

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

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

**APPLICATION OF MERIDIAN OIL INC.
FOR AN UNORTHODOX GAS WELL LOCATION
AND DOWNHOLE COMMINGLING,
SAN JUAN COUNTY, NEW MEXICO.**

Reopened Case No. 10721

**APPLICATION OF MERIDIAN OIL INC.
FOR DOWNHOLE COMMINGLING,
SAN JUAN COUNTY, NEW MEXICO.**

Reopened Case No. 10722

**APPLICATION OF MERIDIAN OIL INC.
FOR AN UNORTHODOX GAS WELL LOCATION
AND DOWNHOLE COMMINGLING,
SAN JUAN COUNTY, NEW MEXICO.**

Reopened Case No. 10723

**APPLICATION OF MERIDIAN OIL INC.
FOR AN UNORTHODOX GAS WELL LOCATION
AND DOWNHOLE COMMINGLING,
SAN JUAN COUNTY, NEW MEXICO.**

Reopened Case No. 10724

**APPLICATION OF MERIDIAN OIL INC.
FOR AN UNORTHODOX GAS WELL LOCATION
AND DOWNHOLE COMMINGLING,
SAN JUAN COUNTY, NEW MEXICO.**

Reopened Case No. 10725

Order No. R-9920-A

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 8:15 a.m. on August 26, 1993, at Santa Fe, New Mexico, before Michael E. Stogner.

NOW, on this 22ⁿ day of October, 1993, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS THAT:

(1) Due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) At the August 26, 1993 Division Hearing, Case Nos. 10721 through 10725 and Case Nos. 10745 and 10754 were Reopened and consolidated for the purpose of presenting additional testimony.

(3) These cases all involve applications by Meridian Oil Inc. ("Meridian") for approval to initially drill, complete and produce each subject well as downhole commingled wells which would commingle production from the Pictured Cliffs formation with production from the Basin-Fruitland Coal Gas Pool.

(4) On July 9, 1993 the Division entered Order No. R-9920 approving the applications in Case Nos. 10721 through 10725, which adopted Meridian's proposed allocation formula but which also established economic limitations on downhole commingling of the production from these two formations which provided:

"...in the event total gas production from both pools in a well exceeds 300 MCF per Day, downhole commingling will not be allowed in the effected well until the combined rate drops below 300 MCF/day."

(5) Meridian timely requested that these cases be reopened so that it could present supplemental evidence concerning this issue in order to demonstrate that this economic limitation, unless amended, would restrict Meridian's ability to produce the Pictured Cliffs formation gas and Basin Fruitland Coal gas in these wells.

(6) Meridian presented additional engineering testimony and economic analysis which supports the adoption of an "Economic Limit" for downhole commingling in these wells with such Economic Limit being based upon the relationship of costs to rate and estimated ultimate gas recovery from either the Pictured Cliffs formation or the Basin Fruitland Coal Gas Pool.

(7) In addition Meridian presented a graph which may be utilized by the Division as an accurate and reliable means by which to establish an Economic Limit for the downhole commingling of production from either of these pools in this area and should be adopted as Exhibit "B" to the original Order.

(8) The Economic Limit plotted on said Exhibit "B", attached hereto and made a part hereof, is based upon either the Pictured Cliff formation or Basin Fruitland Coal Gas Pool well costs with three individual curves representing the minimum estimated cost of:

- (a) a single well (\$320,000.00);
- (b) a dual completed well (\$270,000.00); or,
- (c) a downhole commingled well (\$200,000.00).

(9) As established by Exhibit "B", if the combination of initial rate and estimated ultimate gas recovery ("EUR") for each of the subject wells falls below the curve plotted for the dual completed cost example, then and in that event downhole commingling may be allowed as an alternative economic means by which to produce either pool. For example, if the initial rate of a well is 500 MCFPD and an EUR has been calculated for the well to be 400 MMCF, then as indicated on Exhibit "B" the example well's Economic Limit will be below the dual completion economic limit curve and therefore the example well is entitled to be downhole commingled.

