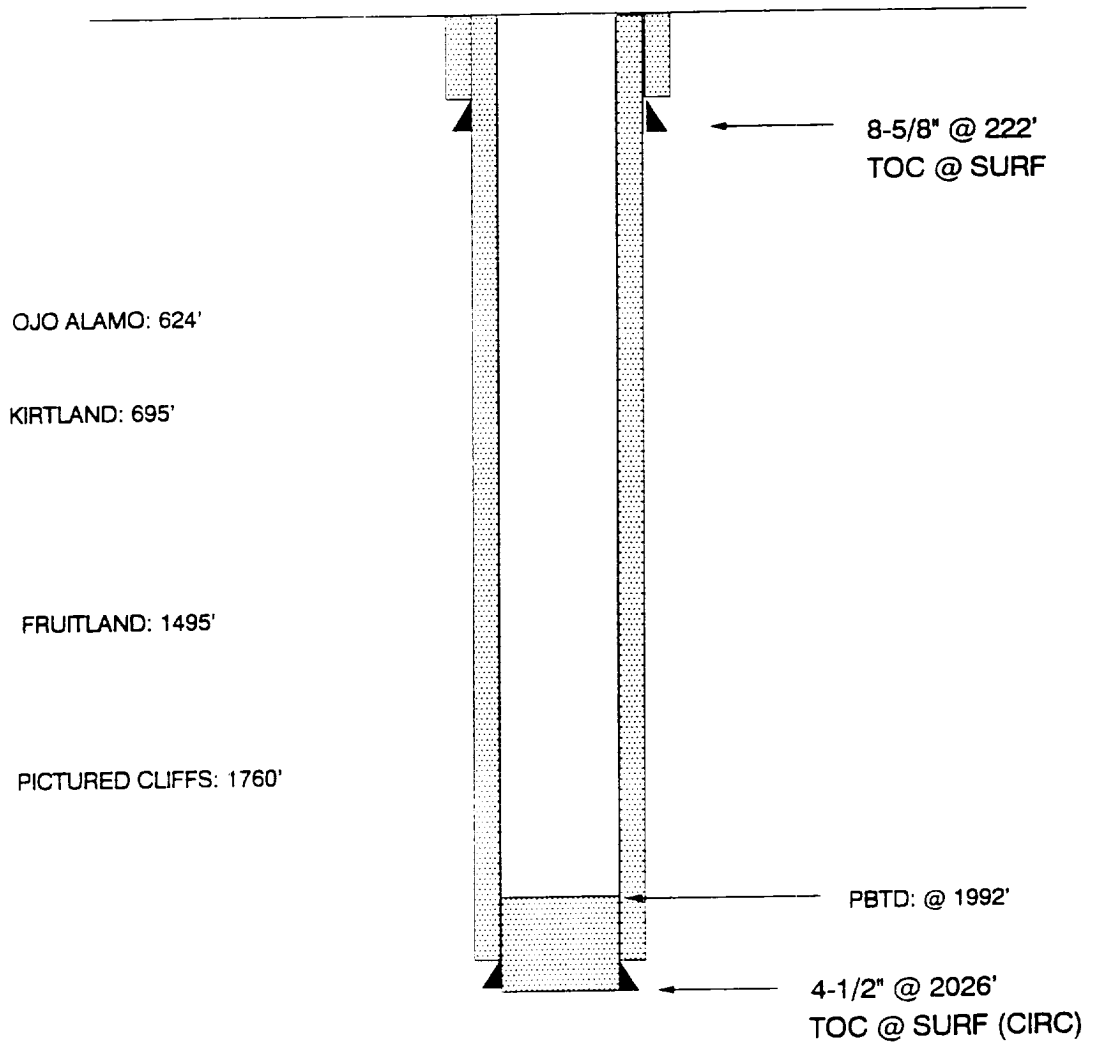
Logging Record: GR, Density/Neutron, Micro Log, Cyberlook/Coal, Mud Log

