

VIRGINIA OIL AND GAS CONSERVATION BOARD

SPACING HEARING

OAKWOOD COALBED GAS FIELD

REQUESTED BY OXY USA., INC.

APRIL 10, 1990

BUCHANAN COUNTY BOARD OF SUPERVISOR'S ROOM

GRUNDY, VIRGINIA

BOARD MEMBERS PRESENT

Mr. Benny Wampler, Chairman

Dr. Robert Whisonant

Mr. Jim Bunn

Mr. Chester Starkey

Mr. Tom Fulmer, State Oil & Gas Inspector

Ms. Diane Davis, Secretary

Counsel for Oxy USA, Inc. - Mr. Richard Counts

Mr. Wampler

Good afternoon ladies and gentlemen, my name is Benny Wampler and I am Assistant Director for Mining for the Virginia Department of Mines, Minerals and Energy. I am going to ask each Board member to introduce themselves.

The following members were present: Dr. Robert Whisonant, Mr. Jim Bunn, Mr. Chester Starkey, Mr. Wampler, Tom Fulmer State Oil & Gas Inspector, Diane Davis Secretary

Mr. Wampler

Thank you. The purpose of the hearing today is to hear arguments and evidence concerning the request of Oxy USA, Incorporated for the establishment of drilling units and spacing for the Oakwood Coalbed Gas Field. We will now ask Mr. Counts to present the evidence to the Board.

Mr. Counts

Thank you Mr. Chairman and members of the Board. Mr. Chairman, as you have indicated, the Board has convened today to hear Oxy's request for the issuance of an Order granting 80 acre spacing to cover the lands involved in this application. Also appearing today on behalf of Oxy USA in addition to the expert witnesses which we will call, I would like to introduce to the Board Ms. Patricia Patton, counsel for Oxy USA, along with John McKinnis with the firm of Counts, McKinnis and Scott. In order to develop some perspective, I would also like to before we get into the hearing pass out some of the exhibits. I think it will help in terms of going through the application. I will be making reference to these, Mr. Chairman, during the course and introducing a number of these as exhibits in the hearing.

Mr. Wampler

Thank you

Mr. Counts

Mr. Chairman and members of the Board, as you are aware the current spacing state wide field rules in Virginia today is based on approximately 19 acre radial spacing. The spacing sought and requested by Oxy today is based on 80 acre spacing. This exhibit which will be introduced during the hearing essentially shows the area sought to be spaced by Oxy which is overlaid by a grid system and the dark lines you see here also entail the Island Creek mine boundaries. This is the entire area sought to be spaced. Essentially right now the western half of this area, all of this area to my left here is currently spaced under an order which the Board issued last year granting 60 acre spacing to Equitable Resources. The area to the east is currently under state wide spacing rules which as I

indicated provide for 19 acre spacing. Mr. Chairman with leave of the Board I would like to go into just briefly to what spacing is for the benefit for the public and what the reasons are why we requested this relief. With your permission I will do that.

Mr. Wampler

Go ahead

Mr. Counts

Essentially the production and development of oil and gas early on was governed strictly by the common law of doctrine of the rule of capture. Under that doctrine if you assume that you have an 80 acre unit and if you further assume that the most efficient and economical way to drain that unit is to locate one well bore in the center of that unit and that one well bore would in fact drain that unit under the rule of capture as a result of the fact that say landowner A owns this unit and they are surrounded by adverse landowners all around as opposed to drilling this well in the center of this unit and maximally drain this unit, the most prudent location to drill this well is going to be on the outer perimeter. The purpose of all conservation laws and schemes throughout the country are for the protection of correlative rights and the prevention of waste. I think we can see here without the benefit of spacing laws and conservation laws that would not be effective. As soon as landowner A drills a well here, landowner B will offset that well as close to landowner A's property line as is possible. We already have two wells where essentially one well would have drained this entire area. As soon as this occurs A will counter by drilling here B to protect will drill here etc. What this results in is two types of waste, economic and physical waste. From an economic standpoint we have drilled a significant number of wells, lets say eight where really one well would have drained this field or this unit of this particular gas. We have physical waste from the standpoint that as opposed to producing this well prudently landowner A is required to produce the gas or produce the oil or the hydrocarbons as quickly as they can get them out of the ground. That will end up leaving a significant amount of hydrocarbons and will not efficiently drain the reservoir. Further graduation of that is that once conservation laws were implemented statewide rules were first enacted, statewide rules are basically are reasonable basis to assume that anywhere within a particular region, particularly within that state that a well will drain a specific number of acres. As I indicated in Virginia, that is based on 19 acre spacing. Coalbed

methane spacing to my knowledge in terms to the wells being drilled throughout the United States basically those goes from some 40 acres to units that are as much as 320 acres in the Fruitland formation in Colorado. As I indicated in Virginia the spacing is now on 19 acre radial basis that is on statewide basis. With regard to the Nora field which covers the western half, the Nora Coalbed Gas Field which covers the western half of the acreage which we have sought to have spaced today that is based on 60 acres and the spacing which Oxy is requesting today is based on 80 acre units. Primarily the purpose of todays hearing is to demonstrate why 80 acre spacing is necessary to govern operations in the area sought to be spaced by Oxy's application. It is necessary from a statewide standpoint to insure that correlative rights and the prevention of waste is protected. I think that you can indicate if you have got an 80 acre unit such as this unit here and you are drilling on statewide rules of a 19 acre radius, the correlative rights of these individuals outside that radius are going to be violated. In addition from the standpoint of the overlap between the area sought to be spaced under this order and the Nora Coalbed Gas Field rules as promulgated by the Board last year that the modification of the overlap of the Nora Coalbed Gas Field is necessary to change with geologic conditions in order to conform to Island Creek's mine boundaries and for the prevention of waste and the protection of correlative rights. Mr. Chairman with that aside I would like to go ahead and call my first witness if there are no questions from the Board. Mr. Starkey.

Mr. Starkey

If you will excuse me but where did you get that 19 acre figure?

Mr. Counts

That is just out of my calculator in terms of trying to take a look at the I think the wells now being drilled statewide spacing is on a 500' radius. That is on a radial basis. I think on a square that would be probably about 23 or 24 acres.

Mr. Starkey

That is for natural gas?

Mr. Counts

Coalbed methane Mr. Starkey. Strictly coalbed methane.

Mr. Wampler

Any other questions of the Board. O.k. proceed.

Mr. Counts

I would like to call as my first witness Mr. Marty Wirth.

Mr. Marty Edward Wirth

Mr. Counts Mr. Wirth who are you employed by and in what capacity?

Mr. Wirth I am employed by Oxy USA, Inc. and I am a coalbed methane project land manager.

Mr. Counts Mr. Wirth have you ever testified before the Virginia Department of Mines, Minerals & Energy?

Mr. Wirth No

Mr. Counts Mr. Wirth would you advise the Board in terms of your background please and your education?

Mr. Wirth I hold a degree in human relations and I have completed numerous professional landman and law educational courses resulting in numerous certified professional landman credits. I am a member of various professional associations and organizations as American Association of Professional Landman, International Right-of-Way Associations and organizations of such.

Mr. Counts Mr. Wirth would you state your work experience with Oxy?

Mr. Wirth I have been employed for almost 13 years with Oxy USA with the majority of my experience being in contract negotiations and lease and surface acquisition, division orders, environmental aspects in the oil and gas industry and negotiations with royalty and surface owners.

Mr. Counts Mr. Chairman I would like to offer Mr. Wirth as an expert witness in this matter.

Mr. Wampler All right

Mr. Counts Mr. Wirth do your responsibilities include the lands involved here and the surrounding area?

Mr. Wirth Yes it does.

Mr. Counts How long have you worked in or been familiar with this area?

Mr. Wirth In the Appalachian area approximately seven years.

Mr. Counts Do your duties involve the lands that are subject to this application?

Mr. Wirth Yes

Mr. Counts Are you familiar with the spacing application and the relief requested?

Mr. Wirth Yes sir

Mr. Counts Is Oxy the owner of the right to drill a well in the lands involved herein so as to produce coalbed methane?

Mr. Wirth Yes sir

Mr. Counts Would you indicate what type of leasehold position that Oxy has acquired.

Mr. Wirth We have acquired numerous oil and gas leases, coalbed methane leases from the various ownership aspect.

Mr. Counts In otherwords, Oxy has a significantly sole position underlying the lands sought to be spaced?

Mr. Wirth Yes sir

Mr. Counts Mr. Wirth what is the boundary of the field Oxy seeks to have spaced?

Mr. Wirth The boundary in the field for this application will be from the north boundary latitude line of 37 degrees, 17 minutes, 30 seconds; the eastern boundary line of longitude line of 81 degrees, 52 minutes, 30 seconds; a southern boundary latitude line of 37 degrees, 07 minutes, 30 seconds and a western boundary line being a longitude line of 82 degrees, 07 minutes, 30 seconds.

Mr. Counts Mr. Wirth would you point that out on the plat that you have prepared.

Mr. Wirth Sure, The exhibit I was referring to was the north boundary line of 37 17 30 here would be your eastern boundary line, southern boundary line and your western boundary line.

Mr. Counts Mr. Wirth was this plat prepared by you or under your direction?

Mr. Wirth Yes sir it was

Mr. Counts How does this plat differ from the one attached as Exhibit A to Oxy's application?

Mr. Wirth We have superimposed the 80 acre units on the exhibit previously submitted.

Mr. Counts Mr. Chairman I would like to offer this plat into evidence as **Exhibit Number One** and this plat is offered in substitution to the one attached as Exhibit A to the application.

Mr. Bunn Could you show me on there the Town of Grundy please.

Mr. Wirth Yes sir. Grundy is located right here.

Mr. Bunn Thank you

Mr. Wampler This will be substituted.

Mr. Counts We are also Mr. Wirth, for orientation purposes to point out the boundaries of Russell and Tazewell Counties.

Mr. Wirth A small overlapping of the counties right here of Tazewell County and the Russell County line, right in this area.

Mr. Counts Mr. Wirth, do you further wish to amend the application as to the counties involved?

Mr. Wirth Yes

Mr. Counts Mr. Chairman, I believe the original application indicated that the lands involved were only in Buchanan. As Mr. Wirth has demonstrated to the Board, a very small segment of the acreage is also involved in Tazewell and Russell County. Mr. Wirth would you advise the Board as to the existing spacing for acreage sought to be spaced by this application.

Mr. Wirth Repeat that again.

Mr. Counts Would you advise the Board as to the existing spacing for the acreage sought to be spaced by the application or the existing spacing of your area here?

Mr. Wirth As you referred to earlier, approximately the western half of this area has been previously spaced by the Nora Coalbed Gas Field in 1989 which approximately covers 500,000 acres and created a 60 acre unit spacing in that area. The remaining acreage is governed by statewide spacing, (i.e. 500'

from a lease line and a 1000' between each coalbed methane well).

Mr. Counts Mr. Wirth could you indicate the eastern most boundary of the Nora Coalbed Gas Field?

Mr. Wirth The eastern most boundary will be 82 degrees 00 minutes 00 seconds.

Mr. Counts Thank you sir. Does Oxy request modification of the Board's March 20th, 1989 order such that the drilling units contained in that portion of the Nora Coalbed Gas Field bounded on the north by latitude line 37 degrees 17 minutes 30 seconds on the east by longitude line 82 degrees on the south by latitude line 37 degrees 07 minutes 30 seconds and on the west by longitude line 82 degrees 07 minutes 30 seconds be modified so as to establish in such area 80 acre units?

Mr. Wirth Yes we do.

Mr. Counts Mr. Wirth you also have an exhibit that depicts the overlap between the Nora Coalbed Methane Field and Oxy's proposed field?

Mr. Wirth Yes

Mr. Counts Would you show that to the Board please sir? Mr. Chairman and members of the Board this exhibit is also on page two of your book.

Mr. Wirth The green outline is the current approximate area of the Nora Coalbed Gas Field, the red is the application which we are here today to discuss.

Mr. Counts Mr. Chairman I would like to offer this plat into evidence as **Exhibit Number Two**.

Mr. Wampler O.k. so noted

Mr. Counts Mr. Wirth what name does Oxy propose for the pool underlying this proposed field?

Mr. Wirth What we are going to ask for is the Oakwood Coalbed Gas Field.

Mr. Counts Does Oxy request that this order be effective as of today?

Mr. Wirth Yes we do

Mr. Counts Mr. Chairman I have no further questions of this witness.

Mr. Wampler Any questions from the Board?

Dr. Whisonant I have one. Mr. Wirth you said that Oxy has significant holdings in the proposed new field. What kind of number would that be?

Mr. Wirth We are talking almost 80,000 acres under leasehold interest.

Dr. Whisonant Out of a total of how many?

Mr. Wirth Approximately 85 to 87 thousand is a rough estimate. This is when we say Oxidental Corporation. Between the two companies of Island Creek and Oxy USA.

Dr. Whisonant So Oakwood would be about 86 87 thousand acres total?

Mr. Wirth The total spacing area we are asking for or just the area which Island Creek, a total area of approximately 100,000 acres.

Dr. Whisonant That is this.

Mr. Wirth Yes inside the red, yes sir.

Dr. Whisonant O.k. and of that you have got about?

Mr. Wirth I would say 87 to 85 percent of it. Because some of that acreage Island Creek does not mine on. Therefore we do not have at this time, plans to develop on it.

Dr. Whisonant Is it unleased or does somebody else have it?

Mr. Wirth That is another coal company's concern and I believe I cannot make a statement as to if it is leased or not.

Mr. Counts I would also like to add to Dr. Whisonant that we would be concerned from a spacing application that it is really necessary to show that you are a party in interest to be able to maintain an application for spacing not that you have, we try to indicate that Oxy does have a significant acreage position in here but I would like to point out to the Board to that is going to be the exception as opposed to the rule. That at any time any operator has that high of percentage under lease in a given area you may well go into an area and in fact only have five

percent or ten percent under lease. I am concerned from a precedence standpoint that it not reflect that any operator have a burden of having even a majority of acreage under lease. But Oxy does has, as Mr. Wirth has indicated, a significant amount of acreage under lease in this situation.

Dr. Whisonant Thank you

Mr. Wirth You are welcome

Mr. Bunn Is it Marty?

Mr. Wirth Yes sir

Mr. Bunn O.k. what I would like to know are you the one we are going to address the questions to on this 80 acre spacing?

Mr. Counts Mr. Bunn we will have a geologist and engineer testify with regard to the spacing request with regard to drainage and answer technical questions.

Mr. Bunn That is fine.

Mr. Wampler Any other questions? Thank you Mr. Wirth.

Mr. Counts Mr. Chairman the next witness I would like to call is Mr. Robert Barnes.

Mr. Robert Allen Barnes was sworn in

Mr. Counts Mr. Barnes, who are you employed by and in what capacity?

Mr. Barnes Employed as a drilling specialist by Oxy USA, Incorporated.

Mr. Counts Have you previously testified before the Department of Mines, Minerals & Energy?

Mr. Barnes No sir

Mr. Counts Would you state your education for the Board please sir?

Mr. Barnes I have a degree in accounting from New Mexico State University.

Mr. Counts Would you indicate your work experience?

Mr. Barnes I have been employed by Oxy USA for 11 1/2 years as a drilling specialist in the Rocky Mountain region.

Mr. Counts Would you advise the Board as to your areas of responsibility at Oxy?

Mr. Barnes I was responsible for supervising drilling and completion operations, permitting and production operations in that region.

Mr. Counts Would you list your professional associations.

Mr. Barnes I am a member of the Society of Petroleum Engineers, International Association of Drilling Contractors.

Mr. Counts Mr. Chairman, I would like to offer Mr. Barnes as an expert witness in this matter. Mr. Barnes are you familiar with the well work permit applications filed by Oxy USA with the Inspector's office?

Mr. Barnes Yes sir

Mr. Counts As of this date, how many applications have been filed?

Mr. Barnes Fourteen applications

Mr. Counts Does each of the applications involve lands located in the proposed Oakwood Coalbed Gas Field?

Mr. Barnes Yes sir

Mr. Counts Can you depict the proposed locations of these wells on a map?

Mr. Barnes Yes sir we have a map with the locations plotted on them.

Mr. Counts Would you present that to the Chairman please. Mr. Chairman I would like to offer this plat into evidence as **Exhibit Number Three**.

Mr. Wampler O.k.

Mr. Counts Mr. Barnes were these permit applications filed based on statewide spacing laws?

Mr. Barnes Yes sir initially.

Mr. Counts Have permits been issued to Oxy for any of these fourteen applications?

Mr. Barnes We received permits for CBMI-2, 3 and 4.

Mr. Counts The other 11 applications are pending?

Mr. Barnes Yes sir

Mr. Counts Does Oxy request that the spacing for these fourteen proposed wells be modified to conform to and be consistent with the spacing requested, the 80 acre spacing requested by Oxy in its application?

Mr. Barnes Oxy has set a period of 90 days effective as of the date of the issuance of the order be allowed to submit new well plats based on 80 acre spacing.

Mr. Counts Is the reason for this to accommodate the proposed wells to the new field rules?

Mr. Barnes Yes sir

Mr. Counts Mr. Barnes are you familiar with the application filed in this case?

Mr. Barnes Yes sir

Mr. Counts What sort of spacing is requested?

Mr. Barnes Oxy is requesting 80 acre square with 300' set back in the unit boundary making the well locations a minimum of 800' between wells.

Mr. Counts Do each of the proposed wells involved in the 14 applications you spoke of conform to the requested spacing?

Mr. Barnes No sir, seven of the proposed 14 are located within the 300' setback area.

Mr. Bunn Hold it what was that now?

Mr. Barnes On the smaller grid there is a block inside a block. The picture frame around the larger block is the setback area. Seven of the wells we have before the Commission are in this setback area.

Mr. Counts That is essentially our request for location exceptions as noted in their application. We will go further into that to Mr. Bunn. Mr. Barnes was it necessary to spot wells at these locations due to topographic considerations, economic constraints and to conform to Island Creek's plan of operations?

Mr. Barnes Yes sir

Mr. Counts Will you identify for the Board the six proposed wells which are located within 300' of the unit

boundary where offsetting ownership is common to the unit where the location exceptions are requested?

Mr. Barnes We have grid system set up. Letters by numbers. Well number B-29 which has also been permitted under I-9 is in the setback area, the L-24 is also in the setback area, the P-26 which is called the I-8 is in the setback area, the Q-26 which is the I-10 is setback, the V-34 is in the setback area, the X-11 is in the setback area.

Mr. Counts Mr. Barnes in addition to the six you have just listed for the Board do you also request a location exception for well number 1-5 located in unit X-10?

Mr. Barnes Yes sir, this would be location right here.

Mr. Counts Mr. Barnes in terms of trying to attempt to develop a well location for that well what types of consideration did you encounter in terms of locating the well?

Mr. Barnes We were under pretty steep terrain. We had drainage problems and there are also dwellings in the area. These all played a part in location selection.

Mr. Counts Did you also have discussion with regard to Island Creek in terms of mining operations in terms of locating this well?

Mr. Barnes Yes sir

Mr. Counts I assume that the location conforms with those discussions?

Mr. Barnes Yes sir we have been approved by Island Creek.

Mr. Counts Mr. Barnes are the owners of the offsetting units to those units which you have requested location exception, I apologize to the Board I have already gone through that one. Mr. Barnes does Oxy request that the Board grant location exceptions for these seven wells?

Mr. Barnes Yes sir

Mr. Counts Mr. Chairman I don't have any further questions of Mr. Barnes.

Mr. Wampler Any questions from members of the Board?

Mr. Bunn Yes

Mr. Counts Mr. Bunn we will also have a reservoir engineer that will be giving data on reservoirs.

Mr. Bunn Do you have all the property leased in these areas where you are in the setback area?

Mr. Barnes The fourteen wells listed on this map are at least 1250' from any adverse leases.

Mr. Wampler Thank you

Mr. Counts Mr. Chairman I would like to call Mr. Dennis Lewellen.

Mr. Dennis G. Lewellen was sworn in

Mr. Counts Mr. Lewellen would you state who you are employed by.

Mr. Lewellen I am the division geologist in Virginia for Island Creek Company. I have been here since 1987.

Mr. Counts In what capacity are you employed?

Mr. Lewellen As the Division Geologist I am responsible for the exploration drilling program, underground geologic mine mapping, I will take care of any groundwater problems we have as are related to the mining operations. I have also reviewed the E-logs of gas wells or ventilation holes that are drilled on our property. I have a certain amount of responsibilities in roof control as it is related to poor top and that sort of thing.

Mr. Counts Mr. Lewellen would you also state for the Board your educational background?

Mr. Lewellen I have a masters degree in coal geology from Eastern Washington University which is out in Cheney, Washington. I am a PhD candidate in coal geology at the University of Kentucky, Lexington.

Mr. Counts Would you indicate any professional associations that you are a member of?

Mr. Lewellen I am a member of AAPG (American Association of Petroleum Geologists), AIPG (American Institute of Professional Geologists) and I am a member of VMI (Virginia Mining Institute).

Mr. Counts Mr. Lewellen do you have other experience which this Board might find favorable with regard to this matter?

Mr. Lewellen Yes in terms of roof control, I have looked at the hydraulic fracs in other mines at the Jim Walter #4 Mine in the Black Warrior Basin and I have seen some of the fracs in the roof at the Buchanan #1 mine which is adjacent to our VP#6 mine. I have looked at some of the stuff we have done in ventilation holes in our VP#6 mine.

Mr. Counts Mr. Chairman I would like to offer Mr. Lewellen as an expert witness in this matter.

Mr. Wampler All right

Mr. Counts Mr. Lewellen in order for the Board to understand the necessity for coming up with a special set of rules for the production from the various coal seams underlying this field, would you please describe the general geological history and lithology of such coal seams for the area.

Mr. Lewellen The coal seams that we are interested in are in the coal measures, the upper carboniferous or Pennsylvanian seams and I have a strat column here which I can show you. What you have here is a stratigraphic column of the coal seams, the Pennsylvanian Age coal seams of the Oakwood Coalbed Gas Field. The formations that we are dealing with are the Lee formation and the Pocahontas formation and we are interested in the Pocahontas 9 through Pocahontas 2, the Lower Horsepen, War Creek, Middle and Upper Horsepen, Lower Seaboard, Middle Seaboard, Greasy Creek and Upper Seaboard. Basically we are looking at all the coal seams below the Tiller seam. In terms of economic importance based upon gas content, continuity, lateral continuity of the coal seam and thickness, the most important coal seams are labeled here in group one which are the three and four seams and in group two the War Creek, Lower Horsepen and Pocahontas are particularly important to us and then the group 3. Most of the coal that you see here is a low vol. bituminous although some of the stuff in the upper portion in group 3 probably gets into the mid vol. range. Gas contents will vary between about 230 to 697 to 700 cubic feet per ton. Really the group ones are the most important to us.