(10) In contrast, the Economic Limit adopted in Order No. R-9920 is too restrictive because it failed to address the fact that there are various combinations of either rate or EUR other than those used in Order R-9920 which would be economic or uneconomic.

(11) As observed by the applicant, Division Order No. R-9920 is more restrictive than the Division's statewide Rule 303-C(1)(b)(i) which allows downhole commingling based upon the economics of a single zone rather than requiring the combined total gas production from both zones to be uneconomic.

(12) The issue of downhole commingling unconventional coal gas production in northwest New Mexico is covered in RULE 12 of the Special Rules and Regulations for the Basin Fruitland Coal Gas Pool, as promulgated by Division Order No. R-8768, as amended, for those reasons covered in this matter such downhole commingling is in itself more confining and is in greater need of protection from abuses than commingling conventional gas production.

(13) No operator or interested party appeared in opposition to the application.

(14) This application should therefore be granted.

IT IS THEREFORE ORDERED THAT:

(1) The application of Meridian Oil Inc. to amend Division Order No. R-9920 to include additional factors in the Economic Limit provisions of said order based upon the relationship of costs to rate and estimated ultimate gas recovery from either the Pictured Cliffs formation or the Basin Fruitland Coal Gas Pool is hereby approved.

(2) The proviso included as a part of Decretory Paragraph No. (1) on page 8 of said Order No. R-9920 is hereby amended to read as follows:

"PROVIDED HOWEVER, in the event the Economic Limit plotted for production from either pool in a well is less than the curve for the dual completion case as plotted on Exhibit "B" [being a plot of costs compared to both maximum average daily producing rate against pipeline pressure ("Initial Rate") and an estimated ultimate gas recovery ("EUR")] attached hereto and made a part hereof, then and in that event, downhole commingling shall be allowed in the effected well. In the event the Economic Limit plotted for production from both pools in a well initially exceeds the curve for the dual completion case, then downhole commingling shall not be allowed in the well until such time as the Economic Limit in that well for production from either pool drops below the dual completion curve plotted on Exhibit "B"."

(3) Decretory Paragraph No. (3) on page 8 being one in the same shall be changed to read in its entirety as follows:

"(3) The operator shall consult with the Supervisor of the Aztec Office of the Division to insure the validity and accuracy of the initial test on each well. Further, as part of the procedure for obtaining authorization to produce the subject well as a downhole commingled well, the operator shall submit to the Supervisor of the Aztec Office of the Division a sworn certificate verifying the cost, the Initial Rate and the EUR for that well. The Supervisor of the Aztec Office of the Division shall approve the downhole commingling and authorize the operator to produce the well if the Economic Limit for production from either pool in that well is less than the curve for the dual completion case as plotted on Exhibit "B". In the event the well initially fails to qualify for downhole commingling, the well can still qualify at some future date if and when the Economic Limit in that well for production from either pool drops below the dual completion case curve plotted on Exhibit "B"."

Reopened Case Nos. 10721 through 10725

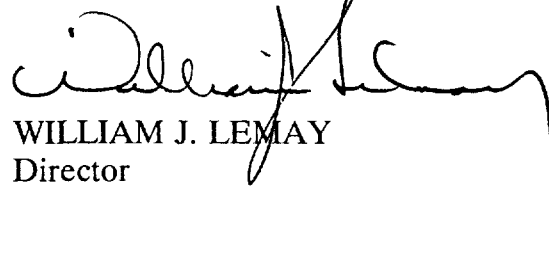
Order No. R-9920-A

Page 5

(4) Exhibit "B" attached hereto shall be made a part of the order issued in Case Nos. 10721 through 10725.