Spud Date: 6/29/93

Estimated Drilling Costs: \$55,397

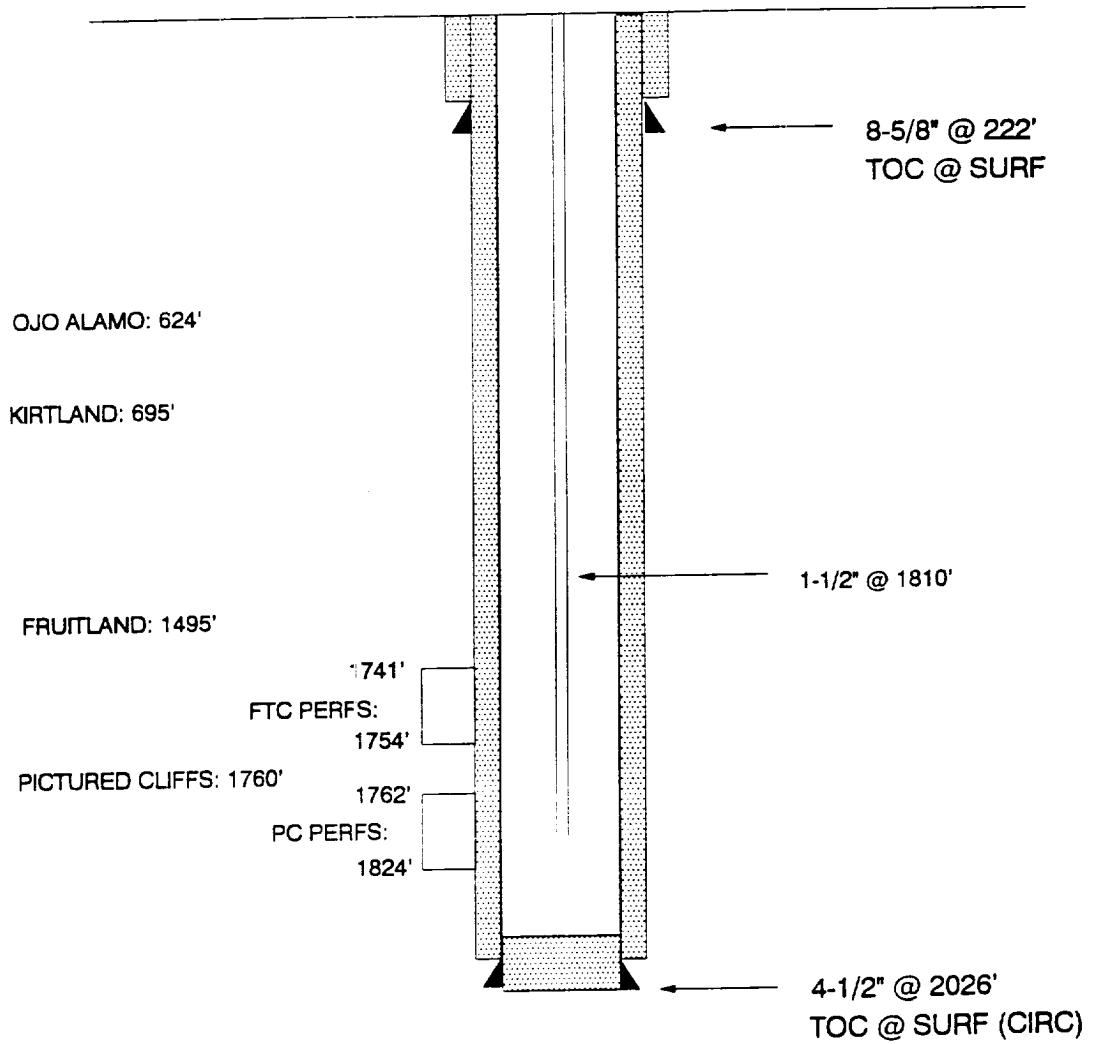
CURRENT
RHODES C #100

UNIT A SECTION 30 T28N R11W
SAN JUAN COUNTY, NEW MEXICO



PROPOSED
RHODES C #100

UNIT A SECTION 30 T28N R11W
SAN JUAN COUNTY, NEW MEXICO



RHODES C #100

MONTHLY GAS PRODUCTION ALLOCATION FORMULA

GENERAL EQUATION

$$Q_t = Q_{ftc} + Q_{pc}$$

WHERE: Q_t = TOTAL MONTHLY PRODUCTION (MCF/MONTH)
 Q_{ftc} = FRUITLAND COAL (ftc) MONTHLY PRODUCTION
 Q_{pc} = PICTURED CLIFFS (pc) MONTHLY PRODUCTION (MCF/MONTH)

REARRANGING THE EQUATION TO SOLVE FOR Q_{ftc} :

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$$Q_{pc} = Q_{pci} \times e^{-\{D_{pc} \times (t)\}}$$

WHERE: Q_{pci} = INITIAL PC MONTHLY FLOW RATE (CALCULATED FROM FLOW TEST)
 D_{pc} = PICTURED CLIFFS MONTHLY DECLINE RATE CALCULATED FROM:
 $D_{pc} = \frac{(Q_{pci} - Q_{pcabd})}{N_p(pc)}$
 See Determination of Q_{pci} and PC Estimated Ultimate Recovery ($N_p(pc)$)
 $Q_{pcabd} = 300 \text{ MCF/M}$

WHERE: $N_p(pc)$ = PICTURED CLIFFS ESTIMATED ULTIMATE RECOVERY (EUR)
 $N_p(pc) = P \times 1.06 \text{ MMCF/PSI}^{**} \times R_f$