Mr. Bunn What was it now?

Mr. Lewellen It ranges quite widely from 230 to about 690 700.

Mr. Bunn Cubic feet

Mr. Lewellen Per ton

Mr. Counts Mr. Lewellen would you indicate generally for the Board how these coal primarily are different from those in Dickenson County where the predominant part of the Nora Coalbed Gas Field spacing is located?

Mr. Lewellen I believe in our case they are probably looking at something higher in the section, perhaps around the Tiller in that interval. Our seams it is a different set of coalseams, we are much deeper in terms of the coal measure section.

Mr. Starkey Excuse me I missed the question.

Mr. Counts I asked Mr. Lewellen if he would indicate for the Board how the difference in the coal from the Dickenson County where primarily the Nora Coalbed Gas Field lies as opposed to Buchanan County where Oxy's request for spacing is.

Mr. Starkey Thank you

Mr. Counts Mr. Chairman I would like to offer this coal strat column chart into evidence as **Exhibit Number Four**.

Mr. Starkey Let me ask a question here if I may. Do you have a figure on the BTU content of this gas?

Mr. Lewellen Of the methane?

Mr. Starkey Yes

Mr. Lewellen Most of the numbers will range between 960 to 1010 we seem to average around 977 BTU.

Mr. Starkey Does this come out under rock pressure?

Mr. Lewellen No, this is coming out of coal seams and of course it will be under hydrostatic pressure but basically we bring it down to atmospheric pressure or try to get it as low as we can. It is a low pressure reservoir.

Mr. Counts Mr. Lewellen what coal seams are underlying the proposed boundaries of the Oakwood Coalbed Gas Field do you anticipate will be developed. I think you have already indicated that.

Mr. Lewellen We anticipate to develop all the ones I named plus any unnamed seams. There are numerous riders and liters and very thin discontinuous seams in this area as well.

Mr. Counts Do you also have maps depicting cross-sections with regard to the coal.

Mr. Lewellen Yes I do, I have a location map and a cross-section I will show you.

Mr. Starkey Before you leave this, maybe I didn't understand when you went back and answered the question on the range of the cubic feet of methane per ton were you speaking about your drilling area here?

Mr. Lewellen Yes in our area.

Mr. Starkey I thought it didn't sound right, o.k. I understand now.

Mr. Lewellen Before I go into the cross-section, I will first just show you a location map and how this cross-section fits in with the Island Creek properties. This map here shows the seven mine properties at Island Creek, VP#3, 1, Beatrice, 5, 6, 2 and 4. We have four active mines on the west side of the property and then Beatrice 2 and 4 are presently inactive. I have got a scale here. The cross-section is shown here it runs northwest/southeast. The first hole is L-302 on the northwest and on the southeast end it is L-299. Now I will bring up the cross-section here. This cross-section shows the coal seams which we are interested in developing. We will be going down as deep as the Pocahontas #2 which lies about 40' below the 3 seam which is the datum here. The holes you see on the northwest is L-302 and then it just goes on through seven different core holes to L-299 which is on the southeast. You have got a scale here of about 0-5000 for horizontal and 0-200 for vertical. The coal seams you see on this cross-section aren't to scale. I had to thicken them up so that you could see them.

Mr. Counts Mr. Lewellen should all the coal seams below the Tiller be involved in any order resulting from this hearing?

Mr. Lewellen Yes sir

Mr. Counts Mr. Chairman I would like to offer Mr. Lewellen's location map as **Exhibit Number Five** and the strat cross section as **Exhibit Number Six**.

Mr. Wampler O.k. it will be so accepted.

Mr. Counts Thank you sir. Mr. Lewellen based on your study is the area described as the Oakwood Coalbed Gas Field wholly underlain by the several coal seams you named?

Mr. Lewellen Yes, the most continuous is the Poca 3, Pocahontas #3, then the other coal seams I had mentioned tend to be more sporadic, come and go.

Mr. Counts Mr. Lewellen we see in the strat chart and the cross-section, would you also with regard to the exhibit one get in terms of perspective for the Board indicate visavis the area sought to be spaced, what the relationships are of these seams and how that impacts the area requested by Oxy.

Mr. Lewellen All right in our program the areas we are most interested in in terms where we have the thickest coal, the most numerous and best gas content lie in this area here in the east and central portion of our properties. Then as you go to the northwest the gas contents, off in this direction, the gas contents tend to get lower. The number of coal seams diminishes and they do get somewhat thinner. The reason this is occurring is most of the section we are looking at is pinching out into the Lee Formation sandstones. Overall this fits pretty well with what our mine planning is and how we can best develop it.

Mr. Counts Mr. Lewellen should the Board's order provide that all coalbed gas wells now or later drilled in this field be declared exploratory wells so as to qualify for the two year period of confidentiality provided for in Virginia Code for all logs, surveys and other reports filed with the Inspector?

Mr. Lewellen Yes sir

Mr. Counts Mr. Lewellen is it your professional opinion that 80 acre spacing is necessary to allow conformity with Island Creek's mine boundaries?

Mr. Lewellen Yes sir

Mr. Counts Does the area sought to be spaced including the overlap essentially conform with Island Creek's mine boundary as depicted on the front cover of the material submitted to the Board?

Mr. Lewellen Yes it does

Mr. Counts Mr. Lewellen am I correct in that the eastern half of Island Creek's mine boundary is presently covered by the Nora Coalbed Gas Field spacing order? Excuse me the western boundary?

Mr. Lewellen Yes it is covered by that.

Mr. Counts In your opinion Mr. Lewellen will the granting of the application be in the best interest of conservation, prevention of waste and protection of correlative rights?

Mr. Lewellen Yes sir

Mr. Counts Thank you Mr. Lewellen. Mr. Chairman I have no further questions of this witness.

Mr. Wampler Mr. Lewellen I would like to ask you a question on the confidentiality. I would like for you to explain more why that you recommend that that be considered exploratory and when you are asking the Board to set this up throughout the field why it should be considered exploratory and held confidential.

Mr. Lewellen Well we will be putting a lot of time and money into collecting data on the stratigraphy and the reservoir characteristics and a number of other things which will be beneficial to us. It will help us out in our long term development of this field.

Mr. Counts Mr. Chairman I would also like to have Mr. Wilson who will be my next witness to address the confidentiality question as well.

Mr. Wampler O.k.

Mr. Bunn Is it the right time now Rick for me to ask about the 80 acre?

Mr. Counts Next one sir.

Mr. Bunn All right that will be fine.

Dr. Whisonant I want to be sure I am oriented now relative to the, you can't hear, I just want to stay caught up on how the Nora production compares to this. Now Nora coal seams that you are developing are above stratigraphically or below?

Mr. Lewellen The Nora coal seams are above us as near as we can tell because looking at the regional geology I know that most of these seams that we are dealing with

pinch out. We don't know exactly what the Nora field consists of considering that that data is confidential.

Dr. Whisonant

I am also curious about how deep are these wells? I can't tell from your cross-section relative to say ground surface or sea level or some plane?

Mr. Lewellen

The Pocahontas #3 seam is at sea level roughly in our area. The section will roughly be 1500' to the southeast and it loses about 300' to the northwest. So it will be between 1200 and 1500' of section and that is starting at stream drainage. So three seams at sea level basically.

Dr. Whisonant

Thank you

Mr. Counts

Mr. Lewellen is it essentially your position, to follow up on Dr. Whisonant's question, that the coals basically commencing with the Buchanan County line and running to the west essentially constitute a separate and distinct reservoir.

Mr. Lewellen

Yes sir I think so.

Mr. Counts

That would be due to?

Mr. Lewellen

We are lower in the section stratigraphic section.

Mr. Counts

Relative thickness of coal as well as coals pinching out disappearing?

Mr. Lewellen

Our coal, the three seam is generally about six feet and as we go to the east and northwest these coals will pinch out and get thinner.

Mr. Counts

Thank you Mr. Chairman

Mr. Starkey

On this production per ton, will that vary I assume in different areas?

Mr. Lewellen

It will vary with the rank of the coal. It will vary with the ash content. Generally the higher the rank the more gas. The ash content even though you may have a high rank coal if you have a high ash content you won't have as much gas. If you are too close to the surface and get within three or four hundred feet a lot of that gas will leak off. There are a lot of different variabilities in the gas contents. That is why you see such a wide range. Plus we were taking.

Mr. Starkey

Did you quote a range?

Mr. Lewellen Yes it was between about 230 and 700.

Mr. Starkey In this field.

Mr. Lewellen Yes

Mr. Starkey What about other fields. Do you have experience and knowledge of other fields other ranges you spoke of acreage going up

Mr. Lewellen I would say if you wanted to pick an average number, what I have seen like in the Black Warriors is probably running about 400 cubic feet per ton. Out west I have seen that number to. It seems to be hovering around there between 200, 400 and 600.

Mr. Starkey This was what was the high range, up to 230

Mr. Lewellen Yes, yes

Mr. Starkey What was the low range?

Mr. Lewellen The low range would be around 230 or so.

Mr. Starkey I thought that was the high range?

Mr. Lewellen The higher the number the more gas you have got. So 700 cubic feet per ton is about as high as it gets.

Mr. Starkey Do you expect to get that here?

Mr. Lewellen In places we will. We have gotten samples like that, yes sir.

Mr. Starkey Is there a minimum figure for economic purposes...

Mr. Lewellen We figure looking at what we have got the limited data we have is it is going to average around 400 cubic feet per ton.

Mr. Starkey And that is economical?

Mr. Lewellen Yes sir. Economically there are other factors other than just gas content that come into play. But that is an important factor.

Mr. Starkey I guess I am trying to relate this some way to the 80 acre figure. If it is lower do you want more acreage?

Mr. Lewellen When Weldon comes up he can discuss that with you. He will answer your question better than I can.

Mr. Bunn In this if you will, did you find that the gas is pretty much in all the seams. It is just that they dissipate faster or that you find it in all seams above drainage as well as below drainage?

Mr. Lewellen I will find gas in all the below drainage seams once you get below the water table. What happens when you get above drainage, above water table is occasionally you get a little bit of gas but most of it has bled off through just increased permeability of the surrounding strata. But the strata around here is pretty tight so once you get below the ground water table it will keep the gas in it.

Mr. Starkey Is there any by products of this that you want to capture?

Mr. Lewellen From the coalbed what you basically get is 96 percent methane, a little bit of Co2 and some inerts. So it is very dry gas and very pure.

Mr. Wampler O.k. thank you very much.

Mr. Counts Mr. Chairman I would like to call my next witness Mr. Weldon J. Wilson

Mr. Weldon J. Wilson was sworn in

Mr. Counts Mr. Wilson who are you employed by and in what capacity?

Dr. Wilson I am employed by Oxy USA, Inc. I am an engineering advisor for that firm. I have worked in that capacity for a total of 7 1/2 years.

Mr. Counts Would you state for the Board please your educational background

Dr. Wilson I have a PhD in physics from Oklahoma State University. I have attended numerous industry short courses and seminars on reservoir simulation, coalbed methane production, hydraulic fracture simulation.

Mr. Counts Would you also state for the Board any professional associations.

Dr. Wilson I am a member of the Society of Petroleum Engineers, the American Physical Society, Society of Industrial and Applied Mathematician, the Society of Exploration Geophysicist.

Mr. Counts Thank you, Mr. Chairman I would like to offer Mr. Wilson as an expert witness in this case.

Mr. Wampler O.k.

Mr. Counts Mr. Wilson does your responsibilities with Oxy USA include the lands involved in this application?

Dr. Wilson Yes they do.

Mr. Counts Are you familiar with the geological data available in this area?

Dr. Wilson Yes

Mr. Counts Have you made a study of the lands involved here and the surrounding area?

Dr. Wilson Yes I have

Mr. Counts Would you discuss with the Board the data used in making those studies.

Dr. Wilson We used predominantly data taken from literature along with a computer coalbed reservoir simulator that was developed initially by Gas Research Institute. The data was taken from studies funded by the Department of Energy, U. S. Bureau of Mines and the Gas Research Institute. Some background in those the Gas Research Institute was founded back in the 70's to more effectively utilize our gas resources in this country. It takes funding from users and then uses that money to fund fundamental research to all phases of natural gas. The Department of Energy naturally has strategic interest in utilization of gas resources as well as does the Bureau of Mines.

Mr. Counts Mr. Wilson are you familiar with whether the Gas Research Institute or GRI has been involved in any studies in Virginia?

Dr. Wilson Yes they have some of which we have been associated with in conjunction with them.

Mr. Counts Have any of those lands involved lands in Buchanan County Virginia?

Dr. Wilson Yes they have.

Mr. Counts Are you aware of any reports that have been prepared by GRI with regards to this data?

Dr. Wilson

Yes

Mr. Counts

Would you indicate for the Board the names of any of those reports?

Dr. Wilson

They have a quarterly report on the coalbed methane. They have regional reports for the Central Appalachian region. They are continually coming out with specialized reports not only of a data collection nature but also of field instrumentation, reservoir computer models that would help utilize the resource.

Mr. Counts

Thank you Mr. Wilson, Mr. Chairman I am going to be using several exhibits now in connection with Mr. Wilson's testimony and for the sake of expediency I would like to go ahead and go through several of those now and have those admitted as exhibits. They are all in the book you have in front of you. **Exhibit Number Seven** a chart entitled Air Permeability Distribution for Pocahontas Coal **Exhibit Number Eight** a chart entitled Permeability of Pocahontas Coal vs. Hydrostatic Stress **Exhibit Number Nine** entitled Pocahontas Coal Capillary Pressure **Exhibit Number Ten** a chart entitled Pocahontas Coal Water/Gas Relative Permeability **Exhibit Number Eleven** a chart entitled CBM Spacing Study Langmuir Desorption Isotherm. Thank you Mr. Chairman. Mr. Wilson will you go into a more complete discussion with regard to what these exhibits reveal and indicate to the Board what type of factors you have considered in terms of building your computer model.

Dr. Wilson

Yes, let me go over each one in turn. For convenience we are talking, I have got overhead, these are reproductions of what you have in your booklets. All of these exhibits I will be talking about here they were data taken from the literature, the sources I have previously mentioned. They are publicly available in the scientific and engineering literature. They were used as the basis for the computer modeling study which I will subsequently show. One of the key reservoir parameters that is important in trying to determine a spacing is the permeability. This is a series of tests done on Pocahontas coal from the Beatrice mine that was done at the University of Pittsburgh under the auspice of the Gas Research Institute. This has been published in 1974 in the Society of Petroleum Engineer's Journal. What it shows basically if you look at it is a tremendous variability in the permeability of coal even though these samples may have been taken

only a few feet apart. You will have some that will be over a hundred millidarcies. This would be a very good conductive coal that would transmit its gas through the well bore very effectively. You have the majority of the samples, around the 50 or 60 percent range, that are around the one millidarcy range. That would transmit the gas less effectively to the well bore. It would probably indicate that one would need to stimulate the well in some fashion. The depth at which coal is buried is an important factor on its permeability. One measure of that is what kind of confining stress you do these tests at and that is the two different bar types. You will notice that there is basically good agreement between these two tests because of the very low difference in pressures.

Mr. Wampler

Excuse me before you remove that I would like to take questions as we go so you won't have to pick out the one we are asking questions about. If we ask a question we are going to cover later tell us.

Mr. Bunn

So you are saying about 60 percent of the coal that they fall in the range of .1 to 1...

Dr. Wilson

Of these samples that were taken, roughly 60 percent of them fell within that range.

Mr. Bunn

That is millidarcies.

Dr. Wilson

It is millidarcies.

Dr. Whisonant

Dr. Wilson, those confining pressures, generally is that burial depth the main determinant there. Or something else?

Dr. Wilson

Yes the burial depth and the reservoir pressure that you are working at. These confining pressures, what you should probably keep in mind is it would be the burial depth, the overburden pressure as it is called minus the rock pressure, the full pressure of the fluid that is in there.

Dr. Whisonant

I presume that the 200-400 range is roughly equivalent to what you figure will be the case at Oakwood.

Dr. Wilson

On this series of tests it really isn't. At some portion of the reservoir there may well be that. I have another shot on the next photo that will show you where we expect more....

Dr. Whisonant

O.k.

Dr. Wilson I think this will probably answer the question better as to where we expect to be.

Mr. Wampler This is Exhibit Eight you are discussing. It will be helpful to us to number those.

Dr. Wilson O.k. What this is is a plot of five different samples of again Pocahontas #3 coal. It is actually showing you the relationship between the stress at which you were performing the test, the hydrostatic stress and the permeability of the coal. So one can effectively think of this scale as being tied to the depth at which the coal is buried. Again, you will notice that there is a fair amount of scatter. That occasionally you will get, in this case, one sample out of five it has a permeability that is ten to fifteen times greater than the other samples. I think that is something real that is occurring in the reservoir. That you will see that kind of variations over very small differences in strata probably.

Mr. Counts Dr. Wilson in considering the permeability or considering maximum spacing what kind of an impact does the permeability have on maximum spacing so as to insure protection of correlative rights.

Dr. Wilson The higher the permeability, then the larger the spacing that will effectively drain an area. If you have a very low permeability reservoir your wells have to be quite close together to effectively drain it. The range that we would expect, we are in the range of roughly 15,000 to 2,000 feet deep. One psi per foot of overburden. So we are in the 15,000-2,000 psi overburden pressure and our reservoir pressure is about 700. So if you take the difference between those so we are, whatever that is, maybe 800 in that range so basically this data agrees pretty well with the previous data that was done at a range of hydrostatic stress that we are not that interested in and that it falls around one to two with an occasional one being up at 10 or 20 milidarcy. Again this was, I believe this was DOE funding, University of California Berkley published International Journal of Rock Mechanics 1975.

Mr. Wampler Any questions on Exhibit Eight. I would like to take a ten minute recess please.

Mr. Counts Mr. Chairman I believe we were getting ready to start with Exhibit Number Nine now.

Dr. Whisonant Excuse me Mr. Counts let me just inform everyone here that our regular chairman, Mr. Wampler, had to leave. I will taking over if things don't go quite as smoothly as possible please bear with me. But we will do our best. Lets resume the testimony then.

Mr. Counts Thank you sir. Dr. Wilson I believe we are at Exhibit Nine.

Dr. Wilson Exhibit Nine, again data is available in the literature for Pocahontas coal Beatrice mine. There is actually two sets of data. One which we call the University of Pittsburgh data I believe this was DOE funded. That is the red curve. The blue is a GRI funded in one of the GRI reports. What this shows is how much pressure it takes to move gas through the pore spaces of the coal. That is a fundamental piece of information that we need to know because we know the pressure in these coal seams is very low. If there is not enough intrinsic reservoir pressure there, then even though the gas may exist there wouldn't be enough pressure to blow it through to overcome the capillary forces and blow it into the well bore when we drill it down.

Mr. Starkey Dr. Wilson you don't do any forcing any exhilarated as you do in natural gas wells?

Dr. Wilson We would upon drilling a well you draw that down as much as you can either by pumping water off of the formation or trying to get the wellbore pressure as low as possible. What I am talking about here is the difference in pressure between far out in the reservoir and near to the well bore. That pressure difference is what pulls the gas in towards you. If you don't have, what these curves are showing, if you don't have something at least on the order of 30 or 40 psi, you don't pull the gas toward you.

Mr. Starkey I guess my question is if you don't have it, you just leave it?

Dr. Wilson That is right, the gas will not move. What our model that I will show you later actually inputs is this red curve and we have to tabulate it and all those data points are placed into our computer simulator.

Dr. Whisonant Dr. Wilson, excuse us just a minute, Mr. Fulmer wants to ask a question.

Mr. Fulmer The GRI data you have plotted on there is that the most recent data?

typically produced not only from this data that I am showing you here for the Pocahontas coal but throughout the country. It also has associated water production with it. That is what these the curves of this exhibit attempt to exemplify. Again this was kind of busy but I have shown two different sources of data to give you some feeling for what kind of ranges of reservoir values one might expect even from a particular seam and a particular mine area. The one set of data which I have labeled GRI data that is the triangles or the solid lines is, I am sorry it is the dash lines and triangles is the GRI data and the other set of data which is the solid lines and the dots is the University of Pittsburgh published back in 1974 on the Pocahontas #3 coal seam.

Mr. Bunn

Let me ask. Could you tell me what the scales are there. What is going across the bottom and what is going up and down.

Dr. Wilson

What is being plotted along here is the water saturation as it currently exists. That is something that changes as you look at this plot as you produce the well you produce more and more water so typically one would start out for coalbeds one would start out at high water saturations and as you produce the coal that gas you would also produce water and this water saturation would go in this direction as you produce the well. The vertical scale runs from 0 to 1. It is a relative measure of how well that particular fluid would flow. So for instance, let me just concentrate on one of these curves to give you a feel for it, say the red one. The red one is the relative permeability of water. As we start off the reservoir we would expect it to be very high water saturation. So its relative permeability to water would be very high. That means that only water would flow initially it is high relative permeability of water. As one produces more and more water the amount of water that would actually flow at any given time is decreasing. Its relative permeability is decreasing. At some point you begin to produce gas and that is this solid blue curve. So as I get down and produce the reservoir where I am at an average water saturation of 70% I am flowing partially gas which is the blue curve and partially water although it is easier to flow the water at this point than it is the blue curve which is the gas. As I continue to produce the reservoir my water production drops and my gas production increases. The blue curve.

At some point late in the life we would be producing almost totally gas.

Mr. Bunn

At what point is the well economical to operate?

Dr. Wilson

That is not easy to answer. From this chart there are certainly lots of coalbed methane gas reservoirs that would be economic to operate realizing that they were going to start off flowing maybe for the first year or two nothing but water. So you could be out here on this part of the curve and produce it backwards and you have to run the specific economics for that case. We are in a very fortunate situation I think in that regard as far as the Pocahontas #3 seam is concerned.

Mr. Bunn

So you are saying you are past the 70% range going in right?