(5) Jurisdiction of this cause is hereby retained for the entry of such further orders as the Division may deem necessary.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION



WILLIAM J. LEMAY
Director

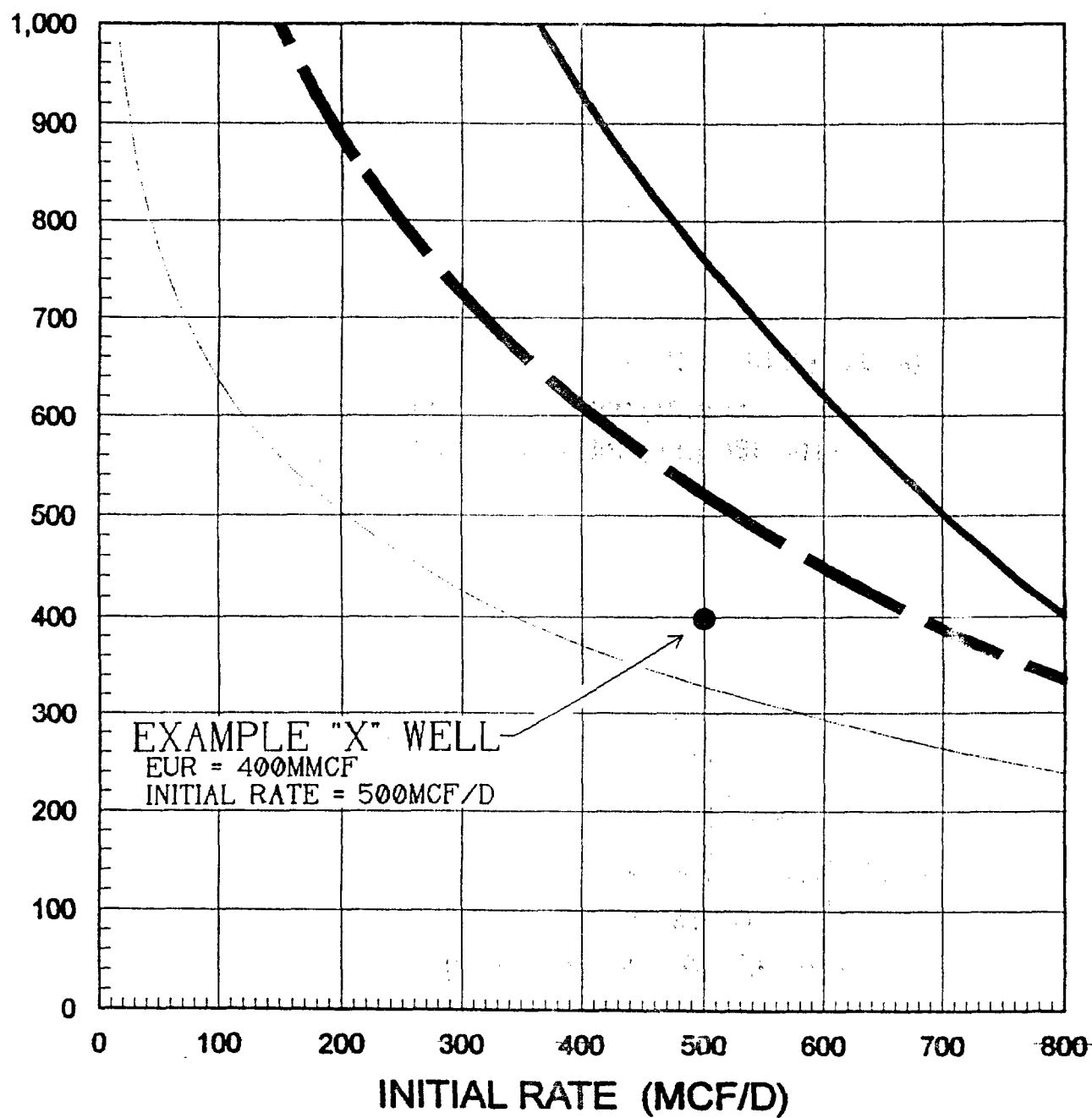
S E A L

Exhibit "B"

Consolidated Case Nos. 10721, 10722, 10723, 10724, and 10725.
Division Order No. R-9920, as amended by R-9920-A

PICTURED CLIFFS / FRUITLAND COAL
ECONOMIC EVALUATION
COMPLETION TECHNIQUE SENSITIVITY

EUR (MMCF)



SINGLE DUAL COMMINGLE

STATE OF NEW MEXICO
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Case No. 10721

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Case No. 10722

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Case No. 10724

APPLICATION OF MERIDIAN OIL INC.
FOR AN UNORTHODOX GAS WELL LOCATION
AND DOWNHOLE COMMINGLING, SAN JUAN
COUNTY, NEW MEXICO.