 P^* = INITIAL RESERVOIR PRESSURE (SIBHP)
 R_f = RECOVERY (FIELD ANALOGY): = 0.85
 $**$ DETERMINED FROM MATERIAL BALANCE (FIELD ANALOGY) AND VOLUMETRIC RESERVES (LOG ANALYSIS)

By calculating $N_p(pc)$ from SIBHP and determining Q_{pci} , D_{pc} can then be calculated utilizing the previously described parameters. See derivation of D_{pc} , item (c) on page 4.

THUS: $Q_{ftc} = Q_t - Q_{pci} \times e^{-\{D_{pc} \times (t)\}}$
 WHERE: (t) IS IN MONTHS

REFERENCE: Thompson, R. S., and Wright, J. D., "Oil Property Evaluation", pages 5-2, 5-3, 5-4.

RHODES C #100

**DETERMINATION OF Q_{pci} :
(INITIAL PICTURED CLIFFS MONTHLY PRODUCTION)**

$$\underline{Q_{pci} = Q_t(1) \times Q_{pc}(p) / \{Q_{pc}(p) + Q_{ftc}(p)\}}$$

WHERE:

$Q_t(1)$ = FIRST MONTH TOTAL PRODUCTION (MCF)

$Q_{pc}(p)$ = FINAL PICTURED CLIFFS FLOW TEST (MCFPD)

$Q_{ftc}(p)$ = FINAL FRUITLAND COAL FLOW TEST (MCFPD)

RHODES C #100

EXAMPLE DETERMINATION OF:

(a) $N_p(pc)$

(b) Q_{pci}

(c) D_{pc}

PC EUR

INITIAL PC MONTHLY FLOW RATE

PC MONTHLY DECLINE RATE

(a) DETERMINATION OF $N_p(pc)$

(see page 5 for $N_p(pc)$ derivation)