Dr. Wilson

I suspect from our modeling studies, it is very difficult to get hard numbers here, I suspect we are going to start initially in this range right here. Which means we don't have to go through this two year period of flowing water. I think somewhere in between 80 percent and 60 percent is where this coal seam should lie. Which means you will be getting gas production almost immediately.

Mr. Counts

Do you have a question Mr. Chairman?

Dr. Whisonant

Any questions?

Mr. Starkey

I am probably the only one in the room that doesn't know this. Do you have some responsibility for the disposal of that water?

Mr. Counts

Yes, absolutely sir. Those regulations and rules are promulgated by Mr. Fulmer's office.

Mr. Starkey

O.k. thank you.

Mr. Counts

The next will be Exhibit Number Eleven.

Dr. Wilson

The final or the most important variables I haven't shown you everything that is input into the simulator by any means but that as you are more familiar is the desorption isotherm. If one puts, in the case I have done it for a ton of coal, if one puts a ton of coal in a canister and starts pumping in methane under pressure, raising the methane pressure, what one would find is that more and more of that methane would be absorbed onto the surface of the coal. It would proceed as we increased the

gas pressure since the pressure is high we would be able to force more of them onto the surface and reaches a limiting value and in this case this is for Pocahontas coal that limiting value is about 650 standard cubic feet per ton for this particular sample shown here.

Mr. Bunn

But you are saying here in this field that 230 is about a minimum. Right.

Dr. Wilson

What you also have to consider is what the pressure is one will be working at. In our case we are probably at a reservoir pressure of around 700 so one would come up to this curve here and that is going to give something around 500 standard cubic feet per ton for this particular sample.

Mr. Bunn

In this particular area the minimum would be about 700.

Dr. Wilson

Right as presented earlier the minimum I believe he said was 230 and the maximum was about 700. In terms of our simulation study we have actually input this curve. That is a little better than putting in a specific number because then it can pick up how much gas is absorbed into the coal and would subsequently be desorbed into your gas production. Depending on what reservoir pressure you were at at a given time. The way you actually work it of course in a reservoir is that one starts at the initial reservoir pressure and one proceeds in this direction as you decrease the average reservoir pressure by producing the well. The gas then desorbes out of the coal and that is what is actually produced by the gas well.

Mr. Bunn

Tell me this formula here.

Dr. Wilson

This is the formula that is actually used in our model. It is the Langmuir Isotherm model that you maybe see in the literature occasionally. It is characterized by two constants, volume constant and a pressure. These two values here are the ones that were used and it generated this plot. I put that up there because often they just refer to it as Langmuir and no one ever seems to write down the equations. But that is it.

Dr. Whisonant

Questions

Mr. Counts

Dr. Wilson, utilizing the data that you just demonstrated to the Board were you able to project a

model depicting the maximum spacing which could be efficiently drained.

Dr. Wilson

Yes I was.

Mr. Counts

Before we go further into that would you mind explaining to the Board how using one of your exhibits how your data was imputed into your model.

Dr. Wilson

The next exhibit I believe is 12. This is a summary from a typical run that I might make of again there is a lot of data here but let me pick out one. For instance the permeability, in the case that I will be showing you today I used a permeability of two millidarcies. The way that was arrived at was going back to exhibit number 8 one would get into the range in which we were expecting, come up for the hydrostatic stress, come up and we have got in this case five different curves and then would take a weighted average to obtain the two millidarcies.

Mr. Counts

Mr. Chairman I would like to offer into evidence the following exhibits at this time. **Exhibit Number Twelve** which is entitled Coalbed Methane Spacing Study Reservoir Parameters Assumed, **Exhibit Number Thirteen** chart entitled Coalbed Methane Spacing Study Cumulative Production, **Exhibit Number Fourteen** chart entitled Coalbed Methane Spacing Study Recovery Factor. All of these exhibits are also in the folder before you.

Dr. Whisonant

Thank you

Mr. Counts

Dr. Wilson what did your model reveal as to the maximum efficient spacing for the field?

Dr. Wilson

Well, using these assumed parameters that were again taken predominantly from the literature we were able to project, using our computer simulator, these forecasts for the cumulative production from the 320 acre block. What we did was actually run the simulator for a variety of different cases shown here. We assumed in the first case that we had one well in the center of the 320 acre block. That is this bottom curve which shows its cumulative production over a 20 year span production. We then re-ran the simulator with the same reservoir parameters assuming that we 160 acre spacing or two wells in that 320 acre block. That was this next curve and we proceeded again to look at additional wells if we drilled four wells in that 320 acres which is 80 acre spacing, five wells which turns into 64 acres, eight wells which would be 80 acre

spacing, ten wells which is the 32 acres spacing and 16 wells or 20 acre spacing. What we saw upon doing that and just looking at this series of curves is by increasing the number of wells one drills in 320 acres one does not proportionately get the additional gas that one might expect. In fact you reach a point of diminishing returns. As you see these curves are getting clumped closer and closer together even though you may have drilled as many as twelve additional wells between one curve to the other. Another line that we use for our purposes is a cut off line. As you produce these wells the rate is also declining and this cut off line is where it crosses a particular curve indicates where the rate dropped below 25 mcf a day which is what we were using as a minimum economic break.

Mr. Bunn

25

Dr. Wilson

Twenty-five

Mr. Bunn

25 what now

Dr. Wilson

Mcf per day What you see from that is if you are at a very small spacing 20 acres that yes you can produce an amount of gas but economically from those 16 wells you would only produce it during the first four years. So by drilling more wells you accelerate your production. You get more of the production in up front. By drilling fewer wells you extend the economic life of the reservoir. In effect spread out that resource over a longer period of time. I would like to particularly point out that the two curves in question in the overlap area that would be appropriate would be the green one and the blue one. The blue one is the 80 acres spacing. That would be four wells in our 320 acres block that was simulated and the green one is the 64 acre spacing. As you can see there is very little incremental production that is gained by going to the additional well. In fact this difference is something on the order of ten percent. You gain ten percent incremental gas production but your cost have gone up 25% in going from four wells to five wells.

Mr. Bunn

This is what you are showing that after 20 years the well has totally drained. Is that right.

Dr. Wilson

Yes to the point of, right. Actually for some of these it occurs much earlier than that. That 20 year cut off is really only appropriate for the 80

acre. If you look at the 20 acre spacing its life is going to be four or five years.

Mr. Bunn

All right. How can you relate this to the degasification that they are using for the Pocahontas seam now?

Dr. Wilson

I am not familiar really with that degasing scheme. I do know that those are very close to actively mined areas.

Mr. Bunn

That is what I am trying to say. It is hard for me to believe that Occidental would have two companies operating so close as you do and not know how to correlate the degasification wells and the experience you have had from degasing the coal from those wells and not know where it reaches some kind of value to you on your determination of these wells. Where they should be spaced.

Dr. Wilson

Well we certainly have utilized vent hole production data some that was published back in the late 70's as part of GRI studies to verify our computer modeling. So we are able to accurately match the observed vent rates during that GRI program.

Mr. Bunn

I guess it is a fair assumption to ask or to assume, that is a horrible word to use in front of these attorney's here but you are going to drain this acreage before you mine. Is that correct?

Dr. Wilson

I think drain is a relative, it is kind of relative. I go back to the Langmuir isotherm exhibit. One will never get, in this particular case, one will never get no matter how long you wait all of the gas that is in there. You have to make an economic judgement really as to what is the optimum, how long you want to really suck on these wells to desorp the gas from. Again, you reach points of diminishing returns. It is economically based. The economics would be different I believe for degasing a well as opposed where you are trying to economically produce a well.

Mr. Starkey

Dr. Wilson, you may have explained this earlier, but your model is based on these assumptions in exhibit 12. Are these assumptions from your experience and calculations?

Dr. Wilson

Well the assumptions are a combination of several things and there are firm numbers. Very firm numbers and there are some that are softer. Probably the softest ones that I have shown you are

the ones that I actually showed the GRI and DOE data on. Some of the numbers like porosity we assume 4%, that I think is a very firm number, it can't be much off of that. Some of those are log determined values. Again you can go to the literature and pick those up as well. Formation temperature is a pretty firm number. The gas viscosity is a really firm number. Other numbers, for instance I don't see it here, initial reservoir pressure I think that one is a pretty firm number. We can put a gauge down vent holes and determine those. That is how that one was determined.

Mr. Counts

Mr. Starkey for purposes of this model I think it is important to remember that the first commercial production in coalbed methane really occurred in 1982. This is virtually a new untapped resource which we really don't have a lot of data on. There is a lot of studies out there on it. There is of course some production in Virginia but very limited. The vast majority of production is in the Southern Appalachian Basin and in Colorado in the four corners area. So we have really come up with the firmest numbers that we could. But we have just really tried to generate all the empirical data that we could with regard to some of those other numbers.

Mr. Starkey

I guess my thought was triggered by questions of the affiliate company or sister company having experience in this area and whether we used much of that.

Dr. Wilson

We have used some of their data although primarily it has been production related data from the late 70's.

Mr. Counts

From that standpoint also Mr. Starkey I am not aware of any coalbed methane that is being produced commercially within the Commonwealth of Virginia right save and except that in Dickenson County and the Nora field right now. I would have to assume Dr. Wilson that there is some data that you would like to have access to with regard to production that you aren't able to obtain.

Dr. Wilson

That is correct.

Mr. Bunn

Can you tell us what is your spacing on your degas wells on your Island Creek operations?

Dr. Wilson

No I can't.

Mr. Counts

I am not sure Mr. Bunn that spacing there, I am not sure what context you are using that word. There is no technical spacing because those aren't under the Oil and Gas Act "wells" which would require spacing or compliance even with statewide rules under the Oil and Gas Act.

Mr. Bunn

What I am asking is there has got to be some kind of relationship, Mr. Counts, purely for safety, expediency of releasing this gas. I guess really we are not talking two foreign substances. We are talking about the same particular situation. We are just trying to develop a gas and use it rather than blow it off into the air.

Mr. Counts

Exactly

Mr. Bunn

There is bound to be some kind of study done between the two.

Dr. Wilson

I am not aware of any such study. I would say that I think the objectives are much different between what is trying to be done in degasing and what is done here. I personally would want to go to a much smaller spacing for safety purposes than for an economic gas production coalbed methane adventure.

Mr. Counts

Mr. Bunn historically I think that with regards to study such as the Gas Research Institutes study that they have put on or undertaken, it is my understanding that a lot of companies including oil and gas operators as well as coal operators have provided those companies with certain data that they have used. That has been your cooperative effort, to the best of my knowledge with regard to regional studies which have been undertaken. A study undertaken by GRI as far as I know with regard to the Central Appalachian Basin as well as other areas constitutes the most comprehensive study undertaken with regard to coalbed methane in this particular area.

Dr. Wilson

That is correct. The Bureau of Mines and the Gas Research Institute were sources where the most cooperation has occurred. We have used those in our reservoir perimeter.

Mr. Starkey

Were you able to anticipate that you are able to produce this gas in the same fashion as oil and gas wells in so far as capping them and blowing them off if it comes feasible. Or they have to be produced differently from ordinary gas, natural gas well?

Dr. Wilson I think insofar as it doesn't impact mine safety, that concern would make it special, if it does not impact mine safety I would not assume that it would be any different.

Mr. Starkey What would happen if it impacted mine safety? If it wasn't economical to sell you would just blow it off?

Dr. Wilson Safety should be the overriding concern.

Mr. Starkey It would be another degasification hole?

Mr. Counts Provisions of the Oil and Gas Act and Regulations and Emergency Orders and various other measures provide for the venting of gas for safety purposes. Mr. Bunn with regard to your line of questioning if you would like to break and go back to Mr. Lewellen for a couple of minutes, if you would like to explore that line Mr. Lewellen is with Island Creek, we would be happy to do that.

Mr. Bunn That is the reason that I was trying to ask those questions why he was here. When he said he was with Island Creek and you said hold it. Our first duty of this Board is to preserve the natural resources and use them most efficiently and to explore them as efficiently as we can.

Mr. Counts Absolutely

Mr. Bunn We recognize that we are wasting a natural resource right now but it is for safety purposes. I think anybody in this room can understand that. But I just wanted to know if there is some kind of way that two companies can work together to maximize the recovery of this without stopping a complete mining operation. But to capture as much gas as possible to maximize the use of the natural resource.

Mr. Counts It is my understanding, Mr. Bunn, that Island Creek and Oxy both have every intention of trying to maximize these resources. I could not agree with you more. I think Virginia has lost a tremendous amount of a valuable natural resource as a result of the fact that perhaps, of course as we indicated recently 1982 was the first commercial recovery. It was only through a result of studies such as rendered by the Department of Energy and Gas Research Institute which was finally able to convince operators that this was actually a viable resource that could be captured economically. Quite frankly I have attended conferences very recently

which said the San Juan Basin is terrific, the Black Warrior is somewhat less than terrific and who knows about the Central Appalachian Basin. Who knows about the Northern Appalachian Basin. I think the jury is still out with regard to how economic that those operations can be. I think that certainly it is exciting for Virginia that we now have operators here that are going to undertake that and hopefully it will be extremely economic. It will certainly be beneficial to this state if it is.

Mr. Bunn

O.k. to satisfy myself Tom I would like to, we can go ahead and continue, but I would like to talk to Mr. Lewellen.

Mr. Counts

Since we are already on the subject, Mr. Chairman if you don't have any problems, let me go ahead and call Mr. Lewellen he has already been sworn.

Mr. Fulmer

Lets take a break.

Dr. Whisonant

Lets call the meeting back to order.

Mr. Counts

Thank you Mr. Chairman. I believe we were getting ready to go with Exhibit 14 a chart entitled Coalbed Methane Spacing Study Recovery Factor.

Dr. Wilson

Using our coalbed methane reservoir simulator we were able to determine the percent of coalbed methane gas in place that is recovered as a function of the number of wells we have drilled all for a 320 acre study block that we were using. This is a typical kind of chart that is used in the Oil and Gas industry. The think that is different here is we have used a reservoir simulator specifically designed for coalbed methane. We are able to calculate the initial gas in place. We used the simulator to see how much of that is produced over the economic life of the wells. That determines the total gas that is recovered. We have been able to calculate a percentage. Then that is plotted versus the number of wells that were drilled in that block to obtain that total gas recovered from the 320 acres. As you see if you only drill one well in the block or a 320 acre spacing, one only would recover about 22 or 23 percent according to our simulation study. If one drills an additional well, one does not double the percentage in place recovered. But one still recovers a substantial portion up around 37 or 38 percent. As one progresses and drills more wells you can recover more and more of the resource that is available there. What is typically done in the oil and gas industry is try to get as far up on

this knee of the curve as is economically possible. In this case the bend occurs around the 80 acre spacing. To go to 20 acre spacing one still only recovers 65% of the gas in place, 80 acre spacing I believe that number was actually 56% of the initial gas in place. So even we have drilled to go to 20 acre spacing we have drilled what 12 more wells we incrementally get very little in addition. Particular ones to point out again in going from 80 acre spacing to 64 acre spacing, the reason I have used 64 throughout is that is an even number of wells in a 320 acre block. The incremental is only a little over 1% of the initial gas in place.

Mr. Counts

Dr. Wilson I would like to confirm for the benefit of the Board that this spacing study model is based upon the model that you put together with regard to Buchanan County, Virginia. This is not a generic number picked out that will be applicable to any particular area based upon the assumed data in your model. Correct?

Dr. Wilson

That is correct. It is based on the unique reservoir characteristics that we believe exist in this area.

Mr. Counts

And specifically for the Oakwood Coalbed Gas Field?

Dr. Wilson

That is correct.

Dr. Whisonant

Questions? I have got one. I keep wanting to return to this issue of how fundamentally different Oakwood and Nora are. It looks like we are headed toward two coalbed methane fields with different spacing rules. So my question would concern the last few exhibits. I am assuming that if you had Nora numbers up here the curves would look different. The sixty acre spacing is still more applicable?

Mr. Counts

If I can interrupt for just one moment. I think what we will probably will end up seeing in Virginia as well as a number of other states, are the fact that depending upon reservoir characteristics which certainly Dr. Wilson can testify to. You are going to find a lot of the same formations, even the same seams, will be spaced differently in different areas. Depending upon the thickness, depending upon the permeability etc. For instance there has been a recent request in Alabama to expand spacing which was initially established at 40 acres to 160 acres. Now that is fine that you finally get around to expanding the spacing on that but what happens in a

situation like that is that the correlative rights of those parties who are around those 40 acre squares when they were initially drilled, those correlative rights were violated. They don't have redress now. But we are basically saying here is it is our opinion that the Oakwood Coalbed Gas field represents essentially a separate distinct reservoir from that of the Nora field. Dr. Wilson.

Dr. Wilson

In my opinion I am not privy to the reservoir numbers for that field, but it would have to be studied as a unique case in much the same way as we have done here. It could very well give the 60 acre spacing. Each reservoir has to be considered as a unique reservoir with its properties determining what the optimum value would be. It is not uncommon in oil and gas parts of the country to even have different strata on different spacing. That may be only 20 or 30 feet apart. One might be 640 because of the gas zone and below it or above it might be an oil zone that might be 20 or 40 acre spacing.

Dr. Whisonant

Thank you I thought that is what you had been saying several times. I just wanted to be crystal clear on the record. It will show up as two different spacing rules for adjacent fields.

Mr. Counts

Absolutely

Dr. Whisonant

In fact one previously overlaps the other.

Mr. Counts

As you are aware there are other areas in Virginia, for instance the Richmond basin, Pulaski and Craig counties. We may end up with several different spacing field rules depending upon the reservoir characteristics of each area.

Dr. Whisonant

Thank you.

Mr. Starkey

Dr. Wilson, Mr. Counts said something I would like to pursue. You answered a question I asked awhile ago and I thought you said that once you have a methane well gas in you either put it into production or blow it off. Is that a pretty fair statement?

Dr. Wilson

Or you can keep it shut in. You keep the well capped. Certainly that would be a third option. Generally one would probably either vent or put it into production.

Mr. Starkey I don't know enough about drilling to pick that up so you clarified that for me. That answers my question.

Mr. Counts Dr. Wilson are you familiar with the application filed in this case?

Dr. Wilson Yes I am

Mr. Counts Would you please briefly for the Board summarize the purpose of the application.

Dr. Wilson Yes we seek to get the what we call the Oakwood Coalbed Gas Field, the gas seams associated with that as you have seen as a reservoir producing coal seam gas. In addition we would like the Board to recognize the spacing for this field that would most effectively and efficiently utilize and produce this resource.

Mr. Counts Dr. Wilson the most effective spacing to utilize this resource is also not only in the best interest of Oxy USA but also in the correlative rights of the underlying owners. Am I not correct?

Dr. Wilson That is correct.

Mr. Counts Dr. Wilson are there existing permitted wells in the lands involved which are completed in and producing from coal seams covered in this matter?

Dr. Wilson No

Mr. Counts Have you made a study of other similar coalbed methane gas development in other areas.

Dr. Wilson We have made studies of the Black Warrior Basin area, the San Juan Basin and a few smaller areas although none to the detail that we have presented here.

Mr. Counts How has the development of these areas compare with Oxy's plan of development?

Dr. Wilson They are similar in that they have a water production. All coalbed methane that I am aware of has to a greater or lesser degree a water production phase and they do produce associated water. They are similar in that they all produce gas as the predominant mechanism that is desorbed gas from the coal.

Mr. Counts Does Oxy plan to commingle production from various coal seams through the same bore hole?

Dr. Wilson Yes, we plan to commingle the zones.

Mr. Counts In your opinion is production from such commingled coalbed methane wells from the various coal seams the most efficient and economical way to produce such gas?

Dr. Wilson Yes it is.

Mr. Counts Would you explain to the Board why that is true?

Dr. Wilson There are really only a few reasons, technical reason. And economically it would just not be feasible to produce the gas economically without commingling the zones. Technically there is no reason that one would want to not commingle them.

Mr. Counts Do you also recommend that the special field rules provide for venting as necessary for mine safety and for the testing of wells?

Dr. Wilson Yes I do.

Mr. Counts Do you recommend that a minimum distance of 300' from the unit boundary be maintained for all wells drilled except those requiring location exceptions?

Dr. Wilson Yes

Mr. Counts Do you further recommend a minimum distance between coalbed wells of 800'?

Dr. Wilson Yes I do

Mr. Counts In your opinion Dr. Wilson how large a tract in the Oakwood Coalbed Gas field producing from one or more of these coal seams effectively and efficiently drain?

Dr. Wilson As I showed in my previous exhibits I believe all our evidence indicates that 80 acres is the most appropriate spacing that would efficiently and effectively produce the gas from these seams.

Mr. Counts As Dr. Whisonant has indicated, why should the Board's March 20, 1989 order with regard to the Nora Coalbed Methane Field be modified from 60 to 80 acre units in the overlap which we have discussed?

Dr. Wilson

I think that there are three reasons: the first is I believe it is a different reservoir. We have seen from our geologic testimony and Mr. Lewellen the coal seams that are giving us the predominant gas production mechanisms will not exist in that area. They pinch out. In addition the second reason would be that we believe that we have higher quality reservoir. In general we have some of the highest gas content coal in the country I believe. The third reason is that such a plan would conform with Island Creek's mining operations.

Mr. Counts

Based on your discussion of the gas content of the coal would you discuss with the Board the GRI report which is listed as Exhibit 15 in the brochure and I would also like to ask the Board to accept this as **Exhibit Number 15.**

Dr. Whisonant

We accept

Mr. Counts

To show you why we believe we are in the highest quality part of the gas reservoir, our area of interest is essentially this blocked area. This that we have plotted here is an isopac map showing the thicknesses of the Pocahontas coal. As we have said earlier the dominant thing, reservoir parameter is the permeability times the thickness. We are in some of the thicker seams. The highest quality gas content. In general better quality gas, better quality reservoir I should say. As you get away from this area the seams are pinching out and the thicknesses are getting smaller.

Mr. Counts

I would also like to point out for the Board, if I may, I know that all of you on the Board know your geography in terms of Southwest Virginia. But to bring into perspective of the Nora field into play. We are looking here at Dickenson County (am I correct, I believe that is correct) and this is the area the extent of the Nora Coalbed Gas Field. You see as you go into Buchanan County the GRI report is indicating the increased thicknesses with regard to the isopac map here. This essentially is the dividing line in terms of the Oakwood Coalbed Gas Field that we requested. We requested that this part of the field be increased to 80 acre spacing with the eastern part of the field also being increased from the statewide spacing to the 80 acre spacing. So I think there is a very direct correlation to our point with regard to our fact that we are essentially dealing with a separate distinct reservoir once you get on over into Buchanan County.