Case No. 10725

Order No. R-9920

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 8:15 a.m. on April 22, 1993, at Santa Fe, New Mexico, before Examiner Michael E. Stogner.

NOW, on this 9th day of July, 1993, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS THAT:

(1) Due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) At the time of the hearing Case Nos. 10721 through 10725 were consolidated for the purpose of presenting testimony.

(3) The applicant in each of the five following cases is Meridian Oil Inc. and due to the similarity, close proximity, and nature of each, a single directive issued by the Division is deemed appropriate:

- (a) in Case No. 10721 the applicant seeks approval to downhole commingle Fulcher Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed Rowley Com Well No. 500 to be drilled at an unorthodox gas well location for the Fulcher Kutz-Pictured Cliffs Pool 2335 feet from the South line and 1850 feet from the West line (Unit K) of Section 7, Township 27 North, Range 10 West, NMPM, San Juan County, New Mexico. Said well is to be dedicated to a standard 332.92-acre gas spacing and proration unit for the Basin-Fruitland Coal (Gas) Pool being Lots 1 through 4 and the E/2 W/2 (W/2 equivalent) of said Section 7 and to a 166.61-acre gas spacing unit for the Fulcher Kutz-Pictured Cliffs Pool being Lots 3 and 4 and the E/2 SW/4 (SW/4 equivalent) of said Section 7;
- (b) in Case No. 10722 the applicant seeks approval to downhole commingle Fulcher Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed McAdams Well No. 500 to be drilled at a standard gas well location 790 feet from the North line and 1010 feet from the East line (Unit A) of Section 28, Township 27 North, Range 10 West, NMPM, San Juan County, New Mexico. Said well is to be dedicated to a standard

320-acre gas spacing unit for the Basin-Fruitland Coal (Gas) Pool being the E/2 of said Section 28 and to a standard 160-acre gas spacing unit for the Fulcher Kutz-Pictured Cliffs Pool being the NE/4 of said Section 28;

- (c) in Case No. 10723 the applicant seeks approval to downhole commingle West Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed Whitley "A" Well No. 100 to be drilled at an unorthodox gas well location for the West Kutz-Pictured Cliffs Pool 2010 feet from the South line and 1090 feet from the West line (Unit L) of Section 17, Township 27 North, Range 11 West, NMPM, San Juan County, New Mexico. Said well is to be dedicated to a standard 320-acre gas spacing and proration unit for the Basin-Fruitland Coal (Gas) Pool being the W/2 of said Section 17 and to a standard 160-acre gas spacing unit for the West Kutz-Pictured Cliffs Pool being the SW/4 of said Section 17;
- (d) in Case No. 10724 the applicant seeks approval to downhole commingle West Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed Rhodes "C" Well No. 101 to be drilled at an unorthodox gas well location for both the West Kutz-Pictured Cliffs Pool and the Basin-Fruitland Coal (Gas) Pool, being 100 feet from the South line and 2270 feet from the West line (Unit N) of Section 30, Township 28 North, Range 11 West, NMPM, San Juan County, New Mexico. Said well is to be dedicated to a standard 315.97-acre gas spacing and proration unit for the Basin-Fruitland Coal (Gas) Pool being Lots 1 through 4 and the E/2 W/2 (W/2 equivalent) of said Section 30 and to a 158.04-acre gas spacing unit for the West Kutz-Pictured Cliffs Pool being Lots 3 and 4 and the E/2 SW/4 (SW/4 equivalent) of said Section 30; and,