$$N_p(pc) = 1.06 \text{ (MMCF/PSI)} \times P^* \text{ (PSI)} \times R_f$$

$$P^* = 405 \text{ PSI (FROM SIBHP)}$$

$$N_p(pc) = 1.06 \text{ MMCF/PSI} \times 405 \text{ PSI} \times 0.85$$

$$\underline{N_p(pc) = 366.5 \text{ MMCF}}$$

(b) DETERMINATION OF Q_{pci}

$$Q_{pci} = Q_t(1) \times \{Q_{pc}(p)/(Q_{pc}(p) + Q_{ftc}(p))\}$$

$$Q_t(1) = 15,000 \text{ MCF}$$

$$Q_{pc}(p) = 500 \text{ MCF/D}$$

$$Q_{ftc}(p) = 400 \text{ MCF/D}$$

1ST MONTH TOTAL PRODUCTION

PC FLOW TEST

FTC FLOW TEST

$$Q_{pci} = 15,000 \text{ MCF/M} \times \{500 \text{ MCF/D}/(500 \text{ MCF/D} + 400 \text{ MCF/D})\}$$

$$\underline{Q_{pci} = 8,333 \text{ MCF/M}}$$

(c) DETERMINATION OF D_{pc}

$$D_{pc} = (Q_{pci} - Q_{pcabd})/N_p(pc)$$

$$Q_{pcabd} = 300 \text{ MCF/M}$$

$$D_{pc} = (8,333 \text{ MCF/M} - 300 \text{ MCF/M})/(366.5 \text{ MMCF})$$

$$\underline{D_{pc} = 0.022/\text{M}}$$

$$\underline{\text{THUS: } Q_{ftc} = Q_t(\text{MCF/M}) - 8,333(\text{MCF/M}) \times e^{\{-(0.022(1/\text{M})) \times t(\text{M})\}}}$$

RHODES C #100

A. DETERMINATION OF PC RESERVES		$N_p(pc) = (HCPV \times B_g \times R_f)$
Volumetric Evaluation (averages are for subject 160 acre drill block)		
a.	(t) thickness	= 50.0 ft
b.	(phi) porosity	= 15.0 %
c.	(Sw) H2O saturation	= 69.0 %
d.	(Rf) Recovery Factor	= 85.0 %
e.	(rcf) Reservoir Cubic Feet	@ reservoir conditions
f.	(scf) Standard Cubic Feet	@ standard conditions

1. $HCPV = \text{HYDROCARBON PORE VOLUME (rcf)}$

$$= t \text{ (ft)} \times a \text{ (ft}^2\text{)} \times \phi \times (1-S_w)$$

$$= 35 \text{ (ft)} \times 160 \text{ (acres)} \times 43,560 \text{ (ft}^2\text{/acre)} \times 0.15 \times (1-0.55)$$

$$= 16,204,320 \text{ ft}^3 \quad 1 \text{ mmrcf} = 1,000,000 \text{ ft}^3$$

HCPV = 16.204 mmrcf

2. $B_g = \text{FORMATION VOLUME FACTOR (scf/rcf)}$

UTILIZING THE REAL GAS LAW TO DETERMINE THE FORMATION VOLUME FACTOR (B_g):

REAL GAS LAW states:

$$P V = Z n R T$$

Rearranging to solve for n:

$$n = P V / Z R T$$

assuming:

$$n_r = n_s$$

WHERE: $n_r = \text{NUMBER OF MOLES OF GAS AT RESERVOIR CONDITION}$

$n_s = \text{NUMBER OF MOLES OF GAS AT SURFACE CONDITIONS}$

THUS: $\frac{P_r V_r}{Z_r T_r R} = \frac{P_s V_s}{Z_s T_s R}$

Rearranging: $\frac{V_s}{V_r} = \frac{B_g}{Z_s T_s P_r / Z_r T_r P_s}$

assuming:

$$Z_s = 1.00$$

$$Z_r = 0.94$$

$$T_s = 60 \text{ } ^\circ\text{F} \quad \text{or } 520 \text{ } ^\circ\text{R}$$

$$T_r = 100 \text{ } ^\circ\text{F} \quad \text{or } 560 \text{ } ^\circ\text{R}$$

$$P_s = 15.025 \text{ psia}$$

$$P_r = \text{Determined from build-up test}$$

$$B_g = \text{FORMATION VOLUME FACTOR (scf/rcf)} = \frac{Z_s T_s P_r}{Z_r T_r P_s}$$

$$= (\text{scf/rcf}) \{1.00 \times 520 \text{ (} ^\circ\text{R)} \times P_r \text{ (psia)}\} / \{0.94 \times 560 \text{ (} ^\circ\text{R)} \times 15.025 \text{ (psia)}\}$$