Mr. Counts Dr. Wilson, Mr. Barnes has testified that location exceptions are requested for some seven wells. Have you reviewed these locations and is it your opinion that the correlative rights of the owners will be protected through these exceptions?

Dr. Wilson Yes I have reviewed and it is my opinion they will.

Mr. Counts Does Oxy request that the order resulting from this hearing find that the vertical limits of this field comprise all coal seams below the Tiller seam?

Dr. Wilson Yes it does.

Mr. Counts In your opinion will the granting of the application foster, encourage and promote the safe and efficient exploration for and development, production and utilization and conservation of coalbed methane from the seams underlying the lands involved in the application?

Dr. Wilson Yes

Mr. Counts In your opinion will the granting of the application be in the best interest of conservation, prevention of waste and protection of correlative rights?

Dr. Wilson Yes it is. In terms of conservation the increased spacing as we have indicated is the most efficient and effective way to economically produce this gas. In addition, the coal would be degased so that subsequent planned mining activity in the area would have the benefits of increased safety in their operations.

Mr. Counts Thank you Dr. Wilson. Mr. Chairman I have no further questions of this witness.

Dr. Whisonant Any questions from the Board. Mr. Counts I have one. Would you and or your witnesses, please express clearly again the need for confidentiality concerning this endeavor. The issue came up earlier and I am not sure we are quite clear as to why this must be so treated.

Mr. Counts Certainly. The Virginia Oil and Gas Act requires that an in order to obtain confidentiality an operator must so request. Coalbed methane is a new resource which is being just now being explored in Virginia. With regard to for instance if we were looking at the eastern part of the state and developing a major reservoir there there is a tremendous amount of testing from both a geologic

and engineering standpoint and a geophysical standpoint that have to be done. There has to be some incentive to the operator to be able to perform all these tests, to drill core holes, to evaluate the reservoirs etc. Being able to protect the information, I think is given throughout the conservation schemes of most all states, that protection of this information has found to be justifiable in terms of furthering the interest of the Conservation Board and essentially that is what we are requesting here. This is a new resource. There is new technologies being developed everyday. The request for holding this information confidential, if I am not mistaken Tom, I believe that is for a maximum period of two years. Which the legislature has granted in order to be able to say that o.k. the operator is entitled to some consideration with regard to confidentiality but there should also be a compelling public interest with regard to not having that period extend into infinity. So what we have requested here is two year confidentiality with regard to the testing results of these wells.

Dr. Whisonant

Thank you Mr. Counts. Any other questions?

Mr. Counts

Thank you sir. Are you ready for closing remarks Mr. Chairman?

Dr. Whisonant

Please

Mr. Counts

I think we have shown that existing statewide rules clearly are inadequate for the development of coalbed methane underlying the proposed Oakwood Coalbed Gas Field as indicated by the evidence presented today. Adherence to statewide rules will result in drainage significantly outside the boundary established by statewide spacing and, therefore, will not protect the correlative rights of those individuals outside the approximate 18 acre radial units or 23 acre square units created under statewide rules. With respect to the request for modification of the Nora Coalbed Gas Field we have put on evidence that the Oakwood Coalbed Gas Field involves essentially a separate distinct reservoir with one or more coal seams present and secondly greater thickness of seams. Hopefully our evidence has indicated that and supported that. Also it is illustrated by evidence outside that preparation by Oxy including the GRI report which we just reviewed. In addition to the evidence put on by Oxy USA to that effect, this also supported by numerous industry publications including the Gas Research

Institute Report. In addition, our evidence has shown that the Oakwood Coalbed Gas Field is a better quality reservoir with more seams present. More gas per cubic feet and also the fact that it conforms with Island Creek's areas of operation. In this application Oxy is concerned with being required to drill more wells than are necessary to develop the field. That is why we need the maximum efficient spacing available and that is why we have requested the 80 acre spacing. If we had to drill more wells then hopefully as I have shown on my diagram that would result in economic and physical waste. For the owner, less than maximum efficient spacing will also result in drainage and waste. I think it is important to recognize in Virginia that spacing is prospective and that for instance some states do require that a number of wells be drilled in a given area before spacing will be allowed. As you have indicated your concern this order, other orders may well in fact be modified in the future. What I think is extremely important to realize though from the Board's standpoint and the Board is charged with the protection of correlative rights and prevention of waste. If we look at an 80 acre unit and we assume that one will maximally drain an 80 acre unit but if we consider the fact for some reason as I indicated the spacing in Virginia is prospective. So we don't have all the data we would like to have. We can't confirm for certain that it is 79 acres, 80, 81 etc. but from the Board's standpoint I think it is extremely important that we not space the area too small. If the area gets spaced too small there is no relief available for the correlative rights of those parties that have been impacted. There reservoir outside this area if that is spacing statewide or other, has been drained and there is no relief, no recourse available to them. What is important to the Board in terms of the Board considering any request for spacing as flip back to the other paper and go back to the same untidy unit, is the fact that relief is available to the extent that later on the Board were to find that it had spaced to large of an area. Now this is from the standpoint of increased density which I think will be most appropriate in Virginia in all likelihood. That opposed to one well in this particular area you would be able to drill two wells or the Board could come in and despace the area and for instance lay down 40 units or stand up 40 units. What is important to realize is that the maximum, the maximum efficient spacing should be established for this field for the protection of correlative rights. In the event that spacing proves ends up proving it

is larger than is necessary, there is recourse and the correlative rights of these individuals end up being protected. In the event, however, that the Board were to space the area too small there is no recourse and the correlative rights are violated. On behalf of Oxy USA I respectfully request that the 80 acre spacing and the additional relief requested by Oxy in this matter be granted. I would like to thank very much the members of the Board and also you Mr. Chairman for your time.

Dr. Whisonant

Thank you Mr. Counts. Is there anyone else present here today that wishes to be heard before the Board on this matter. If so please come forward and identify yourself.

Rand Sterling

Mr. Chairman, my name is Rand Sterling I am a staff attorney with Equitable Resources in Kingsport we have just several brief comments if we may. First we would request that we be given an opportunity to provide you with written comments and we would suggest possibly a two week period. We did not receive actual notice of this hearing. We heard of this hearing, there was constructive notice by publication but we did not have a full and complete opportunity to review the application. Furthermore there are materials that have been submitted today that we would like to be able to review. We obviously have not brought with us our engineers or geologists. This is an order or this request or application does have the effect of modifying an existing order. We feel that due process would be best served if in the future for all interested parties and operators that actual notice be provided. Furthermore we would request that if we could if the application is in public record if we could take a copy of that with us or that could be provided so that our engineers and geologists could have an opportunity to review that.

Mr. Counts

They are a matter of public record with regard to the package as submitted.

Mr. Sterling

So we may be able to obtain a copy of that so that we can take that back with us and review it with our group.

Mr. Counts

In terms of the major exhibits we don't have any additional copies.

Mr. Fulmer

We can provide it in fact George Mason already has a copy of it.

Mr. Sterling Oh he does? I wasn't aware of it.

Mr. Fulmer We will supply you with another copy. There isn't any problem with that.

Mr. Sterling If at all possible we would appreciate having the opportunity of having the two week period to review the application so that our people can have an opportunity to review that and make written comments at that time. Thank you for your time.

Dr. Whisonant Questions, thank you. Anyone else. Would you please come forward and identify yourself.

Mr. Edwards Yes sir, my name is Michael Edwards I am president of Edwards & Harding Petroleum Company. My comments are similar to those of Mr. Sterling of EREX in that the area of the proposed spacing order here affects part of the area that our company has under lease. As matter of fact it affects part of the area that the Board has created units that our company is operator of and we would also like to request a similar period to review and comment on the order. Thank you.

Dr. Whisonant Thank you Mr. Edwards. Questions? Anyone else. Thank you everyone this hearing is closed.

Mr. Fulmer Wait, let me ask a couple of technical questions here to just clarify up a few things just for the record Rick. Noting the date of the application was dated the 7th we received. I know at that time the emergency legislation wasn't passed but it was signed on the fourth. So technically I am asking some questions. The relief sought is under 45.1-357.3?

Mr. Counts That is correct.

Mr. Fulmer That is correct, you want to amend your application sir?

Mr. Counts Yes sir, so amended.

Mr. Fulmer For your spacing are you asking relief under 45.1-357.2 dealing with statewide spacing?

Mr. Counts Mr. Fulmer with regard to 357.2 obviously that is the statewide spacing for coalbed methane development. That is obviously applicable to statewide rules and also 45.1-301. We are asking that we receive this relief even considering the statewide rules, save and except from statewide. We

want something over and above the statewide spacing for these units.

Mr. Fulmer

Am I correct in seeing in your application you mention in section three page five of the application, minimum distance between vertically drilled coalbed methane degasification wells. Do you mean gob wells or vertical vent holes, that nature?

Mr. Counts

I will have to ask for some technical expertise on that. Mr. Fulmer I am advised that will be essentially anything but gob wells.

Mr. Fulmer

Anything but gob wells.

Mr. Counts

Yes sir

Mr. Fulmer

Like I said I am just trying to get this on for the record to make sure we get all of this correct. For your gob wells, when they go on production will that be 80 acre units? Or will you want less?

Mr. Counts

At the present time the request for relief we have made addresses only the vertically drilled wells. We are not at this time addressing gob wells.

Dr. Whisonant

Thank you Mr. Fulmer. Other questions, then the hearing is closed. Thank you very much.

Mr. Counts

Thank you Mr. chairman and members of the Board.

EXHIBIT LISTING OF OXY USA, INC.

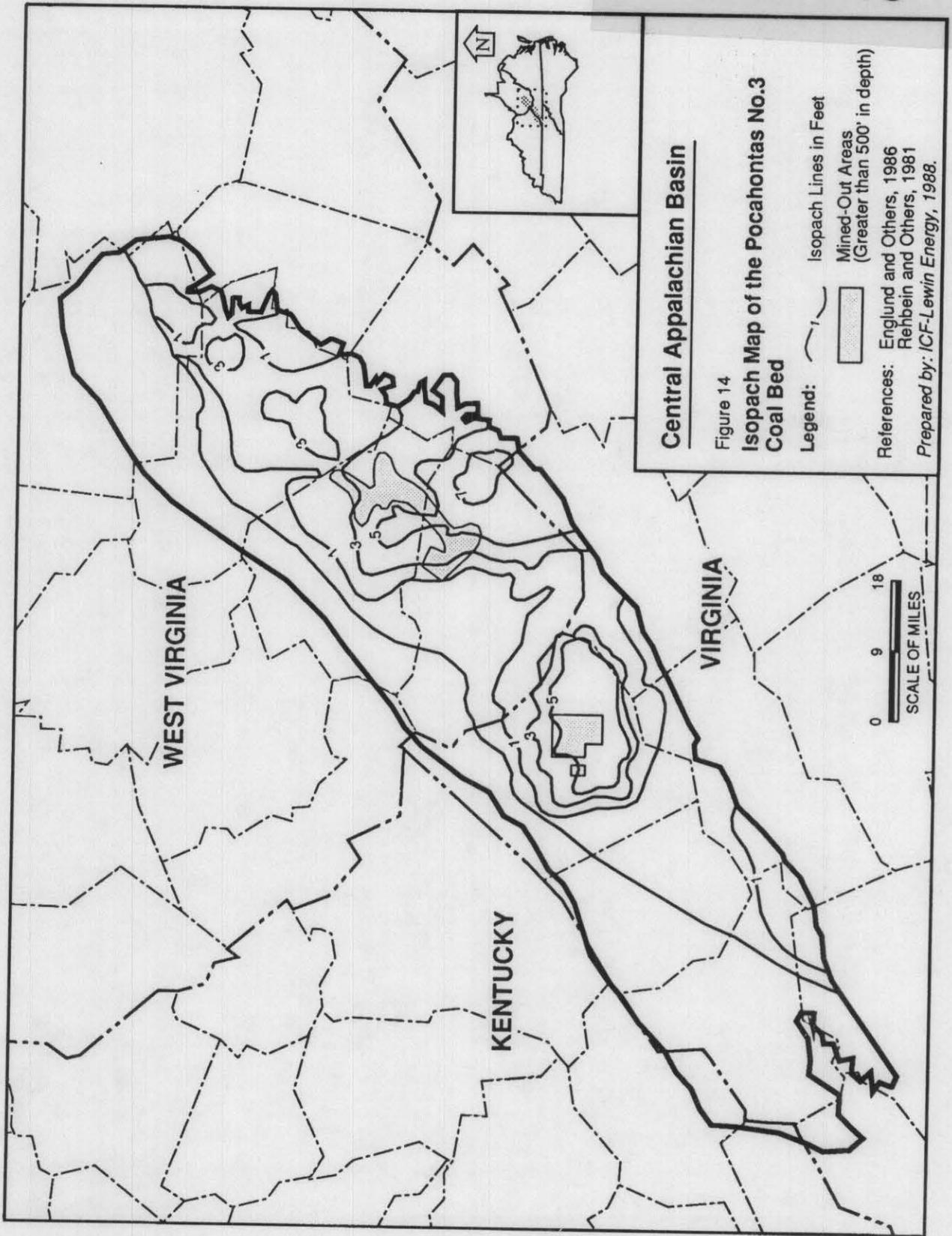
1. Grid Map
2. Approximate Extent of Field Overlap and Relationship
3. Plat
4. Stratigraphic Column of The Pennsylvanian Age Coal Seams, Oakwood Coalbed Gas Field
5. Location Map of the NW-SE Cross Section of the Tiller To Pocahontas #2 Horizon
6. Stratigraphic Cross Section of the Tiller To Poca. #2 Horizon, Drawn by Lewellen
7. Air Permeability Distribution For Pocahontas Coal
8. Permeability of Pocahontas Coal vs. Hydrostatic Stress
9. Pocahontas Coal Capillary Pressure
10. Pocahontas Coal Water/Gas Relative Permeability
11. CBM Spacing Study Langmuir Desorption Isotherm
12. CBM Study Reservoir Parameters Assumed
13. CBM Spacing Study Cumulative Production
14. CBM Spacing Study Recovery Factor
15. Isopach Map of the Pocahontas No. 3 Coal Bed