- (e) in Case No. 10725 the applicant seeks approval to downhole commingle West Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed Rhodes "C" Well No. 102 to be drilled at an unorthodox gas well location for the West Kutz-Pictured Cliffs Pool being 790 feet from the North line and 1950 feet from the East line (Unit B) of Section 31, Township 28 North, Range 11 West, NMPM, San Juan County, New Mexico. Said well is to be dedicated to a standard 317.85-acre gas spacing and proration unit for the Basin-Fruitland Coal (Gas) Pool being Lots 1 and 2, the NE/4, and the E/2 NW/4 (N/2 equivalent) of said Section 31 and to a standard 160-acre gas spacing unit for the West Kutz-Pictured Cliffs Pool being the NE/4 of said Section 31.

(4) Both the West Kutz and Fulcher Kutz Pictured Cliffs Pools are governed under the spacing provisions of the Division's General Rules and Regulations [Rule 104.C(3)] which provides for 160-acre drilling tracts. The Basin Fruitland Coal (Gas) Pool is spaced on 320-acre spacing, pursuant to the provisions of Rule 4 of the Special Rules and Regulations for the Basin Fruitland Coal (Gas) Pool, as promulgated by Division Order No. R-8768, as amended.

(5) The proposed unorthodox locations are caused by various topographic reasons and not geologic.

(6) Applicant's geologic evidence indicates that gas production capabilities from both the Pictured Cliffs and Fruitland Coal intervals in this general area of the San Juan Basin is expected to be marginal in nature, thereby making the downhole commingling of both zones practical in order to adequately recover Basin-Fruitland Coal gas and conventional Pictured Cliffs gas reserves underlying each respective proration unit in a prudent manner.

(7) Further, the applicant's evidence indicates that due to the marginal production expected in both intervals, it will probably be uneconomic to drill either a stand alone Pictured Cliffs or Fruitland Coal Gas well or a dual producer in this area. However, in the event total gas production from both pools in a well exceeds 300 MCF per Day, downhole commingling will not be allowed in the effected well until the combined rate drops below 300 MCF/day.

(8) The ownership within the Basin-Fruitland Coal (Gas) Pool and the Fulcher Kutz-Pictured Cliffs Pool or West Kutz-Pictured Cliffs Pool underlying each respective proration unit is not common.

(9) The applicant has notified all interest owners owning an interest in either the Pictured Cliffs or Fruitland formation within the subject proration units of its proposed downhole commingling.

(10) No offset operator and/or interest owner appeared at the hearing in opposition to the proposed downhole commingling and/or unorthodox well locations.

(11) The applicant further demonstrated through its evidence and testimony that:

- (a) there will be no crossflow between the two commingled pools;
- (b) neither commingled zone exposes the other to damage by produced liquids;
- (c) the fluids from each zone are compatible with the other;
- (d) the bottomhole pressure of the lower pressure zone should not be less than 50 percent of the bottomhole pressure of the higher pressure zone adjusted to a common datum; and,
- (e) the value of the commingled production is not less than the sum of the values of the individual production.

(12) In the interest of prevention of waste and protection of correlative rights, each of the subject applications should be approved.

(13) Due to the nature of gas production from the Basin-Fruitland Coal (Gas) Pool, straight allocation of gas volumes from both zones is not appropriate. The applicant therefore seeks the adoption of a monthly allocation formula, based on initial production test and known/assumed parameters from the Pictured Cliffs zone whereby its initial rate, estimated ultimate recovery, and decline rate can be determined. Any

production rate over what is calculated for the Pictured Cliffs utilizing the applied formula can be attributed to the Fruitland coal gas interval. See Exhibit "A" attached hereto and made a part hereof for additional reference.

(14) The operator should consult with the Supervisor of the Aztec Office of the Division to insure the validity and scientific accuracy of the initial test on each well.

(15) The operator should be responsible for reporting the monthly gas production from each of the subject wells by utilizing the proposed allocation formula.