Bg = 0.0657 {scf/ (rcf psia)} X Pr (psia)

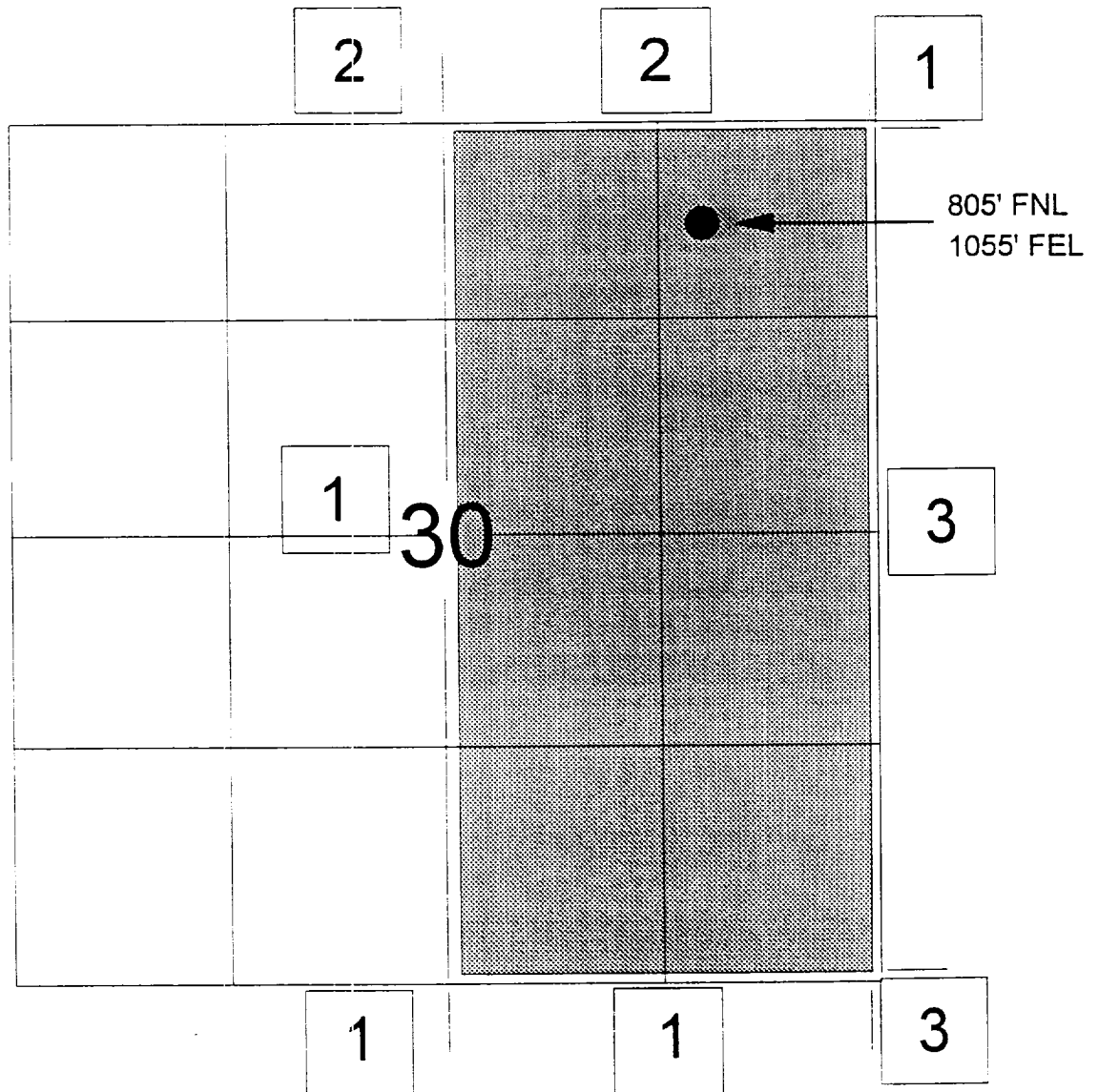
3. $EUR = HCPV \times B_g \times R_f$

$$= 16.204 \text{ (mmrcf)} \times 0.0657 \text{ {scf/(rcf psia)}} \times P_r \text{ (psia)} \times 0.85$$