EXHIBIT #1

PLAT PREPARED BY OXY USA

ON FILE IN THE DIVISION OF GAS AND OIL
230 CHARWOOD DRIVE
ABINGDON, VIRGINIA

EXHIBIT #15



APPROXIMATE EXTENT OF FIELD OVERLAP AND RELATIONSHIP

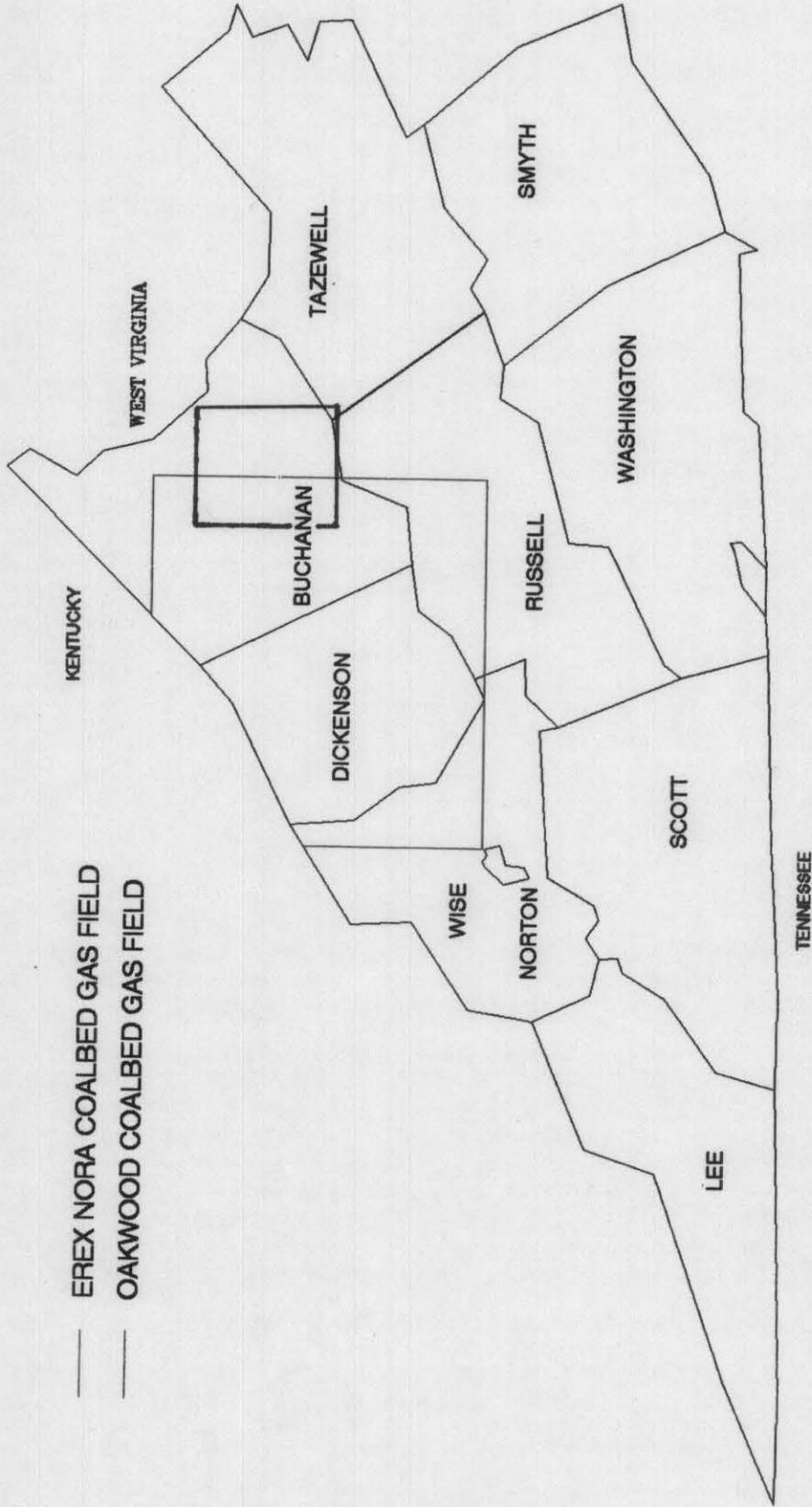


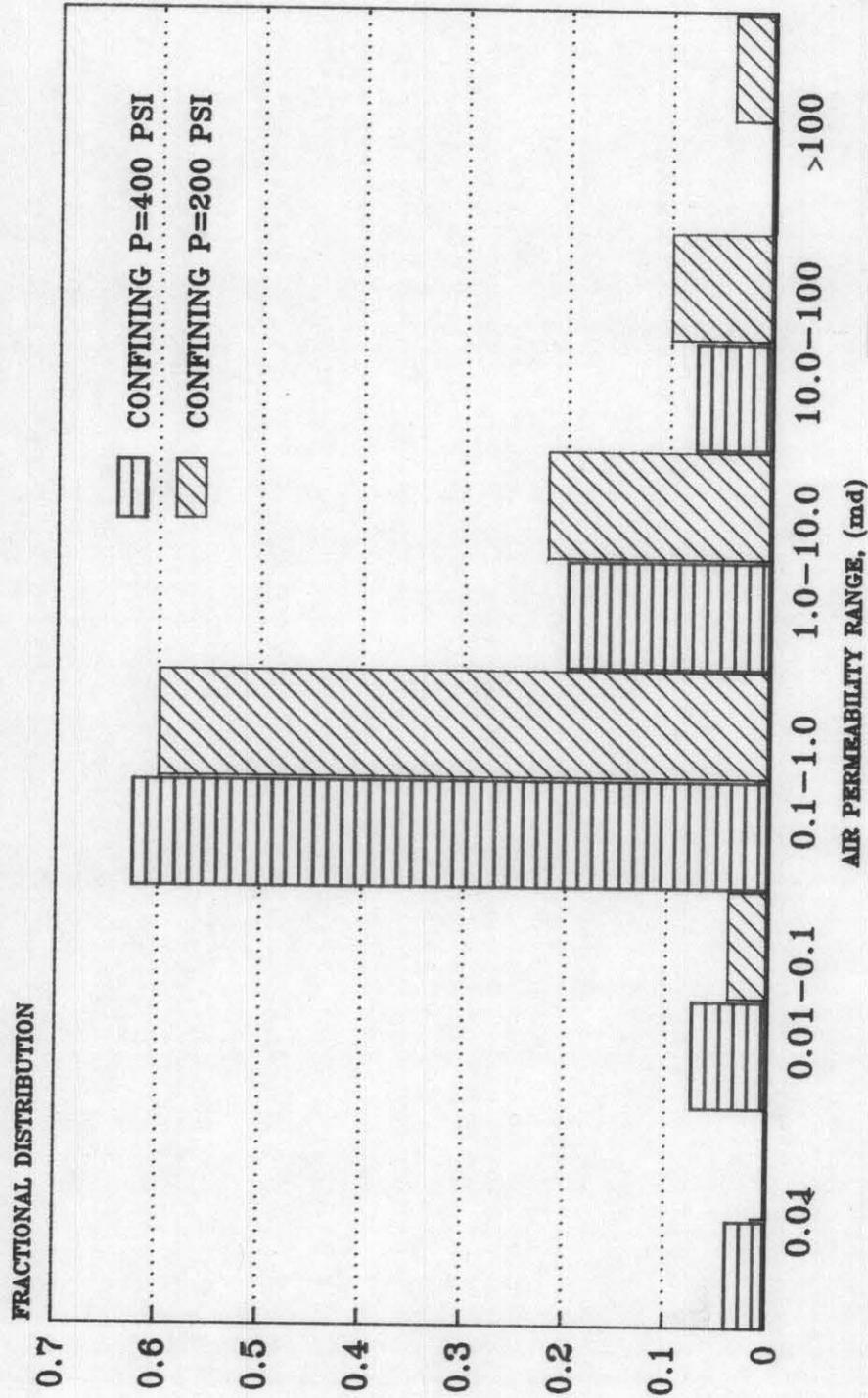
EXHIBIT #2

EXHIBIT #3

PLAT PREPARED BY OXY USA

ON FILE IN THE DIVISION OF GAS AND OIL
230 CHARWOOD DRIVE
ABINGDON, VIRGINIA

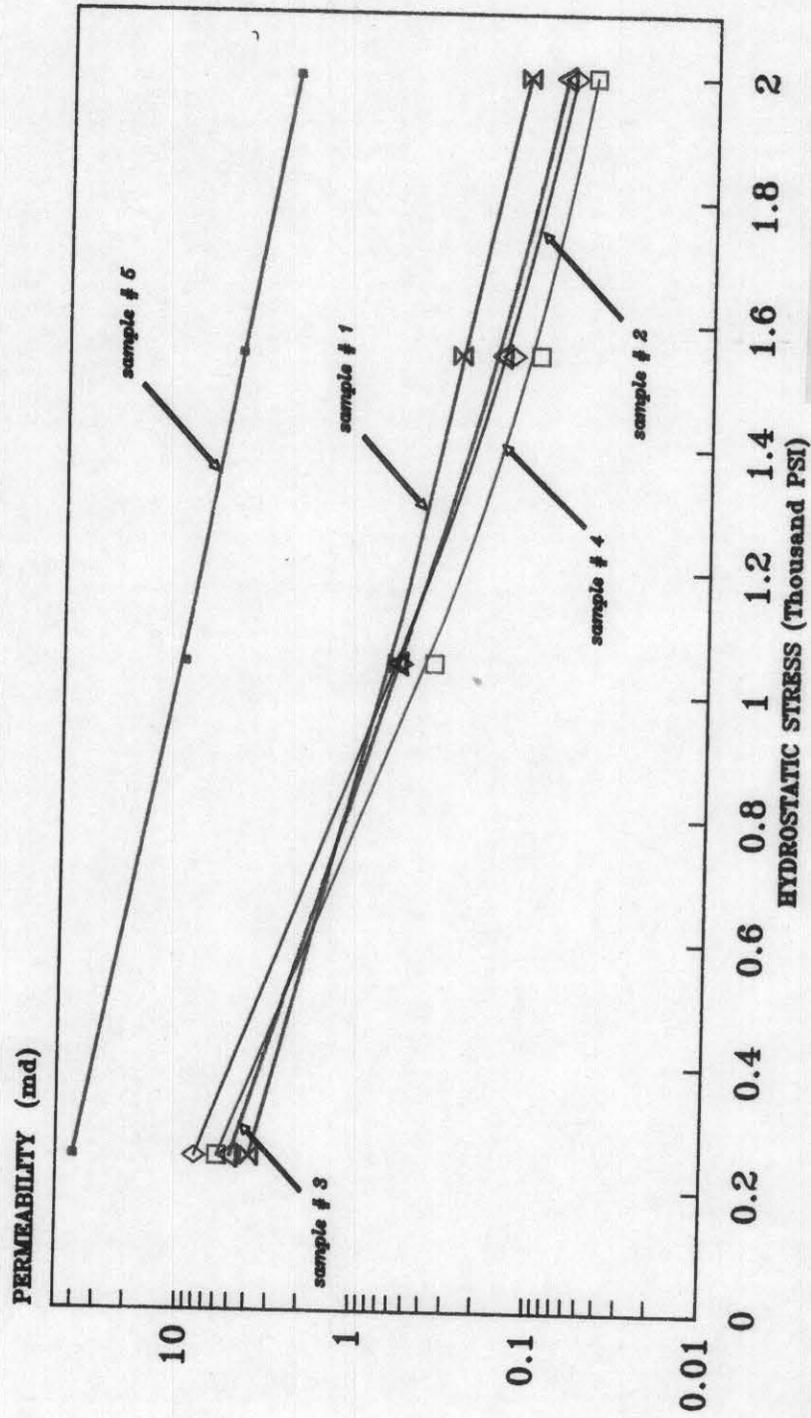
AIR PERMEABILITY DISTRIBUTION FOR POCAHONTAS COAL



SOURCE: M.K. Dabbous, et al.
SPEJ (Dec. 1974) p. 563f.

EXHIBIT #7

PERMEABILITY OF POCAHONTAS COAL VS HYDROSTATIC STRESS



SOURCE: W.H. Somerton, et al., Int. J.
Rock Mech. 12 pp. 129-145 (1975)

EXHIBIT #8

POCAHONTAS COAL CAPILLARY PRESSURE

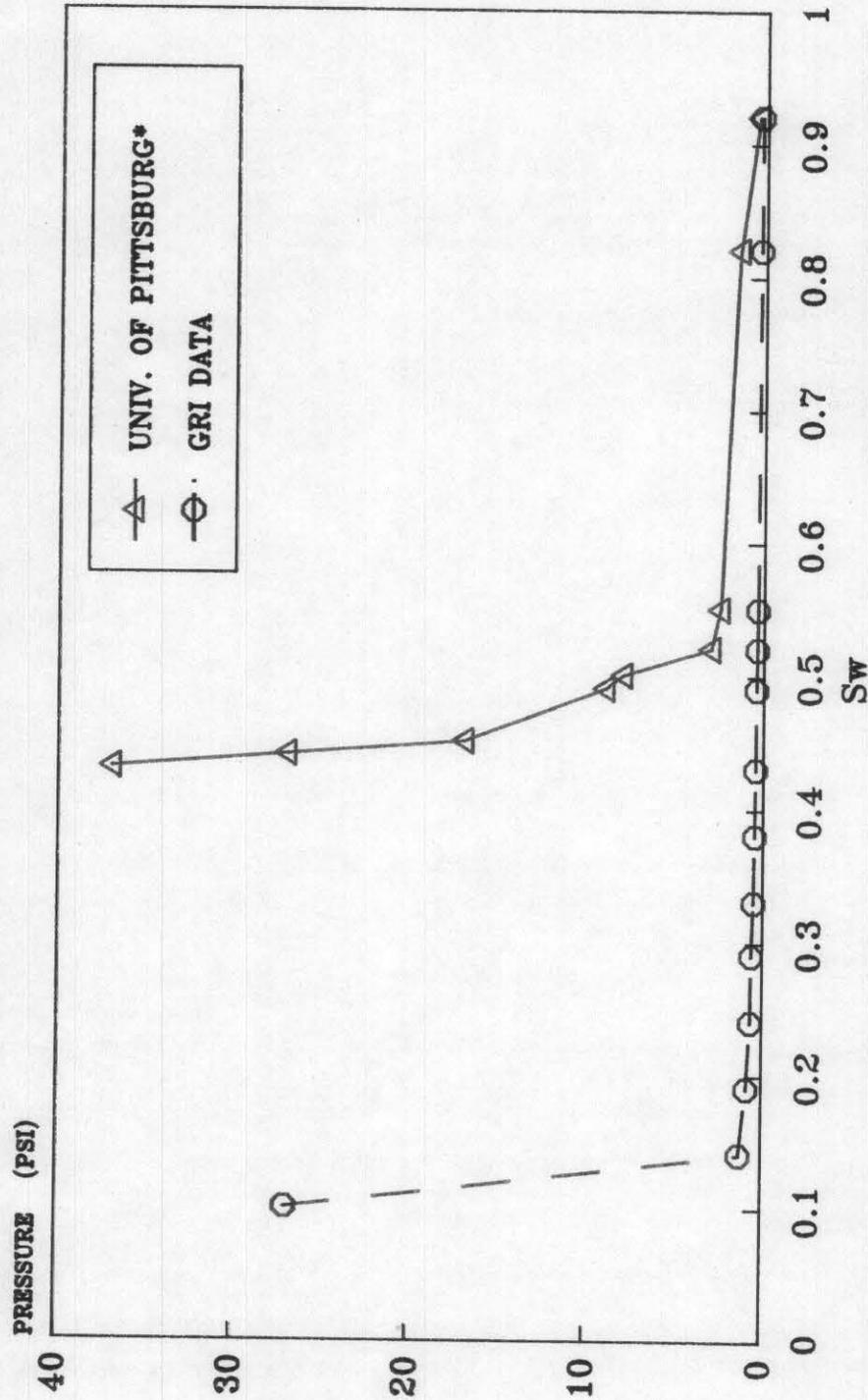
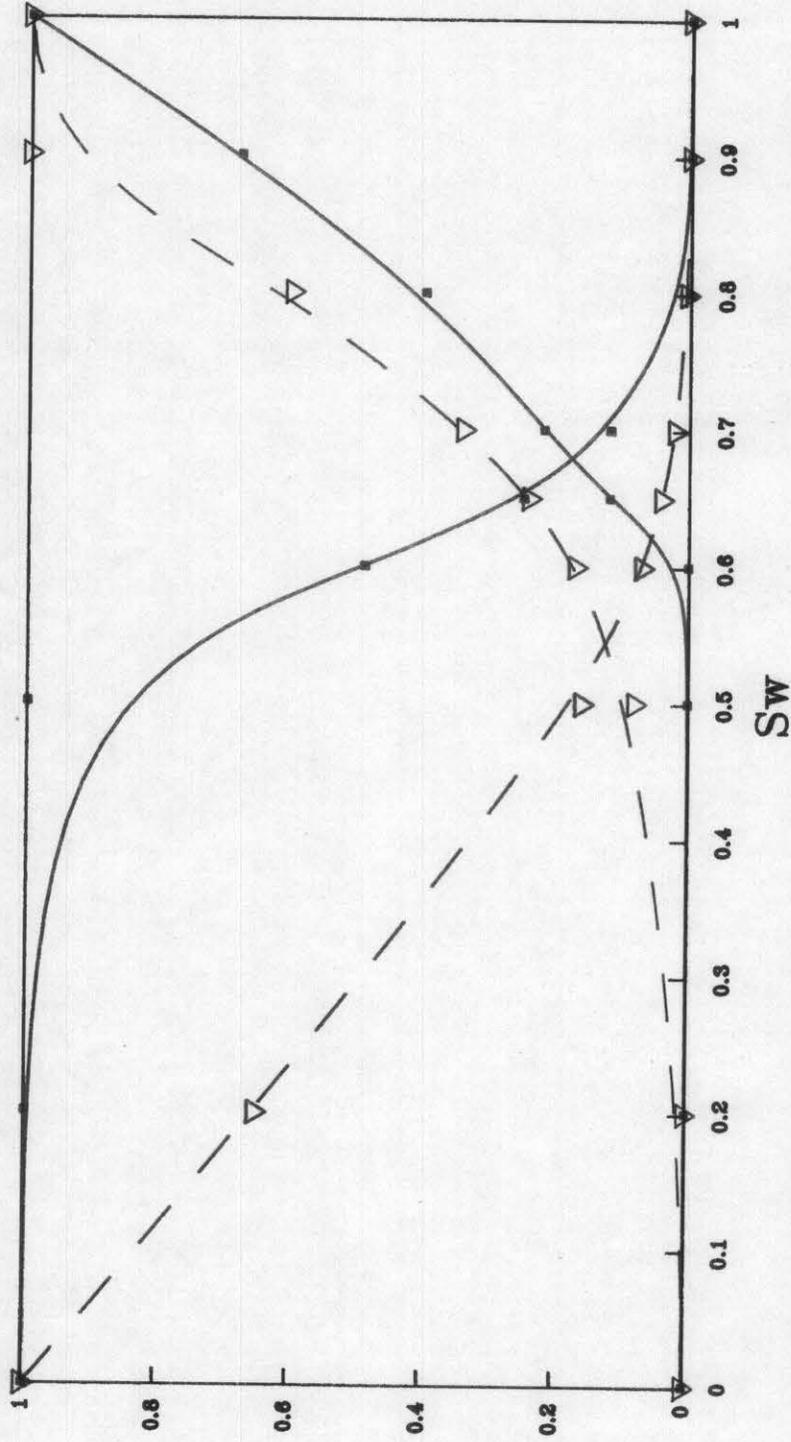


EXHIBIT #9

*SOURCE: M.K. Dabbous, et al. SPEJ
(Oct. 1976) p. 261f

POCAHONTAS COAL WATER/GAS RELATIVE PERMEABILITY



\square K_{rw} \square K_{rg} ∇ GRI K_{rw} ∇ GRI K_{rw}

*SOURCE: A.A. Reznite, et al. SPEJ
 (Dec. 1974) p. 556f.

EXHIBIT #10

CBM SPACING STUDY LANGMUIR DESORPTION ISOTHERM

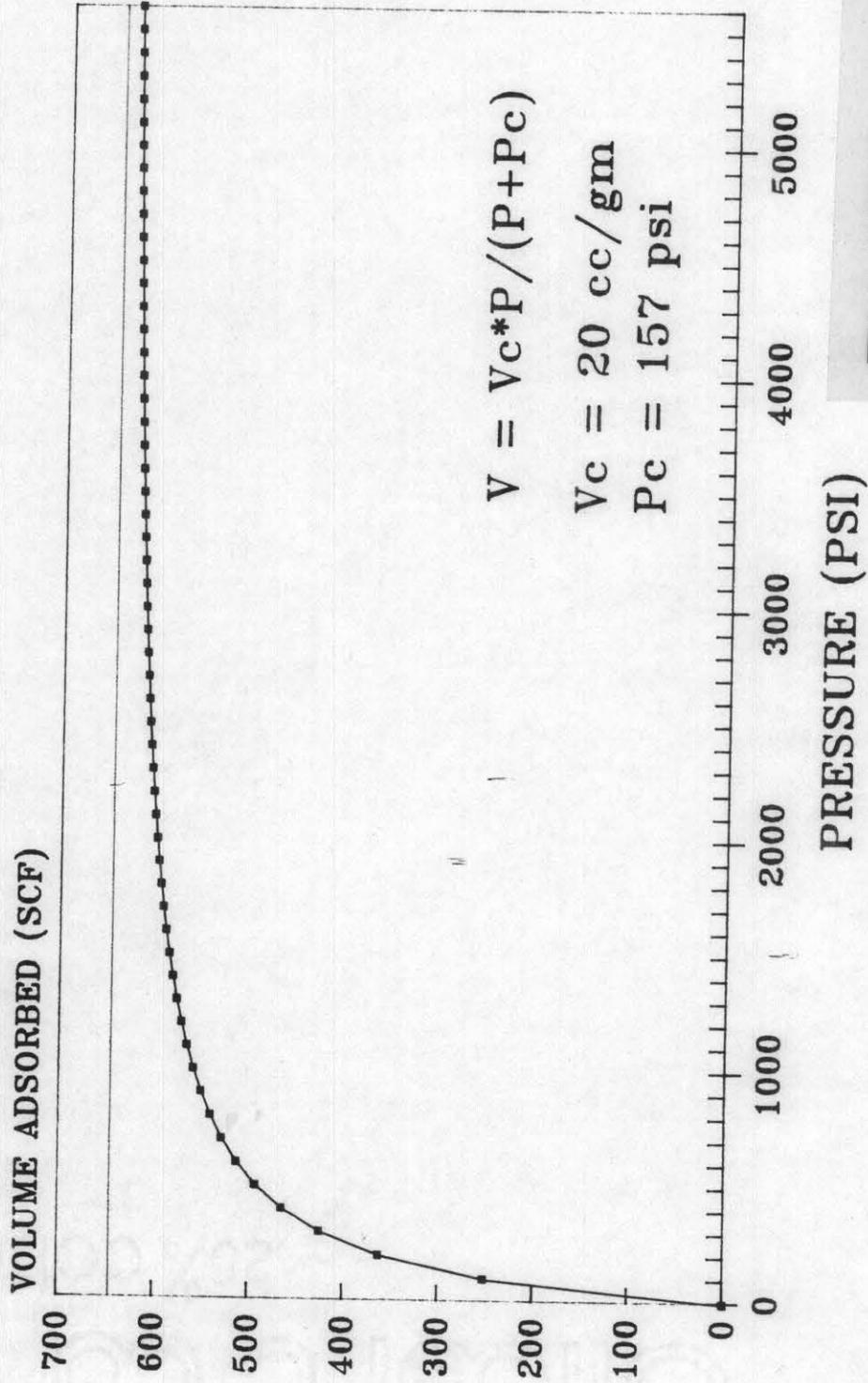


EXHIBIT #11

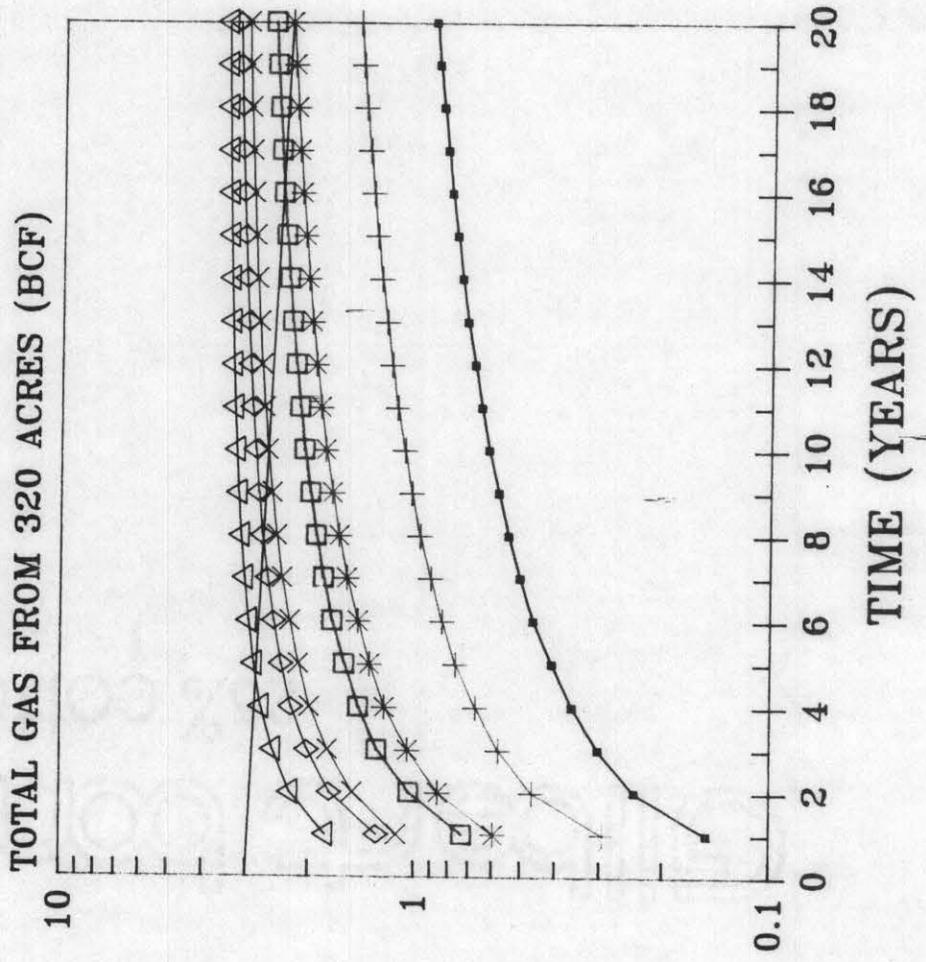
CBM SPACING STUDY

RESERVOIR PARAMETERS ASSUMED

AVERAGE RESERVOIR DEPTH, FT	2000
NET RESERVOIR THICKNESS, FT	13
ABSOLUTE PERMEABILITY, MD	2
POROSITY, %	4
INITIAL RESERVOIR PRESSURE, PSI	673
INITIAL WATER SATURATION, %	70
FORMATION TEMPERATURE, DEG F	75
FORMATION COMPRESS., 1/PSI	0.000017
DESORPTION VOLUME CONST., CC/GM	20.2
DESORPTION PRESS. CONST., PSI	157
DESORPTION TIME CONSTANT, DAYS	0.231
NATURAL FRACTURE SPACING, IN	0.25
MATRIX PERMEABILITY, MD	0.0
MATRIX POROSITY, %	2.4
STORATIVITY RATIO, FRACTION	0.62
COAL DENSITY, CC/GM	1.36
DIFFUSIVITY COEFF., SQ FT/DAY	20.4
WATER COMPRESSIBILITY, 1/PSI	0.000003
WATER FORM. VOL. FACTOR, CF/SCF	1.0
GAS VISCOSITY, CP	0.01
GAS GRAVITY, FRACTION	0.60

EXHIBIT #12

CBM SPACING STUDY CUMULATIVE PRODUCTION



WELL SPACING/# WELLS

- 320 ACRE/1 WELL
- +— 160 ACRE/2 WELLS
- *— 80 ACRE/4 WELLS
- 64 ACRE/5 WELLS
- ×— 40 ACRE/8 WELLS
- ◇— 32 ACRE/10 WELLS
- △— 20 ACRE/16 WELLS
- — ECONOMIC LIMIT

CBM SPACING STUDY RECOVERY FACTOR

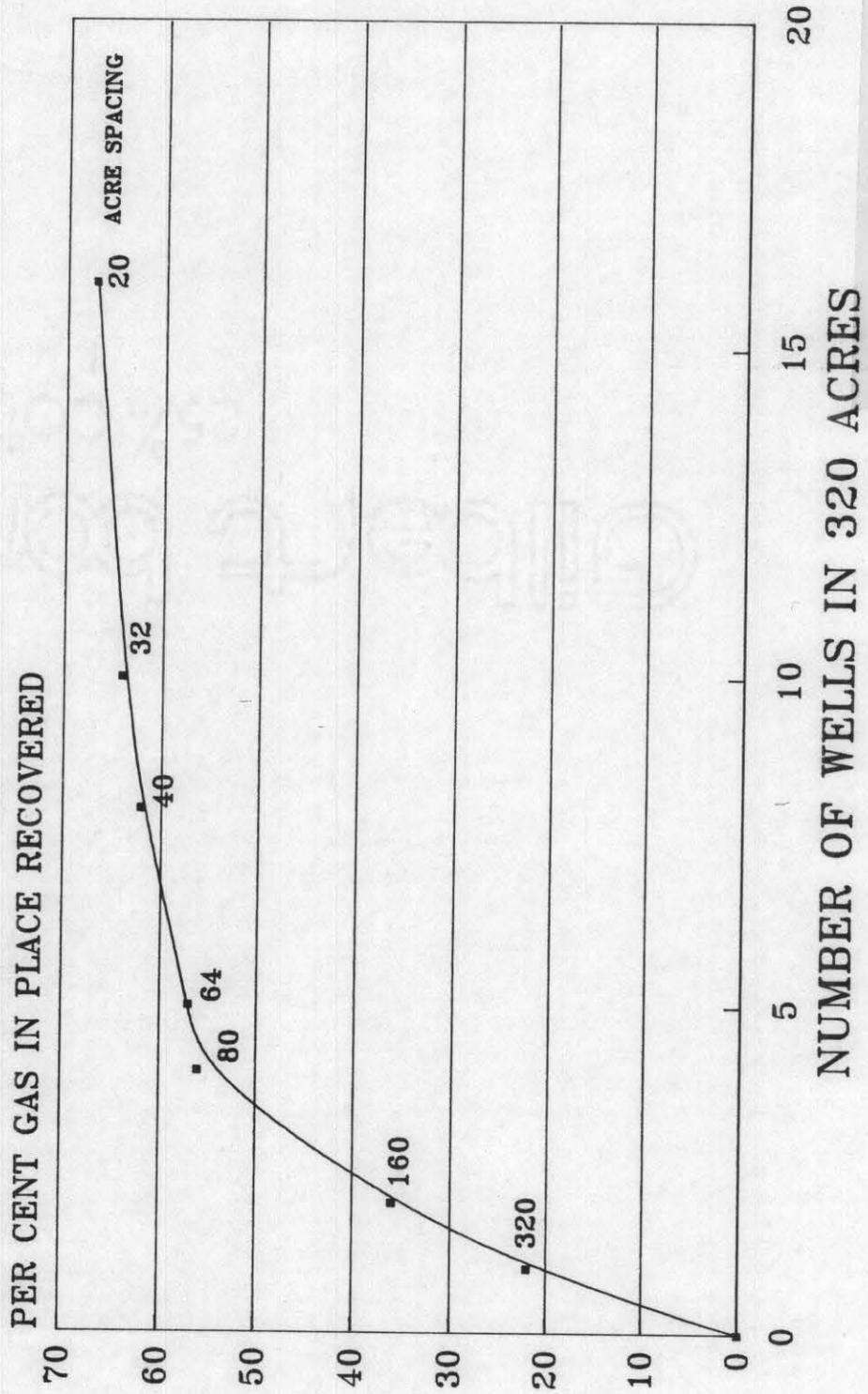


EXHIBIT #14



Department of Energy

Washington, DC 20585

APR 30 1990



Dear Respondent:

Enclosed are copies of the Department of Energy, Energy Information Administration (EIA) Form EIA-627, "Annual Quantity and Value of Natural Gas Report." State agencies that collect data on the volume and value of natural gas production in their State are requested to complete and return Form EIA-627 to the EIA. This report is authorized by the Federal Energy Administration Act of 1974 (P.L. 93-275, U.S.C. § 761 et. seq.). The form is voluntary and you are not required to respond. However, your response is needed to ensure that the results of this survey are accurate and comprehensive. The data collected will be published in the Natural Gas Monthly and in the 1989 Natural Gas Annual. A copy of the latter will be sent to you upon its completion.