(16) An annual report should be submitted by the operator for each well to both the Aztec and Santa Fe offices of the Division showing the complete computations for each month.

(17) Any condensate production should be allocated entirely to the Pictured Cliffs interval. Water production should be reported in a manner acceptable to the supervisor of the Aztec district office of the Division.

(18) Any change in the method of gas allocation between the two pools for any of the subject wells should be made only after due notice and hearing.

(19) To afford the Division an opportunity to assess the potential of waste and to expeditiously order the appropriate remedial action, the operator should notify the Aztec district office of the Division any time one of the five subject wells is shut-in for seven consecutive days.

IT IS THEREFORE ORDERED THAT:

(1) The applicant in Case Nos. 10721, 10722, 10723, 10724, and 10725, Meridian Oil Inc., is hereby authorized:

- (a) to downhole commingle Fulcher Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed Rowley Com Well No. 500 to be drilled at an unorthodox gas well location for the Fulcher Kutz-Pictured Cliffs Pool 2335 feet from the South line and 1850 feet from the West line (Unit K) of Section 7, Township 27 North, Range 10 West, NMPM, San Juan County, New Mexico. Said well shall be dedicated to a standard 332.92-acre gas spacing and proration unit for the

Basin-Fruitland Coal (Gas) Pool being Lots 1 through 4 and the E/2 W/2 (W/2 equivalent) of said Section 7 and to a 166.61-acre gas spacing unit for the Fulcher Kutz-Pictured Cliffs Pool being Lots 3 and 4 and the E/2 SW/4 (SW/4 equivalent) of said Section 7;

- (b) to downhole commingle Fulcher Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed McAdams Well No. 500 to be drilled at a standard gas well location 790 feet from the North line and 1010 feet from the East line (Unit A) of Section 28, Township 27 North, Range 10 West, NMPM, San Juan County, New Mexico. Said well shall be dedicated to a standard 320-acre gas spacing unit for the Basin-Fruitland Coal (Gas) Pool being the E/2 of said Section 28 and to a standard 160-acre gas spacing unit for the Fulcher Kutz-Pictured Cliffs Pool being the NE/4 of said Section 28;
- (c) to downhole commingle West Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed Whitley "A" Well No. 100 to be drilled at an unorthodox gas well location for the West Kutz-Pictured Cliffs Pool 2010 feet from the South line and 1090 feet from the West line (Unit L) of Section 17, Township 27 North, Range 11 West, NMPM, San Juan County, New Mexico. Said well shall be dedicated to a standard 320-acre gas spacing and proration unit for the Basin-Fruitland Coal (Gas) Pool being the W/2 of said Section 17 and to a standard 160-acre gas spacing unit for the West Kutz-Pictured Cliffs Pool being the SW/4 of said Section 17;
- (d) to downhole commingle West Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed Rhodes "C" Well No. 101 to be drilled at an unorthodox gas well location for both the West Kutz-Pictured Cliffs Pool

and the Basin-Fruitland Coal (Gas) Pool, being 100 feet from the South line and 2270 feet from the West line (Unit N) of Section 30, Township 28 North, Range 11 West, NMPM, San Juan County, New Mexico. Said well shall be dedicated to a standard 315.97-acre gas spacing and proration unit for the Basin-Fruitland Coal (Gas) Pool being Lots 1 through 4 and the E/2 W/2 (W/2 equivalent) of said Section 30 and to a 158.04-acre gas spacing unit for the West Kutz-Pictured Cliffs Pool being Lots 3 and 4 and the E/2 SW/4 (SW/4 equivalent) of said Section 30; and,

- (e) to downhole commingle West Kutz-Pictured Cliffs Pool and Basin-Fruitland Coal (Gas) Pool production within the wellbore of its proposed Rhodes "C" Well No. 102 to be drilled at an unorthodox gas well location for the West Kutz-Pictured Cliffs Pool being 790 feet from the North line and 1950 feet from the East line (Unit B) of Section 31, Township 28 North, Range 11 West, NMPM, San Juan County, New Mexico. Said well shall be dedicated to a standard 317.85-acre gas spacing and proration unit for the Basin-Fruitland Coal (Gas) Pool being Lots 1 and 2, the NE/4, and the E/2 NW/4 (N/2 equivalent) of said Section 31 and to a standard 160-acre gas spacing unit for the West Kutz-Pictured Cliffs Pool being the NE/4 of said Section 31.

