KM PRODUCTION COMPANY
P.O. Box 2406
Farmington, NM 87401
(505) 325-6900

July 7, 1988

Ms. Sally W. Boyd
P.O. Box 3291
Santa Fe, New Mexico 87501

Dear Sally:

Enclosed you will find a written copy of my testimony presented on July 6, 1988. If you have any questions, feel free to call.

Yours truly,

Kevin H. McCord

Kevin H. McCord
Petroleum Engineer

KHM/lmc

Enclosures

The Fruitland Formation in the area south of the proposed dividing line is currently primarily developed on 160-acre spacing. The primary objective of much of the shallow-depth drilling in this area is the Pictured Cliffs formation which is also currently developed on 160-acre spacing. Historically, production from these formations has been commingled downhole in order to enhance the economics of drilling and producing wells in the area. With spacing for the two formations uniform, downhole commingling has proven to be relatively simple from an administrative perspective--primarily because it is extremely unusual for ownership to be segregated vertically. With ownership of the two formations common, administrative approval of requests for downhole commingling is commonplace. This has relieved operators of the time and expense of a hearing before the New Mexico Oil Conservation Division (NMOCD) to obtain approval for downhole commingling. The practice of completing and producing wells in this manner has not created allocation of production problems or correlative rights problems because spacing and, consequently, ownership of the two formations has been uniform.

If spacing for the Fruitland formation in the area south of the proposed demarcation line is changed from 160 acres to 320 acres, then administrative problems, allocation problems, and correlative rights problems will begin to surface. The ownership of the two formations may no longer be uniform. In fact, this would be a common situation. If not uniform, then requests for downhole commingling will be granted only after incurring the time and expense of notice and hearing. This is an administrative burden, both for the NMOCD and the operator. In addition, accurate and equitable allocation of production between the formations becomes a critical process under circumstances in which ownership is not common. Allocation is not an exact process and the potential for abuse exists. Non-uniform ownership of the two formations may also provide a setting in which violation of correlative rights is more likely to occur. For example, in the Chaco area, where the main Fruitland coal is located just on top of the Pictured Cliffs formation, the common practice of fracture stimulating the Pictured Cliffs formation commonly results in drainage of gas from the Fruitland coal, thereby damaging the correlative rights of the owners of the Fruitland formation. This is a potential problem regardless of whether the two formations are commingled downhole or completed and produced separately.

Another possible problem, for example, that could arise if the vertical limits are contracted to exclude the Fruitland coal zone and 320-acre spacing is given to the Fruitland coal in the WAW Fruitland-Pictured Cliffs pool, would be the case where in a given well you could have a Fruitland sand with 160-acre spacing overlying a Fruitland coal with 320-acre spacing overlying the Pictured Cliffs sand with 160-acre spacing. This would generally be a case of a pool within a pool, having different spacing, and very little control, completion-wise, to produce these zones separately. If the Fruitland coal was spaced 160 acres in this situation, at least the correlative rights question in this situation would not be such a problem.

It was suggested by Mr. Chavez that if an operator is found to have fracture stimulated into the Fruitland coal while completing the Pictured Cliffs formation and thus produces gas from both formations, then the operator should have the opportunity to come into compliance with the regulations. This would be a near impossible task to do physically other than simply plugging the well. The other possibility would be to readjust ownership, costs, and revenue distribution for the well which would be very difficult to do.

The potential problems I have identified illustrate the kinds of problems that may surface if spacing for the Fruitland formation in the area south of the proposed dividing line is changed from 160 acres to 320 acres. I have not attempted to describe all potential problems. Other problems, such as the allocation of costs of operations between the owners of the two formations under circumstances in which ownership is not common, are foreseeable as I've just pointed out. However, most of these kinds of problems can be avoided simply by maintaining 160-acre spacing for the Fruitland formation in the area south of the proposed dividing line.

Exhibit #11

Exhibit #11 is a list of gas analyses taken from wells in the San Juan Basin. The purpose of this exhibit is to demonstrate that Fruitland coal gas south of the proposed demarcation line can be distinguished from Pictured Cliffs gas, and Fruitland coal gas south of this line is not similar in composition to Fruitland coal gas north of the demarcation line.

Exhibit #11 consists of 4 pages of gas analyses, the majority of which are from wells south of the proposed line of demarcation. The first page of Exhibit #11 is a summary table showing the average normal molecular % components for 79 gas analyses taken from wells south of the demarcation which are either perforated in the Fruitland coal or possibly producing Fruitland coal gas from Pictured Cliffs perforations. Also presented on page 1 of Exhibit #11 is average gas analysis data from the Cedar Hill-Fruitland basal coal field which was taken from Decker, et al's paper entitled "Geology, Geochemistry, Reservoir Engineering and Completion Methods at the Cedar Hill Field, San Juan County, New Mexico: A Field Study of Classic Coal Degasification Behavior", which was printed in the guide book for Geology and Coal-Bed Methane Resources of the Northern San Juan Basin, Colorado and New Mexico Symposium which was held in June 1988. The remaining pages of Exhibit #11 are the individual gas analyses used to come up with the averages on page 1 of Exhibit #11.