Two copies of Form EIA-627, instructions for completing the form, and a return envelope are enclosed. An original of the completed Form EIA-627 should be returned to EIA at the address specified in the instructions by June 29, 1990, if possible. The second copy is for your files.

Your cooperation in providing statistical information on the annual production and value of natural gas in your State to the EIA is appreciated. It should be noted that the data collected on Form EIA-627 are not considered confidential since they are collected in aggregate. Therefore, no confidentiality pledges are required. If there are any questions concerning this form, please call Mrs. Sheila Darnell on (202) 586-6165.

Sincerely,

Diane W. Lique
Director
Reserves and Natural Gas Division
Office of Oil and Gas
Energy Information Administration

3 Enclosures

\$ 5829

Affidavit of Publication

State of Virginia }
City of Bristol } ss.

I, JoAnn Cahill do solemnly swear that I am the Asst. Treasurer of the Bristol Herald Courier, printed and published at Bristol, in the State of Virginia, and that from my own personal knowledge and reference to the files of said publication the advertisement of Va Dept of Mines, Mineral & Energy (Gas & Oil) was inserted in the space of 67.0 (lines) on dates as follows:

March 22, 1990

Subscribed and sworn to before me 4th day of April 1990

(Seal)

JoAnn Cahill
Pattie R Jones

Notary Public.

1-21-92

Pub. 20 from date of hearing

000 Legal Notices

VIRGINIA OIL AND GAS CONSERVATION BOARD
NOTICE OF HEARING
ESTABLISHMENT OF DRILLING UNITS AND SPACING FOR THE OAKWOOD COALBED GAS FIELD

The Virginia Oil and Gas Conservation Board will hold a public hearing on Tuesday, April 10, 1990, at 1:30 p.m. in the Buchanan County Board of Supervisor's board room, basement floor, Buchanan County Court House, Main Street, Grundy, Virginia.

The purpose of the hearing is to hear arguments and evidence concerning the request of OXY USA Inc. for establishment of drilling units and spacing for the Oakwood Coalbed Gas Field.

The area within which OXY USA Inc. has identified as the Oakwood Coalbed Gas Field is bounded on the north by latitude line 37 degrees, 17 minutes, 30 seconds; on the east by longitude line 81 degrees, 52 minutes, 30 seconds; on the south by latitude line 37 degrees, 27 minutes, 30 seconds; and on the west by longitude line 82 degrees, 7 minutes, 30 seconds.

Information pertaining to the area being considered by the Virginia Oil and Gas Conservation Board at this hearing is available for viewing by interested parties at the Division of Gas and Oil, 230 Charwood Drive, Abingdon, Virginia, from 8 a.m. to 5 p.m. Monday through Friday. For more information, you may contact the Division of Gas and Oil at 703/628-8115.

506 03 40 604 0100 1212

Published 20 days from hearing

CERTIFICATE OF PUBLICATION

State of West Virginia, }
County of Mercer, }

To-wit:—

Terri Punturi

of the
Bluefield Daily Telegraph, a daily morning newspaper published in the City
of Bluefield, Mercer County, West Virginia, do certify that the notice attached
hereto under the caption:

APPROVED
BY R. J. J. J.
DATE 3/23/90

was published in the said Bluefield Telegraph

One (1)

Times

on the following days, namely: March 22,

in the year 19 90

Publication Fee \$18.68

Terri Punturi

Subscribed and sworn to before me this 22nd day of

March 19 90

My Commission expires

1985.30 1995
Terri J. Stoppard

Notary Public



VIRGINIA OIL AND GAS
CONSERVATION BOARD
NOTICE OF HEARING
ESTABLISHMENT OF DRILLING
UNITS AND SPACING FOR THE
OAKWOOD COALBED GAS FIELD
The Virginia Oil and Gas Conservation Board
will hold a public hearing on Tuesday, April 10,
1990 at 1:30 p.m. in the Buchanan County Board
of Supervisor's board room, basement floor,
Buchanan County Courthouse, Main Street,
Gandy, Virginia.
The purpose of the hearing is to hear argu-
ments and evidence concerning the request of
Oxy USA Inc. for the establishment of drilling
units and spacing for the Oakwood Coalbed Gas
Field.
The area within which Oxy USA Inc. has
identified as the Oakwood Coalbed Gas Field is
bounded on the north by latitude line 37 degrees,
17 minutes, 30 seconds; on the east by longitude
line 81 degrees, 52 minutes, 30 seconds; on the
south by latitude line 37 degrees, 7 minutes 30
seconds and on the west by longitude line 82 de-
grees, 7 minutes, 30 seconds.
Information pertaining to the area being con-
sidered by the Virginia Oil and Gas Conservation
Board at this hearing is available for viewing by
interested parties at the Division of Gas and Oil,
2200 Charwood Drive, Abingdon, Virginia, from 8
a.m. to 5 p.m., Monday through Friday. For more
information you may contact the Division of Gas
and Oil at 703 628-8115.

This is to certify that the Legal Notice hereto attached was published in the Kingsport Times-News, a daily newspaper published in the City of Kingsport, County of Sullivan, State of Tennessee, beginning in the issue of March 26, 1990, and appearing

1 consecutive weeks-times, as per order of Virginia Division of Gas & Oil

Signed Jo Ann Houser

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Information pertaining to the area being considered by the Virginia Oil and Gas Conservation Board at this hearing is available for viewing by interested parties at the Division of Gas and Oil, 230 Charwood Drive, Abingdon, Virginia, from 8 a.m. to 5 p.m. Monday through Friday. For more information you may contact the Division of Gas and Oil at 703 628-8115.

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STATE OF TENNESSEE, SULLIVAN COUNTY, TO-WIT:

Personally appeared before me this, 2 day of April, 1990,

Jo Ann Houser, Legal Advertising

of the Kingsport Times-News and in due form of law made oath that the foregoing statement was true to the best of his knowledge and belief.

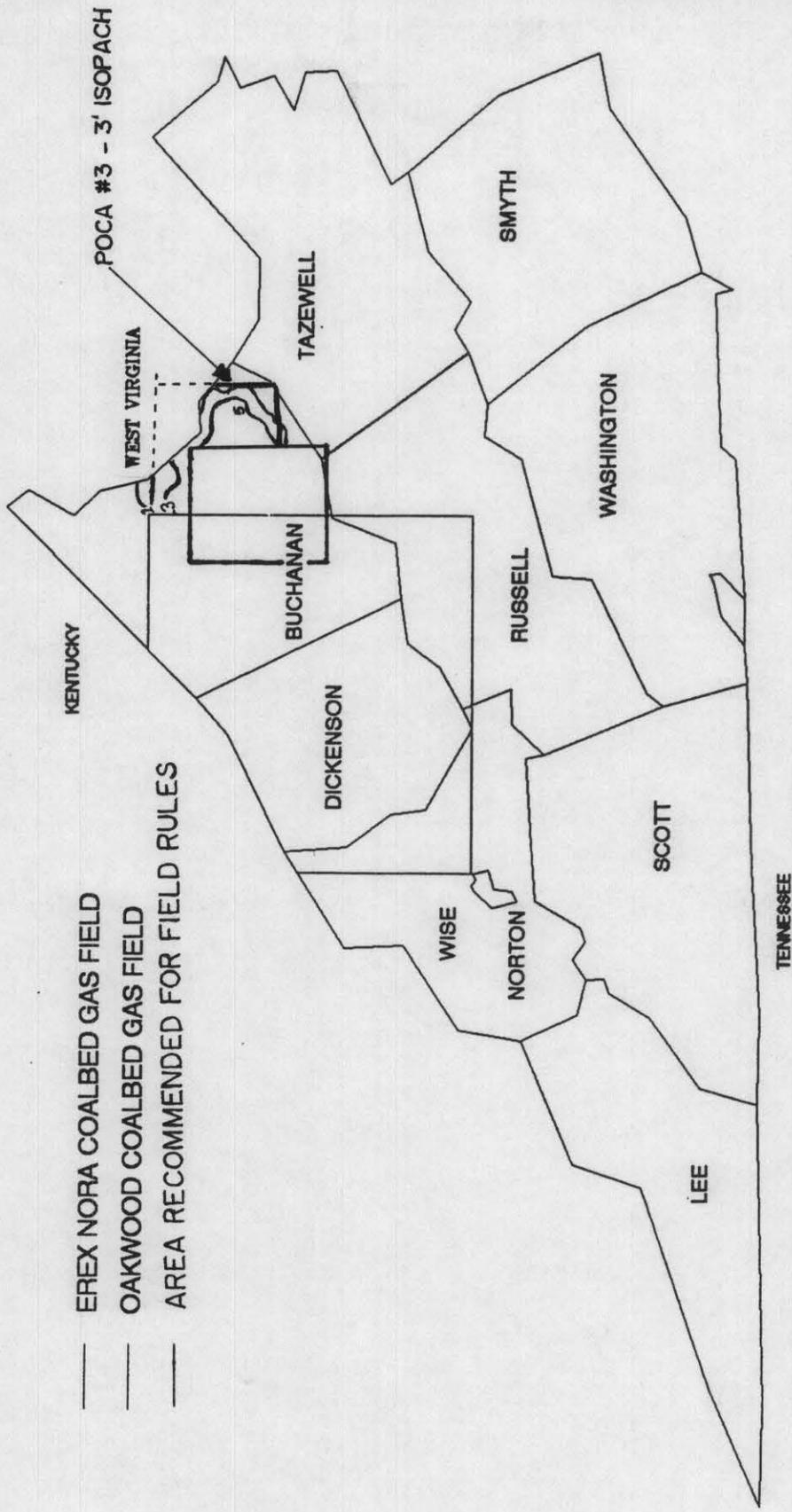
My commission expires 11-25-90 1990

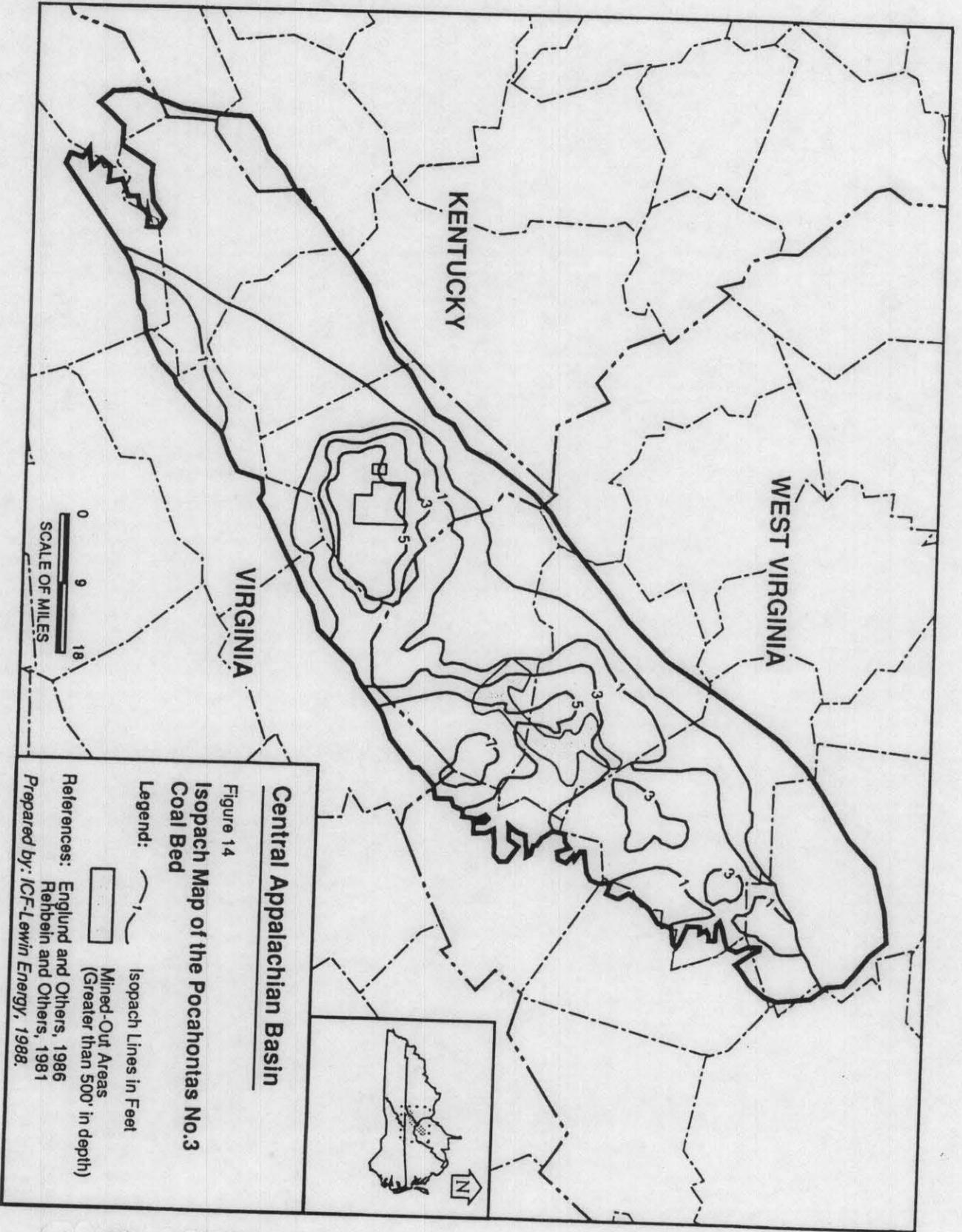
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NOTARY PUBLIC

* COMMONWEALTH
TEARS REQUESTED : 00

2% DISCOUNT IF PAID WITHIN 15 DAYS.

APPROXIMATE EXTENT OF FIELD OVERLAP AND RELATIONSHIP





Central Appalachian Basin

Figure 14

Isopach Map of the Pocahontas No.3 Coal Bed

Legend:  Isopach Lines in Feet

 Mined-Out Areas (Greater than 500' in depth)

References: England and Others, 1986
Rehbein and Others, 1981

Prepared by: ICF-Lewin Energy, 1988.

VIRGINIA OIL AND GAS CONSERVATION BOARD

SPACING HEARING

OAKWOOD COALBED GAS FIELD

REQUESTED BY OXY USA., INC.

APRIL 10, 1990

BUCHANAN COUNTY BOARD OF SUPERVISOR'S ROOM

GRUNDY, VIRGINIA

BOARD MEMBERS PRESENT

Mr. Benny Wampler, Chairman

Dr. Robert Whisonant

Mr. Jim Bunn

Mr. Chester Starkey

Mr. Tom Fulmer, State Oil & Gas Inspector

Ms. Diane Davis, Secretary

Counsel for Oxy USA, Inc. - Mr. Richard Counts

Mr. Wampler

Good afternoon ladies and gentlemen, my name is Benny Wampler and I am Assistant Director for Mining for the Virginia Department of Mines, Minerals and Energy. I am going to ask each Board member to introduce themselves.

The following members were present: Dr. Robert Whisonant, Mr. Jim Bunn, Mr. Chester Starkey, Mr. Wampler, Tom Fulmer State Oil & Gas Inspector, Diane Davis Secretary

Mr. Wampler

Thank you. The purpose of the hearing today is to hear arguments and evidence concerning the request of Oxy USA, Incorporated for the establishment of drilling units and spacing for the Oakwood Coalbed Gas Field. We will now ask Mr. Counts to present the evidence to the Board.

Mr. Counts

Thank you Mr. Chairman and members of the Board. Mr. Chairman, as you have indicated, the Board has convened today to hear Oxy's request for the issuance of an Order granting 80 acre spacing to cover the lands involved in this application. Also appearing today on behalf of Oxy USA in addition to the expert witnesses which we will call, I would like to introduce to the Board Ms. Patricia Patton, counsel for Oxy USA, along with John McKinnis with the firm of Counts, McKinnis and Scott. In order to develop some perspective, I would also like to before we get into the hearing pass out some of the exhibits. I think it will help in terms of going through the application. I will be making reference to these, Mr. Chairman, during the course and introducing a number of these as exhibits in the hearing.

Mr. Wampler

Thank you

Mr. Counts

Mr. Chairman and members of the Board, as you are aware the current spacing state wide field rules in Virginia today is based on approximately 19 acre radial spacing. The spacing sought and requested by Oxy today is based on 80 acre spacing. This exhibit which will be introduced during the hearing essentially shows the area sought to be spaced by Oxy which is overlaid by a grid system and the dark lines you see here also entail the Island Creek mine boundaries. This is the entire area sought to be spaced. Essentially right now the western half of this area, all of this area to my left here is currently spaced under an order which the Board issued last year granting 60 acre spacing to Equitable Resources. The area to the east is currently under state wide spacing rules which as I

indicated provide for 19 acre spacing. Mr. Chairman with leave of the Board I would like to go into just briefly to what spacing is for the benefit for the public and what the reasons are why we requested this relief. With your permission I will do that.

Mr. Wampler

Go ahead

Mr. Counts

Essentially the production and development of oil and gas early on was governed strictly by the common law of doctrine of the rule of capture. Under that doctrine if you assume that you have an 80 acre unit and if you further assume that the most efficient and economical way to drain that unit is to locate one well bore in the center of that unit and that one well bore would in fact drain that unit under the rule of capture as a result of the fact that say landowner A owns this unit and they are surrounded by adverse landowners all around as opposed to drilling this well in the center of this unit and maximally drain this unit, the most prudent location to drill this well is going to be on the outer perimeter. The purpose of all conservation laws and schemes throughout the country are for the protection of correlative rights and the prevention of waste. I think we can see here without the benefit of spacing laws and conservation laws that would not be effective. As soon as landowner A drills a well here, landowner B will offset that well as close to landowner A's property line as is possible. We already have two wells where essentially one well would have drained this entire area. As soon as this occurs A will counter by drilling here B to protect will drill here etc. What this results in is two types of waste, economic and physical waste. From an economic standpoint we have drilled a significant number of wells, lets say eight where really one well would have drained this field or this unit of this particular gas. We have physical waste from the standpoint that as opposed to producing this well prudently landowner A is required to produce the gas or produce the oil or the hydrocarbons as quickly as they can get them out of the ground. That will end up leaving a significant amount of hydrocarbons and will not efficiently drain the reservoir. Further graduation of that is that once conservation laws were implemented statewide rules were first enacted, statewide rules are basically are reasonable basis to assume that anywhere within a particular region, particularly within that state that a well will drain a specific number of acres. As I indicated in Virginia, that is based on 19 acre spacing. Coalbed

methane spacing to my knowledge in terms to the wells being drilled throughout the United States basically those goes from some 40 acres to units that are as much as 320 acres in the Fruitland formation in Colorado. As I indicated in Virginia the spacing is now on 19 acre radial basis that is on statewide basis. With regard to the Nora field which covers the western half, the Nora Coalbed Gas Field which covers the western half of the acreage which we have sought to have spaced today that is based on 60 acres and the spacing which Oxy is requesting today is based on 80 acre units. Primarily the purpose of todays hearing is to demonstrate why 80 acre spacing is necessary to govern operations in the area sought to be spaced by Oxy's application. It is necessary from a statewide standpoint to insure that correlative rights and the prevention of waste is protected. I think that you can indicate if you have got an 80 acre unit such as this unit here and you are drilling on statewide rules of a 19 acre radius, the correlative rights of these individuals outside that radius are going to be violated. In addition from the standpoint of the overlap between the area sought to be spaced under this order and the Nora Coalbed Gas Field rules as promulgated by the Board last year that the modification of the overlap of the Nora Coalbed Gas Field is necessary to change with geologic conditions in order to conform to Island Creek's mine boundaries and for the prevention of waste and the protection of correlative rights. Mr. Chairman with that aside I would like to go ahead and call my first witness if there are no questions from the Board. Mr. Starkey.