Np(pc) = 1.06 (mmscf/psia) X Pr (psia) X 0.85

MERIDIAN OIL INC.

OFFSET OPERATOR\OWNER PLAT
Fruitland Coal\Pictured Cliffs Commingle
RHODES C #100
NE NE Section 30, T28N, R11W
San Juan County, New Mexico



- 1) Meridian Oil Inc., P.O. Box 4289, Farmington, New Mexico 87499-4289
- 2) BHP Petroleum (Americas) Inc., 5847 San Felipe, Suite 3600, Houston, Texas 77057
- 3) R & G Drilling Company, Inc., P.O. Box 158, Thousand Palms, California 92276
M & G Drilling Company, P.O. Box 2560, Palms Springs, California 92263

MERIDIAN OIL

August 19, 1993

BHP Petroleum (Americas) Inc.
5847 San Felipe
Suite 3600
Houston, Texas 77057

RE: Rhodes C #100
Unit A, Section 30, T28N, R11W
San Juan County, New Mexico
Downhole Commingling Request


Gentlemen:

Meridian Oil, Inc. is in the process of applying for a downhole commingling order for the Rhodes C #100 well located in Unit A, Section 30, T28N, R11W, N.M.P.M., San Juan County, New Mexico, in the Kutz Pictured Cliffs and the Basin Fruitland Coal fields.

The purpose of this letter is to notify you of such action. If you have no objections to the proposed commingling order, we would appreciate your signing this letter and returning it to this office.

Your prompt attention to this matter would be appreciated.

Yours truly,


Keith A. Swainson
Production Engineering

KAS/tg

The above downhole commingling request is hereby approved:

Date: _____

MERIDIAN OIL

August 19, 1993

R & G Drilling Company, Inc.
P.O. Box 158
Thousand Palms, California 92276

RE: Rhodes C #100
Unit A, Section 30, T28N, R11W
San Juan County, New Mexico
Downhole Commingling Request

Gentlemen:

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Production Engineering

KAS/tg

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Date: _____

MERIDIAN OIL

August 19, 1993

M & G Drilling Company, Inc.
P.O. Box 2560
Thousand Palms, California 92263

RE: Rhodes C #100
Unit A, Section 30, T28N, R11W
San Juan County, New Mexico
Downhole Commingling Request


Gentlemen:

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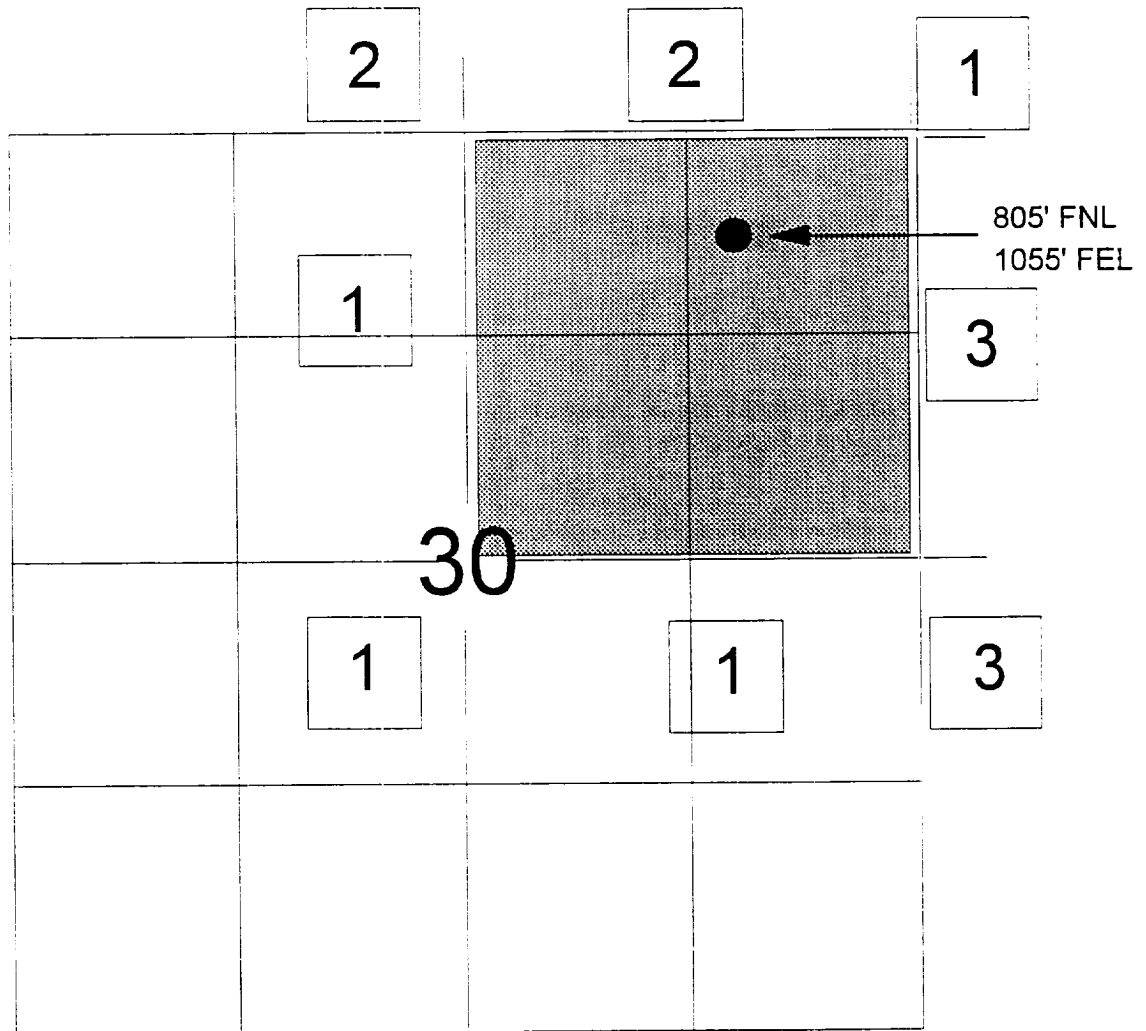
KAS/tg

The above downhole commingling request is hereby approved:

Date: _____

MERIDIAN OIL INC.

OFFSET OPERATOR\OWNER PLAT
Fruitland Coal\Pictured Cliffs Commingle
RHODES C #100
NE NE Section 30, T28N, R11W
San Juan County, New Mexico



- 1) Meridian Oil Inc., P.O. Box 4289, Farmington, New Mexico 87499-4289
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- 3) R & G Drilling Company, Inc., P.O. Box 158, Thousand Palms, California 92276
- M & G Drilling Company, P.O. Box 2560, Palms Springs, California 92263

Pictured Cliffs Formation

MERIDIAN OIL

August 19, 1993

Bureau of Land Management
1235 La Plata Highway
Farmington, New Mexico 87401

RE: Rhodes C #100
Unit A, Section 30, T28N, R11W
San Juan County, New Mexico
Downhole Commingling Request

Gentlemen:

Meridian Oil, Inc. is in the process of applying for a downhole commingling order for the Rhodes C #100 well located in Unit A, Section 30, T28N, R11W, N.M.P.M., San Juan County, New Mexico, in the Kutz Pictured Cliffs and the Basin Fruitland Coal fields.

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