A. A total of 79 gas analyses were examined - mainly from WAW and South Gallegos Fruitland-P.C. wells.

B. These wells are commonly perforated in Fruitland coal, Fruitland sand, Pictured Cliffs sand or any combination of these.

C. To determine and average gas analysis for the area, I grouped gas analysis together by BTU values. and it was then obvious how Fruitland gas and Pictured Cliffs gas separated apart from each other. The summary results shown on the first page of Exhibit #11 give the results of these groupings.

D. I've listed these averages as average Fruitland dominated gas and average P.C. dominated gas because I'm not sure these analyses are 100% Fruitland or 100% P.C. (could still be a mixture), but average analysis given for each zone is definitely dominated by gas from that zone.

D. Results. (Note from the Summary on page 1 of Exhibit #11).

| | Fruitland vs. | Pictured Cliffs |
|---|---|---|
| Avg. BTU | 1023 | 1139 |
| Avg. Methane | 95% | 88% |
| Avg. Ethane | 2% | 6% |
| Avg. S.G. | .59 | .66 |
| Avg. C1/C1-5 (Ratio of methane gas to total hydrocarbon gas) | .97 | .89 |
| Avg. $CO_2$ | 1.3% | 0.9% |

The combination gas analysis values shown fall between the Fruitland dominated gas averages and the P.C. dominated gas averages and probably represent a split mixture of the two formation gases in those wells. Note, at the bottom of the page, the Fruitland coal gas analysis averages from the Cedar Hill field (which is north of demarcation line). These numbers are drastically different from those south of the demarcation line for the Fruitland coal gas.

| | South | Cedar Hill |
|---|---|---|
| Avg. $CO_2$ | 1.3% | 6% |
| Avg. BTU | 1023 | 951 |
| Avg. Methane | 95% | 94% |
| Avg. Ethane | 2.2% | 0.2% |
| Avg. S.G. | .59 | .61 |
| Avg. C1/C1-5 | .97 | 1.00 |

It is also interesting to recognize that the Fruitland coal south of the demarcation line tends to produce gas with very little to no water production at all. These are drastically different production characteristics than in the Cedar Hill field. Note that Rice, et al printed a paper on Fruitland coal gas analysis in the same guide book I mentioned earlier which states that Fruitland coal gas in the southern part of the basin exhibits different gas characteristics than gas analysis in the northern part of the basin. My study represents quite a few more data points on southern wells than Rice examined, and his findings seem to hold true. Rice's paper is entitled "Identification and Significance of Coal-Bed Gas, San Juan Basin, Northwestern New Mexico and Southwestern Colorado. I'd like to also add here that the gas analysis presented by Mr. Bush and the gas composition study presented by Mr. Craney for Fruitland coal fit very well with the averages for the Cedar Hill field and the area north of the line of demarcation, not with the averages for the area south of the line of demarcation.

Exhibit #12

Exhibit #12 is a map of the Fruitland formation outcrop in the San Juan Basin showing contours of coal isoreflectance throughout the San Juan Basin. This map was reproduced from Rice's paper I just mentioned. This map is presented to indicate the location of the gas analysis samples used to calculate the average gas characteristics in Exhibit #11 with relation to the line of demarcation. I have labeled the number of Fruitland coal dominated gas wells, P.C. dominated gas wells, and combination gas wells per section on this map. Note also the location of the Cedar Hill basal coal field which is marked as Area E on Rice's map and marked as a solid area in this exhibit.

Exhibit #13

Decline Plot to support that there is no drainage interference on 160-acre spacing in the Fruitland-P.C. Formation in South Gallegos field.

This exhibit shows the decline trends for 4 combined Fruitland - P.C. producers in the South Gallegos field. These wells are the Nassau #5, #6, #7 and #8, located in Section 36 of T27N, R12W, and operated by Jerome P. McHugh.

The bottom curve is a running average production plot of the Nassau #5 well which started producing in late 1973. The upper curve is a combined running average production plot of the Nassau #6, #7 and #8 wells which began producing in 1977. 3-month running average production was used to generate both curves to smooth out production data on the curves due to production rate variations throughout the years.

The Nassau #5 has an established decline trend which did not vary throughout its production life, even with the large production volumes taken from the 3 160-acre offset wells. The total production from all 4 wells is now over 2 BCF of gas. All of these wells were perforated in the Fruitland coal. The gas analyses for these wells were either Fruitland dominated gas or combined gas from the gas analysis study presented in Exhibit #11. It is interesting to note that these wells all have production declines and make small amounts of water, or no water at all. This is not classic coal gas reservoir behavior. But this is a good example of no interference taking place on 160-acre spaced wells producing all or a large part of their gas from the Fruitland coal. 320-acre spacing would definitely not be appropriate in this area.