Mr. Starkey

If you will excuse me but where did you get that 19 acre figure?

Mr. Counts

That is just out of my calculator in terms of trying to take a look at the I think the wells now being drilled statewide spacing is on a 500' radius. That is on a radial basis. I think on a square that would be probably about 23 or 24 acres.

Mr. Starkey

That is for natural gas?

Mr. Counts

Coalbed methane Mr. Starkey. Strictly coalbed methane.

Mr. Wampler

Any other questions of the Board. O.k. proceed.

Mr. Counts

I would like to call as my first witness Mr. Marty Wirth.

Mr. Marty Edward Wirth

Mr. Counts Mr. Wirth who are you employed by and in what capacity?

Mr. Wirth I am employed by Oxy USA, Inc. and I am a coalbed methane project land manager.

Mr. Counts Mr. Wirth have you ever testified before the Virginia Department of Mines, Minerals & Energy?

Mr. Wirth No

Mr. Counts Mr. Wirth would you advise the Board in terms of your background please and your education?

Mr. Wirth I hold a degree in human relations and I have completed numerous professional landman and law educational courses resulting in numerous certified professional landman credits. I am a member of various professional associations and organizations as American Association of Professional Landman, International Right-of-Way Associations and organizations of such.

Mr. Counts Mr. Wirth would you state your work experience with Oxy?

Mr. Wirth I have been employed for almost 13 years with Oxy USA with the majority of my experience being in contract negotiations and lease and surface acquisition, division orders, environmental aspects in the oil and gas industry and negotiations with royalty and surface owners.

Mr. Counts Mr. Chairman I would like to offer Mr. Wirth as an expert witness in this matter.

Mr. Wampler All right

Mr. Counts Mr. Wirth do your responsibilities include the lands involved here and the surrounding area?

Mr. Wirth Yes it does.

Mr. Counts How long have you worked in or been familiar with this area?

Mr. Wirth In the Appalachian area approximately seven years.

Mr. Counts Do your duties involve the lands that are subject to this application?

Mr. Wirth Yes

Mr. Counts Are you familiar with the spacing application and the relief requested?

Mr. Wirth Yes sir

Mr. Counts Is Oxy the owner of the right to drill a well in the lands involved herein so as to produce coalbed methane?

Mr. Wirth Yes sir

Mr. Counts Would you indicate what type of leasehold position that Oxy has acquired.

Mr. Wirth We have acquired numerous oil and gas leases, coalbed methane leases from the various ownership aspect.

Mr. Counts In otherwords, Oxy has a significantly sole position underlying the lands sought to be spaced?

Mr. Wirth Yes sir

Mr. Counts Mr. Wirth what is the boundary of the field Oxy seeks to have spaced?

Mr. Wirth The boundary in the field for this application will be from the north boundary latitude line of 37 degrees, 17 minutes, 30 seconds; the eastern boundary line of longitude line of 81 degrees, 52 minutes, 30 seconds; a southern boundary latitude line of 37 degrees, 07 minutes, 30 seconds and a western boundary line being a longitude line of 82 degrees, 07 minutes, 30 seconds.

Mr. Counts Mr. Wirth would you point that out on the plat that you have prepared.

Mr. Wirth Sure, The exhibit I was referring to was the north boundary line of 37 17 30 here would be your eastern boundary line, southern boundary line and your western boundary line.

Mr. Counts Mr. Wirth was this plat prepared by you or under your direction?

Mr. Wirth Yes sir it was

Mr. Counts How does this plat differ from the one attached as Exhibit A to Oxy's application?

from a lease line and a 1000' between each coalbed methane well).

Mr. Counts Mr. Wirth could you indicate the eastern most boundary of the Nora Coalbed Gas Field?

Mr. Wirth The eastern most boundary will be 82 degrees 00 minutes 00 seconds.

Mr. Counts Thank you sir. Does Oxy request modification of the Board's March 20th, 1989 order such that the drilling units contained in that portion of the Nora Coalbed Gas Field bounded on the north by latitude line 37 degrees 17 minutes 30 seconds on the east by longitude line 82 degrees on the south by latitude line 37 degrees 07 minutes 30 seconds and on the west by longitude line 82 degrees 07 minutes 30 seconds be modified so as to establish in such area 80 acre units?

Mr. Wirth Yes we do.

Mr. Counts Mr. Wirth you also have an exhibit that depicts the overlap between the Nora Coalbed Methane Field and Oxy's proposed field?

Mr. Wirth Yes

Mr. Counts Would you show that to the Board please sir? Mr. Chairman and members of the Board this exhibit is also on page two of your book.

Mr. Wirth The green outline is the current approximate area of the Nora Coalbed Gas Field, the red is the application which we are here today to discuss.

Mr. Counts Mr. Chairman I would like to offer this plat into evidence as Exhibit Number Two.

Mr. Wampler O.k.. so noted

Mr. Counts Mr. Wirth what name does Oxy propose for the pool underlying this proposed field?

Mr. Wirth What we are going to ask for is the Oakwood Coalbed Gas Field.

Mr. Counts Does Oxy request that this order be effective as of today?

Mr. Wirth Yes we do

Mr. Counts Mr. Chairman I have no further questions of this witness.

Mr. Wampler Any questions from the Board?

Dr. Whisonant I have one. Mr. Wirth you said that Oxy has significant holdings in the proposed new field. What kind of number would that be?

Mr. Wirth We are talking almost 80,000 acres under leasehold interest.

Dr. Whisonant Out of a total of how many?

Mr. Wirth Approximately 85 to 87 thousand is a rough estimate. This is when we say Oxidental Corporation. Between the two companies of Island Creek and Oxy USA.

Dr. Whisonant So Oakwood would be about 86 87 thousand acres total?

Mr. Wirth The total spacing area we are asking for or just the area which Island Creek, a total area of approximately 100,000 acres.

Dr. Whisonant That is this.

Mr. Wirth Yes inside the red, yes sir.

Dr. Whisonant O.k. and of that you have got about?

Mr. Wirth I would say 87 to 85 percent of it. Because some of that acreage Island Creek does not mine on. Therefore we do not have at this time, plans to develop on it.

Dr. Whisonant Is it unleased or does somebody else have it?

Mr. Wirth That is another coal company's concern and I believe I cannot make a statement as to if it is leased or not.

Mr. Counts I would also like to add to Dr. Whisonant that we would be concerned from a spacing application that it is really necessary to show that you are a party in interest to be able to maintain an application for spacing not that you have, we try to indicate that Oxy does have a significant acreage position in here but I would like to point out to the Board to that is going to be the exception as opposed to the rule. That at any time any operator has that high of percentage under lease in a given area you may well go into an area and in fact only have five

percent or ten percent under lease. I am concerned from a precedence standpoint that it not reflect that any operator have a burden of having even a majority of acreage under lease. But Oxy does has, as Mr. Wirth has indicated, a significant amount of acreage under lease in this situation.

Dr. Whisonant Thank you

Mr. Wirth You are welcome

Mr. Bunn Is it Marty?

Mr. Wirth Yes sir

Mr. Bunn O.k. what I would like to know are you the one we are going to address the questions to on this 80 acre spacing?

Mr. Counts Mr. Bunn we will have a geologist and engineer testify with regard to the spacing request with regard to drainage and answer technical questions.

Mr. Bunn That is fine.

Mr. Wampler Any other questions? Thank you Mr. Wirth.

Mr. Counts Mr. Chairman the next witness I would like to call is Mr. Robert Barnes.

Mr. Robert Allen Barnes was sworn in

Mr. Counts Mr. Barnes, who are you employed by and in what capacity?

Mr. Barnes Employed as a drilling specialist by Oxy USA, Incorporated.

Mr. Counts Have you previously testified before the Department of Mines, Minerals & Energy?

Mr. Barnes No sir

Mr. Counts Would you state your education for the Board please sir?

Mr. Barnes I have a degree in accounting from New Mexico State University.

Mr. Counts Would you indicate your work experience?

Mr. Barnes I have been employed by Oxy USA for 11 1/2 years as a drilling specialist in the Rocky Mountain region.

Mr. Counts Would you advise the Board as to your areas of responsibility at Oxy?

Mr. Barnes I was responsible for supervising drilling and completion operations, permitting and production operations in that region.

Mr. Counts Would you list your professional associations.

Mr. Barnes I am a member of the Society of Petroleum Engineers, International Association of Drilling Contractors.

Mr. Counts Mr. Chairman, I would like to offer Mr. Barnes as an expert witness in this matter. Mr. Barnes are you familiar with the well work permit applications filed by Oxy USA with the Inspector's office?

Mr. Barnes Yes sir

Mr. Counts As of this date, how many applications have been filed?

Mr. Barnes Fourteen applications

Mr. Counts Does each of the applications involve lands located in the proposed Oakwood Coalbed Gas Field?

Mr. Barnes Yes sir

Mr. Counts Can you depict the proposed locations of these wells on a map?

Mr. Barnes Yes sir we have a map with the locations plotted on them.

Mr. Counts Would you present that to the Chairman please. Mr. Chairman I would like to offer this plat into evidence as Exhibit Number Three.

Mr. Wampler O.k.

Mr. Counts Mr. Barnes were these permit applications filed based on statewide spacing laws?

Mr. Barnes Yes sir initially.

Mr. Counts Have permits been issued to Oxy for any of these fourteen applications?

Mr. Barnes We received permits for CBMI-2, 3 and 4.

Mr. Counts The other 11 applications are pending?

Mr. Barnes Yes sir

Mr. Counts Does Oxy request that the spacing for these fourteen proposed wells be modified to conform to and be consistent with the spacing requested, the 80 acre spacing requested by Oxy in its application?

Mr. Barnes Oxy has set a period of 90 days effective as of the date of the issuance of the order be allowed to submit new well plats based on 80 acre spacing.

Mr. Counts Is the reason for this to accommodate the proposed wells to the new field rules?

Mr. Barnes Yes sir

Mr. Counts Mr. Barnes are you familiar with the application filed in this case?

Mr. Barnes Yes sir

Mr. Counts What sort of spacing is requested?

Mr. Barnes Oxy is requesting 80 acre square with 300' set back in the unit boundary making the well locations a minimum of 800' between wells.

Mr. Counts Do each of the proposed wells involved in the 14 applications you spoke of conform to the requested spacing?

Mr. Barnes No sir, seven of the proposed 14 are located within the 300' setback area.

Mr. Bunn Hold it what was that now?

Mr. Barnes On the smaller grid there is a block inside a block. The picture frame around the larger block is the setback area. Seven of the wells we have before the Commission are in this setback area.

Mr. Counts That is essentially our request for location exceptions as noted in their application. We will go further into that to Mr. Bunn. Mr. Barnes was it necessary to spot wells at these locations due to topographic considerations, economic constraints and to conform to Island Creek's plan of operations?

Mr. Barnes Yes sir

Mr. Counts Will you identify for the Board the six proposed wells which are located within 300' of the unit

boundary where offsetting ownership is common to the unit where the location exceptions are requested?

Mr. Barnes

We have grid system set up. Letters by numbers. Well number B-29 which has also been permitted under I-9 is in the setback area, the L-24 is also in the setback area, the P-26 which is called the I-8 is in the setback area, the Q-26 which is the I-10 is setback, the V-34 is in the setback area, the X-11 is in the setback area.

Mr. Counts

Mr. Barnes in addition to the six you have just listed for the Board do you also request a location exception for well number 1-5 located in unit X-10?

Mr. Barnes

Yes sir, this would be location right here.

Mr. Counts

Mr. Barnes in terms of trying to attempt to develop a well location for that well what types of consideration did you encounter in terms of locating the well?

Mr. Barnes

We were under pretty steep terrain. We had drainage problems and there are also dwellings in the area. These all played a part in location selection.

Mr. Counts

Did you also have discussion with regard to Island Creek in terms of mining operations in terms of locating this well?

Mr. Barnes

Yes sir

Mr. Counts

I assume that the location conforms with those discussions?

Mr. Barnes

Yes sir we have been approved by Island Creek.

Mr. Counts

Mr. Barnes are the owners of the offsetting units to those units which you have requested location exception, I apologize to the Board I have already gone through that one. Mr. Barnes does Oxy request that the Board grant location exceptions for these seven wells?

Mr. Barnes

Yes sir

Mr. Counts

Mr. Chairman I don't have any further questions of Mr. Barnes.

Mr. Wampler

Any questions from members of the Board?

Mr. Bunn

Yes

Mr. Counts Mr. Bunn we will also have a reservoir engineer that will be giving data on reservoirs.

Mr. Bunn Do you have all the property leased in these areas where you are in the setback area?

Mr. Barnes The fourteen wells listed on this map are at least 1250' from any adverse leases.

Mr. Wampler Thank you

Mr. Counts Mr. Chairman I would like to call Mr. Dennis Lewellen.

Mr. Dennis G. Lewellen was sworn in

Mr. Counts Mr. Lewellen would you state who you are employed by.

Mr. Lewellen I am the division geologist in Virginia for Island Creek Company. I have been here since 1987.

Mr. Counts In what capacity are you employed?

Mr. Lewellen As the Division Geologist I am responsible for the exploration drilling program, underground geologic mine mapping, I will take care of any groundwater problems we have as are related to the mining operations. I have also reviewed the E-logs of gas wells or ventilation holes that are drilled on our property. I have a certain amount of responsibilities in roof control as it is related to poor top and that sort of thing.

Mr. Counts Mr. Lewellen would you also state for the Board your educational background?

Mr. Lewellen I have a masters degree in coal geology from Eastern Washington University which is out in Cheney, Washington. I am a PhD candidate in coal geology at the University of Kentucky, Lexington.

Mr. Counts Would you indicate any professional associations that you are a member of?

Mr. Lewellen I am a member of AAPG (American Association of Petroleum Geologists), AIPG (American Institute of Professional Geologists) and I am a member of VMI (Virginia Mining Institute).

Mr. Counts Mr. Lewellen do you have other experience which this Board might find favorable with regard to this matter?

Mr. Lewellen

Yes in terms of roof control, I have looked at the hydraulic fracs in other mines at the Jim Walter #4 Mine in the Black Warrior Basin and I have seen some of the fracs in the roof at the Buchanan #1 mine which is adjacent to our VP#6 mine. I have looked at some of the stuff we have done in ventilation holes in our VP#6 mine.

Mr. Counts

Mr. Chairman I would like to offer Mr. Lewellen as an expert witness in this matter.

Mr. Wampler

All right

Mr. Counts

Mr. Lewellen in order for the Board to understand the necessity for coming up with a special set of rules for the production from the various coal seams underlying this field, would you please describe the general geological history and lithology of such coal seams for the area.

Mr. Lewellen

The coal seams that we are interested in are in the coal measures, the upper carboniferous or Pennsylvanian seams and I have a strat column here which I can show you. What you have here is a stratigraphic column of the coal seams, the Pennsylvanian Age coal seams of the Oakwood Coalbed Gas Field. The formations that we are dealing with are the Lee formation and the Pocahontas formation and we are interested in the Pocahontas 9 through Pocahontas 2, the Lower Horsepen, War Creek, Middle and Upper Horsepen, Lower Seaboard, Middle Seaboard, Greasy Creek and Upper Seaboard. Basically we are looking at all the coal seams below the Tiller seam. In terms of economic importance based upon gas content, continuity, lateral continuity of the coal seam and thickness, the most important coal seams are labeled here in group one which are the three and four seams and in group two the War Creek, Lower Horsepen and Pocahontas are particularly important to us and then the group 3. Most of the coal that you see here is a low vol. bituminous although some of the stuff in the upper portion in group 3 probably gets into the mid vol. range. Gas contents will vary between about 230 to 697 to 700 cubic feet per ton. Really the group ones are the most important to us.

Mr. Bunn

What was it now?

Mr. Lewellen

It ranges quite widely from 230 to about 690 700.

Mr. Bunn

Cubic feet

Mr. Lewellen Per ton

Mr. Counts Mr. Lewellen would you indicate generally for the Board how these coal primarily are different from those in Dickenson County where the predominant part of the Nora Coalbed Gas Field spacing is located?

Mr. Lewellen I believe in our case they are probably looking at something higher in the section, perhaps around the Tiller in that interval. Our seams it is a different set of coal seams, we are much deeper in terms of the coal measure section.

Mr. Starkey Excuse me I missed the question.

Mr. Counts I asked Mr. Lewellen if he would indicate for the Board how the difference in the coal from the Dickenson County where primarily the Nora Coalbed Gas Field lies as opposed to Buchanan County where Oxy's request for spacing is.

Mr. Starkey Thank you

Mr. Counts Mr. Chairman I would like to offer this coal strat column chart into evidence as Exhibit Number Four.

Mr. Starkey Let me ask a question here if I may. Do you have a figure on the BTU content of this gas?

Mr. Lewellen Of the methane?

Mr. Starkey Yes

Mr. Lewellen Most of the numbers will range between 960 to 1010 we seem to average around 977 BTU.

Mr. Starkey Does this come out under rock pressure?

Mr. Lewellen No, this is coming out of coal seams and of course it will be under hydrostatic pressure but basically we bring it down to atmospheric pressure or try to get it as low as we can. It is a low pressure reservoir.

Mr. Counts Mr. Lewellen what coal seams are underlying the proposed boundaries of the Oakwood Coalbed Gas Field do you anticipate will be developed. I think you have already indicated that.

Mr. Lewellen We anticipate to develop all the ones I named plus any unnamed seams. There are numerous riders and liters and very thin discontinuous seams in this area as well.

Mr. Counts Do you also have maps depicting cross-sections with regard to the coal.

Mr. Lewellen Yes I do, I have a location map and a cross-section I will show you.

Mr. Starkey Before you leave this, maybe I didn't understand when you went back and answered the question on the range of the cubic feet of methane per ton were you speaking about your drilling area here?

Mr. Lewellen Yes in our area.

Mr. Starkey I thought it didn't sound right, o.k. I understand now.

Mr. Lewellen Before I go into the cross-section, I will first just show you a location map and how this cross-section fits in with the Island Creek properties. This map here shows the seven mine properties at Island Creek, VP#3, 1, Beatrice, 5, 6, 2 and 4. We have four active mines on the west side of the property and then Beatrice 2 and 4 are presently inactive. I have got a scale here. The cross-section is shown here it runs northwest/southeast. The first hole is L-302 on the northwest and on the southeast end it is L-299. Now I will bring up the cross-section here. This cross-section shows the coal seams which we are interested in developing. We will be going down as deep as the Pocahontas #2 which lies about 40' below the 3 seam which is the datum here. The holes you see on the northwest is L-302 and then it just goes on through seven different core holes to L-299 which is on the southeast. You have got a scale here of about 0-5000 for horizontal and 0-200 for vertical. The coal seams you see on this cross-section aren't to scale. I had to thicken them up so that you could see them.

Mr. Counts Mr. Lewellen should all the coal seams below the Tiller be involved in any order resulting from this hearing?

Mr. Lewellen Yes sir

Mr. Counts Mr. Chairman I would like to offer Mr. Lewellen's location map as Exhibit Number Five and the strat cross section as Exhibit Number Six.

Mr. Wampler O.k. it will be so accepted.

Mr. Counts Thank you sir. Mr. Lewellen based on your study is the area described as the Oakwood Coalbed Gas Field wholly underlain by the several coal seams you named?

Mr. Lewellen Yes, the most continuous is the Poca 3, Pocahontas #3, then the other coal seams I had mentioned tend to be more sporadic, come and go.

Mr. Counts Mr. Lewellen we see in the strat chart and the cross-section, would you also with regard to the exhibit one get in terms of perspective for the Board indicate visavis the area sought to be spaced, what the relationships are of these seams and how that impacts the area requested by Oxy.

Mr. Lewellen All right in our program the areas we are most interested in in terms where we have the thickest coal, the most numerous and best gas content lie in this area here in the east and central portion of our properties. Then as you go to the northwest the gas contents, off in this direction, the gas contents tend to get lower. The number of coal seams diminishes and they do get somewhat thinner. The reason this is occurring is most of the section we are looking at is pinching out into the Lee Formation sandstones. Overall this fits pretty well with what our mine planning is and how we can best develop it.

Mr. Counts Mr. Lewellen should the Board's order provide that all coalbed gas wells now or later drilled in this field be declared exploratory wells so as to qualify for the two year period of confidentiality provided for in Virginia Code for all logs, surveys and other reports filed with the Inspector?

Mr. Lewellen Yes sir

Mr. Counts Mr. Lewellen is it your professional opinion that 80 acre spacing is necessary to allow conformity with Island Creek's mine boundaries?

Mr. Lewellen Yes sir

Mr. Counts Does the area sought to be spaced including the overlap essentially conform with Island Creek's mine boundary as depicted on the front cover of the material submitted to the Board?

Mr. Lewellen Yes it does

Mr. Counts Mr. Lewellen am I correct in that the eastern half of Island Creek's mine boundary is presently covered by the Nora Coalbed Gas Field spacing order? Excuse me the western boundary?

Mr. Lewellen Yes it is covered by that.

Mr. Counts In your opinion Mr. Lewellen will the granting of the application be in the best interest of conservation, prevention of waste and protection of correlative rights?

Mr. Lewellen Yes sir

Mr. Counts Thank you Mr. Lewellen. Mr. Chairman I have no further questions of this witness.

Mr. Wampler Mr. Lewellen I would like to ask you a question on the confidentiality. I would like for you to explain more why that you recommend that that be considered exploratory and when you are asking the Board to set this up throughout the field why it should be considered exploratory and held confidential.

Mr. Lewellen Well we will be putting a lot of time and money into collecting data on the stratigraphy and the reservoir characteristics and a number of other things which will be beneficial to us. It will help us out in our long term development of this field.

Mr. Counts Mr. Chairman I would also like to have Mr. Wilson who will be my next witness to address the confidentiality question as well.

Mr. Wampler O.k.

Mr. Bunn Is it the right time now Rick for me to ask about the 80 acre?

Mr. Counts Next one sir.

Mr. Bunn All right that will be fine.

Dr. Whisonant I want to be sure I am oriented now relative to the, you can't hear, I just want to stay caught up on how the Nora production compares to this. Now Nora coal seams that you are developing are above stratigraphically or below?