PROVIDED HOWEVER, in the event total gas production from both pools in a well exceeds 300 MCF per Day, downhole commingling will not be allowed in the effected well until the combined rate drops below 300 MCF/day.

(2) The allocation of gas produced from the Pictured Cliffs and Fruitland Coal intervals in each of the subject wells shall be in accordance with the adopted allocation formula, as further referenced in Exhibit "A" attached hereto and made a part hereof.

(3) The operator shall consult with the Supervisor of the Aztec Office of the Division to insure the validity and accuracy of the initial test on each well.

(4) Further, the operator is responsible for reporting the monthly gas production from each of the five wells to the Division utilizing said allocation formula. An annual report for each well 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.

(5) Any condensate production from a well shall be allocated entirely to the appropriate Pictured Cliffs Pool. Water production shall be reported in a manner acceptable to the supervisor of the Aztec district office of the Division.

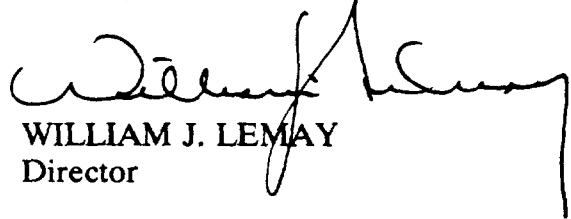
(6) Any variance in the method of gas allocation between the two pools for any of the subject wells shall be made only after due notice and hearing.

(7) The operator shall immediately notify the supervisor of the Aztec District Office of the Division any time one of the five subject wells has been shut-in for seven consecutive days and shall concurrently present, to the Division, a plan for remedial action.

(8) Jurisdiction is hereby retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


WILLIAM J. LEMAY
Director

S E A L

Exhibit "A"

CONSOLIDATED CASES 10721, 10722, 10723, 10724, AND 10725

DIVISION ORDER NO. R-9920

Case No. 10721
Case No. 10722
Case No. 10723
Case No. 10724
Case No. 10725

Rowley Well No. 500
McAdams Well No. 500
Whitley "A" Well No. 100
Rhodes "C" Well No. 101
Rhodes "C" Well No. 102

MONTHLY GAS PRODUCTION ALLOCATION FORMULA GENERAL EQUATION

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

WHERE:

Q_t = TOTAL MONTHLY PRODUCTION FROM WELL (MCF/MONTH)

Q_{ftc} = FRUITLAND COAL (FTC) MONTHLY PRODUCTION (MCF/MONTH)

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:

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

WHERE:

Q_{pci} IS THE INITIAL PC MONTHLY FLOW RATE (CALCULATED FROM FLOW TEST)

OR

$$Q_{pci} = \frac{Q_t(1) * Q_{pc}(p)}{Q_{pc}(p) + Q_{ftc}(p)}$$

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)

Exhibit "A"

Consolidated Cases Nos. 10721, 10722, 10723, 10724, and 10725

Order No. R-9920

Page 2

AND WHERE:

Dpc IS THE CALCULATED PICTURED CLIFFS MONTHLY DECLINE RATE DETERMINED.

$$Dpc = (Qpci - Qpcabd) / Np(pc)$$

WHERE: Qpcabd = PICTURED CLIFFS PRODUCTION RATE AT ABANDONMENT (300 MCF/MO.); AND, Np(pc) IS THE PICTURED CLIFFS ESTIMATED ULTIMATE RECOVERY.

THUS: $Q_{ftc} = Q_t - Q_{pci} * e^{\{-(Dpc)*(t)\}}$

WHERE: (t) = TIME (MONTHS) FROM INITIAL PRODUCTION