Mr. Lewellen The Nora coal seams are above us as near as we can tell because looking at the regional geology I know that most of these seams that we are dealing with

pinch out. We don't know exactly what the Nora field consists of considering that that data is confidential.

Dr. Whisonant

I am also curious about how deep are these wells? I can't tell from your cross-section relative to say ground surface or sea level or some plane?

Mr. Lewellen

The Pocahontas #3 seam is at sea level roughly in our area. The section will roughly be 1500' to the southeast and it loses about 300' to the northwest. So it will be between 1200 and 1500' of section and that is starting at stream drainage. So three seams at sea level basically.

Dr. Whisonant

Thank you

Mr. Counts

Mr. Lewellen is it essentially your position, to follow up on Dr. Whisonant's question, that the coals basically commencing with the Buchanan County line and running to the west essentially constitute a separate and distinct reservoir.

Mr. Lewellen

Yes sir I think so.

Mr. Counts

That would be due to?

Mr. Lewellen

We are lower in the section stratigraphic section.

Mr. Counts

Relative thickness of coal as well as coals pinching out disappearing?

Mr. Lewellen

Our coal, the three seam is generally about six feet and as we go to the east and northwest these coals will pinch out and get thinner.

Mr. Counts

Thank you Mr. Chairman

Mr. Starkey

On this production per ton, will that vary I assume in different areas?

Mr. Lewellen

It will vary with the rank of the coal. It will vary with the ash content. Generally the higher the rank the more gas. The ash content even though you may have a high rank coal if you have a high ash content you won't have as much gas. If you are too close to the surface and get within three or four hundred feet a lot of that gas will leak off. There are a lot of different variabilities in the gas contents. That is why you see such a wide range. Plus we were taking.

Mr. Starkey

Did you quote a range?

Mr. Lewellen Yes it was between about 230 and 700.

Mr. Starkey In this field.

Mr. Lewellen Yes

Mr. Starkey What about other fields. Do you have experience and knowledge of other fields other ranges you spoke of acreage going up

Mr. Lewellen I would say if you wanted to pick an average number, what I have seen like in the Black Warriors is probably running about 400 cubic feet per ton. Out west I have seen that number to. It seems to be hovering around there between 200, 400 and 600.

Mr. Starkey This was what was the high range, up to 230

Mr. Lewellen Yes, yes

Mr. Starkey What was the low range?

Mr. Lewellen The low range would be around 230 or so.

Mr. Starkey I thought that was the high range?

Mr. Lewellen The higher the number the more gas you have got. So 700 cubic feet per ton is about as high as it gets.

Mr. Starkey Do you expect to get that here?

Mr. Lewellen In places we will. We have gotten samples like that, yes sir.

Mr. Starkey Is there a minimum figure for economic purposes...

Mr. Lewellen We figure looking at what we have got the limited data we have is it is going to average around 400 cubic feet per ton.

Mr. Starkey And that is economical?

Mr. Lewellen Yes sir. Economically there are other factors other than just gas content that come into play. But that is an important factor.

Mr. Starkey I guess I am trying to relate this some way to the 80 acre figure. If it is lower do you want more acreage?

Mr. Lewellen When Weldon comes up he can discuss that with you. He will answer your question better than I can.

Mr. Bunn In this if you will, did you find that the gas is pretty much in all the seams. It is just that they dissipate faster or that you find it in all seams above drainage as well as below drainage?

Mr. Lewellen I will find gas in all the below drainage seams once you get below the water table. What happens when you get above drainage, above water table is occasionally you get a little bit of gas but most of it has bled off through just increased permeability of the surrounding strata. But the strata around here is pretty tight so once you get below the ground water table it will keep the gas in it.

Mr. Starkey Is there any by products of this that you want to capture?

Mr. Lewellen From the coalbed what you basically get is 96 percent methane, a little bit of Co2 and some inerts. So it is very dry gas and very pure.

Mr. Wampler O.k. thank you very much.

Mr. Counts Mr. Chairman I would like to call my next witness Mr. Weldon J. Wilson

Mr. Weldon J. Wilson was sworn in

Mr. Counts Mr. Wilson who are you employed by and in what capacity?

Dr. Wilson I am employed by Oxy USA, Inc. I am an engineering advisor for that firm. I have worked in that capacity for a total of 7 1/2 years.

Mr. Counts Would you state for the Board please your educational background

Dr. Wilson I have a PhD in physics from Oklahoma State University. I have attended numerous industry short courses and seminars on reservoir simulation, coalbed methane production, hydraulic fracture simulation.

Mr. Counts Would you also state for the Board any professional associations.

Dr. Wilson I am a member of the Society of Petroleum Engineers, the American Physical Society, Society of Industrial and Applied Mathematician, the Society of Exploration Geophysicist.

Mr. Counts Thank you, Mr. Chairman I would like to offer Mr. Wilson as an expert witness in this case.

Mr. Wampler O.k.

Mr. Counts Mr. Wilson does your responsibilities with Oxy USA include the lands involved in this application?

Dr. Wilson Yes they do.

Mr. Counts Are you familiar with the geological data available in this area?

Dr. Wilson Yes

Mr. Counts Have you made a study of the lands involved here and the surrounding area?

Dr. Wilson Yes I have

Mr. Counts Would you discuss with the Board the data used in making those studies.

Dr. Wilson We used predominantly data taken from literature along with a computer coalbed reservoir simulator that was developed initially by Gas Research Institute. The data was taken from studies funded by the Department of Energy, U. S. Bureau of Mines and the Gas Research Institute. Some background in those the Gas Research Institute was founded back in the 70's to more effectively utilize our gas resources in this country. It takes funding from users and then uses that money to fund fundamental research to all phases of natural gas. The Department of Energy naturally has strategic interest in utilization of gas resources as well as does the Bureau of Mines.

Mr. Counts Mr. Wilson are you familiar with whether the Gas Research Institute or GRI has been involved in any studies in Virginia?

Dr. Wilson Yes they have some of which we have been associated with in conjunction with them.

Mr. Counts Have any of those lands involved lands in Buchanan County Virginia?

Dr. Wilson Yes they have.

Mr. Counts Are you aware of any reports that have been prepared by GRI with regards to this data?

Dr. Wilson

Yes

Mr. Counts

Would you indicate for the Board the names of any of those reports?

Dr. Wilson

They have a quarterly report on the coalbed methane. They have regional reports for the Central Appalachian region. They are continually coming out with specialized reports not only of a data collection nature but also of field instrumentation, reservoir computer models that would help utilize the resource.

Mr. Counts

Thank you Mr. Wilson, Mr. Chairman I am going to be using several exhibits now in connection with Mr. Wilson's testimony and for the sake of expediency I would like to go ahead and go through several of those now and have those admitted as exhibits. They are all in the book you have in front of you. Exhibit Number Seven a chart entitled Air Permeability Distribution for Pocahontas Coal Exhibit Number Eight a chart entitled Permeability of Pocahontas Coal vs. Hydrostatic Stress Exhibit Number Nine entitled Pocahontas Coal Capillary Pressure Exhibit Number Ten a chart entitled Pocahontas Coal Water/Gas Relative Permeability Exhibit Number Eleven a chart entitled CBM Spacing Study Langmuir Desorption Isotherm. Thank you Mr. Chairman. Mr. Wilson will you go into a more complete discussion with regard to what these exhibits reveal and indicate to the Board what type of factors you have considered in terms of building your computer model.

Dr. Wilson

Yes, let me go over each one in turn. For convenience we are talking, I have got overhead, these are reproductions of what you have in your booklets. All of these exhibits I will be talking about here they were data taken from the literature, the sources I have previously mentioned. They are publicly available in the scientific and engineering literature. They were used as the basis for the computer modeling study which I will subsequently show. One of the key reservoir parameters that is important in trying to determine a spacing is the permeability. This is a series of tests done on Pocahontas coal from the Beatrice mine that was done at the University of Pittsburgh under the auspice of the Gas Research Institute. This has been published in 1974 in the Society of Petroleum Engineer's Journal. What it shows basically if you look at it is a tremendous variability in the permeability of coal even though these samples may have been taken

only a few feet apart. You will have some that will be over a hundred millidarcies. This would be a very good conductive coal that would transmit its gas through the well bore very effectively. You have the majority of the samples, around the 50 or 60 percent range, that are around the one millidarcy range. That would transmit the gas less effectively to the well bore. It would probably indicate that one would need to stimulate the well in some fashion. The depth at which coal is buried is an important factor on its permeability. One measure of that is what kind of confining stress you do these tests at and that is the two different bar types. You will notice that there is basically good agreement between these two tests because of the very low difference in pressures.

Mr. Wampler

Excuse me before you remove that I would like to take questions as we go so you won't have to pick out the one we are asking questions about. If we ask a question we are going to cover later tell us.

Mr. Bunn

So you are saying about 60 percent of the coal that they fall in the range of .1 to 1...

Dr. Wilson

Of these samples that were taken, roughly 60 percent of them fell within that range.

Mr. Bunn

That is millidarcies.

Dr. Wilson

It is millidarcies.

Dr. Whisonant

Dr. Wilson, those confining pressures, generally is that burial depth the main determinant there. Or something else?

Dr. Wilson

Yes the burial depth and the reservoir pressure that you are working at. These confining pressures, what you should probably keep in mind is it would be the burial depth, the overburden pressure as it is called minus the rock pressure, the full pressure of the fluid that is in there.

Dr. Whisonant

I presume that the 200-400 range is roughly equivalent to what you figure will be the case at Oakwood.

Dr. Wilson

On this series of tests it really isn't. At some portion of the reservoir there may well be that. I have another shot on the next photo that will show you where we expect more....

Dr. Whisonant

O.k.

Dr. Wilson

I think this will probably answer the question better as to where we expect to be.

Mr. Wampler

This is Exhibit Eight you are discussing. It will be helpful to us to number those.

Dr. Wilson

O.k. What this is is a plot of five different samples of again Pocahontas #3 coal. It is actually showing you the relationship between the stress at which you were performing the test, the hydrostatic stress and the permeability of the coal. So one can effectively think of this scale as being tied to the depth at which the coal is buried. Again, you will notice that there is a fair amount of scatter. That occasionally you will get, in this case, one sample out of five it has a permeability that is ten to fifteen times greater than the other samples. I think that is something real that is occurring in the reservoir. That you will see that kind of variations over very small differences in strata probably.

Mr. Counts

Dr. Wilson in considering the permeability or considering maximum spacing what kind of an impact does the permeability have on maximum spacing so as to insure protection of correlative rights.

Dr. Wilson

The higher the permeability, then the larger the spacing that will effectively drain an area. If you have a very low permeability reservoir your wells have to be quite close together to effectively drain it. The range that we would expect, we are in the range of roughly 15,000 to 2,000 feet deep. One psi per foot of overburden. So we are in the 15,000-2,000 psi overburden pressure and our reservoir pressure is about 700. So if you take the difference between those so we are, whatever that is, maybe 800 in that range so basically this data agrees pretty well with the previous data that was done at a range of hydrostatic stress that we are not that interested in and that it falls around one to two with an occasional one being up at 10 or 20 milidarcy. Again this was, I believe this was DOE funding, University of California Berkley published International Journal of Rock Mechanics 1975.

Mr. Wampler

Any questions on Exhibit Eight. I would like to take a ten minute recess please.

Mr. Counts

Mr. Chairman I believe we were getting ready to start with Exhibit Number Nine now.

Dr. Whisonant Excuse me Mr. Counts let me just inform everyone here that our regular chairman, Mr. Wampler, had to leave. I will taking over if things don't go quite as smoothly as possible please bear with me. But we will do our best. Lets resume the testimony then.

Mr. Counts Thank you sir. Dr. Wilson I believe we are at Exhibit Nine.

Dr. Wilson Exhibit Nine, again data is available in the literature for Pocahontas coal Beatrice mine. There is actually two sets of data. One which we call the University of Pittsburgh data I believe this was DOE funded. That is the red curve. The blue is a GRI funded in one of the GRI reports. What this shows is how much pressure it takes to move gas through the pore spaces of the coal. That is a fundamental piece of information that we need to know because we know the pressure in these coal seams is very low. If there is not enough intrinsic reservoir pressure there, then even though the gas may exist there wouldn't be enough pressure to blow it through to overcome the capillary forces and blow it into the well bore when we drill it down.

Mr. Starkey Dr. Wilson you don't do any forcing any exhilarated as you do in natural gas wells?

Dr. Wilson We would upon drilling a well you draw that down as much as you can either by pumping water off of the formation or trying to get the wellbore pressure as low as possible. What I am talking about here is the difference in pressure between far out in the reservoir and near to the well bore. That pressure difference is what pulls the gas in towards you. If you don't have, what these curves are showing, if you don't have something at least on the order of 30 or 40 psi, you don't pull the gas toward you.

Mr. Starkey I guess my question is if you don't have it, you just leave it?

Dr. Wilson That is right, the gas will not move. What our model that I will show you later actually inputs is this red curve and we have to tabulate it and all those data points are placed into our computer simulator.

Dr. Whisonant Dr. Wilson, excuse us just a minute, Mr. Fulmer wants to ask a question.

Mr. Fulmer The GRI data you have plotted on there is that the most recent data?

Dr. Wilson That has vintage of about 1983, 1984 and I cannot tell you if they have updated it since then or not. So it is in that time.

Mr. Fulmer So it is much younger than the University of Pittsburgh is?

Dr. Wilson Neither one of these from a reservoir engineering standpoint is giving us bad information, is telling us something bad from our perspective. These pressures are very low. Typically if you go out in the Rockies and are trying to develop a tight gas reservoir out there they may be up in the 100's so it tells us we shouldn't have a problem in two things. One pulling the gas toward us and also cleaning up any hydraulic fracture fluids that we might have injected into the formation. They shouldn't have a problem of just staying around.

Mr. Bunn What type of liquids or fracing type substances would you be using?

Dr. Wilson We would probably use a range of fluids. There are three different kinds of fracturing fluids that people would use. A nitrogen foam which would be 50 or 60 percent of the water that had been foamed up. They would use just plain water. They would use a viscosified water in which you placed a guar gum gel in it to viscosify it. We would do the least damaging of those. Again we would probably in a development project of this sort there is no doubt we would do some of each kind.

Mr. Counts Dr. Wilson as related to spacing how rapidly you can move the gas through the reservoir is really a function of the permeability and thickness of the coal. Is that not correct?

Dr. Wilson That is correct. The product of the permeability times the net thickness of the coal is directly related to the rate at which we can pull the gas out. The flow rate of any well that might be there.

Mr. Counts Would it be correct to state then the greater the thickness, and increase permeability the greater the production and the increase drainage.

Dr. Wilson That is correct.

Mr. Counts Thank you sir.

Dr. Wilson The next exhibit I believe is Exhibit Ten. I would like to talk about that now. Coalbed methane is

typically produced not only from this data that I am showing you here for the Pocahontas coal but throughout the country. It also has associated water production with it. That is what these the curves of this exhibit attempt to exemplify. Again this was kind of busy but I have shown two different sources of data to give you some feeling for what kind of ranges of reservoir values one might expect even from a particular seam and a particular mine area. The one set of data which I have labeled GRI data that is the triangles or the solid lines is, I am sorry it is the dash lines and triangles is the GRI data and the other set of data which is the solid lines and the dots is the University of Pittsburgh published back in 1974 on the Pocahontas #3 coal seam.

Mr. Bunn

Let me ask. Could you tell me what the scales are there. What is going across the bottom and what is going up and down.

Dr. Wilson

What is being plotted along here is the water saturation as it currently exists. That is something that changes as you look at this plot as you produce the well you produce more and more water so typically one would start out for coalbeds one would start out at high water saturations and as you produce the coal that gas you would also produce water and this water saturation would go in this direction as you produce the well. The vertical scale runs from 0 to 1. It is a relative measure of how well that particular fluid would flow. So for instance, let me just concentrate on one of these curves to give you a feel for it, say the red one. The red one is the relative permeability of water. As we start off the reservoir we would expect it to be very high water saturation. So its relative permeability to water would be very high. That means that only water would flow initially it is high relative permeability of water. As one produces more and more water the amount of water that would actually flow at any given time is decreasing. Its relative permeability is decreasing. At some point you begin to produce gas and that is this solid blue curve. So as I get down and produce the reservoir where I am at an average water saturation of 70% I am flowing partially gas which is the blue curve and partially water although it is easier to flow the water at this point than it is the blue curve which is the gas. As I continue to produce the reservoir my water production drops and my gas production increases. The blue curve.

At some point late in the life we would be producing almost totally gas.

Mr. Bunn

At what point is the well economical to operate?

Dr. Wilson

That is not easy to answer. From this chart there are certainly lots of coalbed methane gas reservoirs that would be economic to operate realizing that they were going to start off flowing maybe for the first year or two nothing but water. So you could be out here on this part of the curve and produce it backwards and you have to run the specific economics for that case. We are in a very fortunate situation I think in that regard as far as the Pocahontas #3 seam is concerned.

Mr. Bunn

So you are saying you are past the 70% range going in right?

Dr. Wilson

I suspect from our modeling studies, it is very difficult to get hard numbers here, I suspect we are going to start initially in this range right here. Which means we don't have to go through this two year period of flowing water. I think somewhere in between 80 percent and 60 percent is where this coal seam should lie. Which means you will be getting gas production almost immediately.

Mr. Counts

Do you have a question Mr. Chairman?

Dr. Whisonant

Any questions?

Mr. Starkey

I am probably the only one in the room that doesn't know this. Do you have some responsibility for the disposal of that water?

Mr. Counts

Yes, absolutely sir. Those regulations and rules are promulgated by Mr. Fulmer's office.

Mr. Starkey

O.k. thank you.

Mr. Counts

The next will be Exhibit Number Eleven.

Dr. Wilson

The final or the most important variables I haven't shown you everything that is input into the simulator by any means but that as you are more familiar is the desorption isotherm. If one puts, in the case I have done it for a ton of coal, if one puts a ton of coal in a canister and starts pumping in methane under pressure, raising the methane pressure, what one would find is that more and more of that methane would be absorbed onto the surface of the coal. It would proceed as we increased the

gas pressure since the pressure is high we would be able to force more of them onto the surface and reaches a limiting value and in this case this is for Pocahontas coal that limiting value is about 650 standard cubic feet per ton for this particular sample shown here.

Mr. Bunn

But you are saying here in this field that 230 is about a minimum. Right.

Dr. Wilson

What you also have to consider is what the pressure is one will be working at. In our case we are probably at a reservoir pressure of around 700 so one would come up to this curve here and that is going to give something around 500 standard cubic feet per ton for this particular sample.

Mr. Bunn

In this particular area the minimum would be about 700.

Dr. Wilson

Right as presented earlier the minimum I believe he said was 230 and the maximum was about 700. In terms of our simulation study we have actually input this curve. That is a little better than putting in a specific number because then it can pick up how much gas is absorbed into the coal and would subsequently be desorbed into your gas production. Depending on what reservoir pressure you were at at a given time. The way you actually work it of course in a reservoir is that one starts at the initial reservoir pressure and one proceeds in this direction as you decrease the average reservoir pressure by producing the well. The gas then desorbes out of the coal and that is what is actually produced by the gas well.

Mr. Bunn

Tell me this formula here.

Dr. Wilson

This is the formula that is actually used in our model. It is the Langmuir Isotherm model that you maybe see in the literature occasionally. It is characterized by two constants, volume constant and a pressure. These two values here are the ones that were used and it generated this plot. I put that up there because often they just refer to it as Langmuir and no one ever seems to write down the equations. But that is it.

Dr. Whisonant

Questions

Mr. Counts

Dr. Wilson, utilizing the data that you just demonstrated to the Board were you able to project a

model depicting the maximum spacing which could be efficiently drained.

Dr. Wilson

Yes I was.

Mr. Counts

Before we go further into that would you mind explaining to the Board how using one of your exhibits how your data was imputed into your model.

Dr. Wilson

The next exhibit I believe is 12. This is a summary from a typical run that I might make of again there is a lot of data here but let me pick out one. For instance the permeability, in the case that I will be showing you today I used a permeability of two millidarcies. The way that was arrived at was going back to exhibit number 8 one would get into the range in which we were expecting, come up for the hydrostatic stress, come up and we have got in this case five different curves and then would take a weighted average to obtain the two millidarcies.

Mr. Counts

Mr. Chairman I would like to offer into evidence the following exhibits at this time. Exhibit Number Twelve which is entitled Coalbed Methane Spacing Study Reservoir Parameters Assumed, Exhibit Number Thirteen chart entitled Coalbed Methane Spacing Study Cumulative Production, Exhibit Number Fourteen chart entitled Coalbed Methane Spacing Study Recovery Factor. All of these exhibits are also in the folder before you.

Dr. Whisonant

Thank you

Mr. Counts

Dr. Wilson what did your model reveal as to the maximum efficient spacing for the field?

Dr. Wilson

Well, using these assumed parameters that were again taken predominantly from the literature we were able to project, using our computer simulator, these forecasts for the cumulative production from the 320 acre block. What we did was actually run the simulator for a variety of different cases shown here. We assumed in the first case that we had one well in the center of the 320 acre block. That is this bottom curve which shows its cumulative production over a 20 year span production. We then re-ran the simulator with the same reservoir parameters assuming that we 160 acre spacing or two wells in that 320 acre block. That was this next curve and we proceeded again to look at additional wells if we drilled four wells in that 320 acres which is 80 acre spacing, five wells which turns into 64 acres, eight wells which would be 80 acre

spacing, ten wells which is the 32 acres spacing and 16 wells or 20 acre spacing. What we saw upon doing that and just looking at this series of curves is by increasing the number of wells one drills in 320 acres one does not proportionately get the additional gas that one might expect. In fact you reach a point of diminishing returns. As you see these curves are getting clumped closer and closer together even though you may have drilled as many as twelve additional wells between one curve to the other. Another line that we use for our purposes is a cut off line. As you produce these wells the rate is also declining and this cut off line is where it crosses a particular curve indicates where the rate dropped below 25 mcf a day which is what we were using as a minimum economic break.

Mr. Bunn

25

Dr. Wilson

Twenty-five

Mr. Bunn

25 what now

Dr. Wilson

Mcf per day What you see from that is if you are at a very small spacing 20 acres that yes you can produce an amount of gas but economically from those 16 wells you would only produce it during the first four years. So by drilling more wells you accelerate your production. You get more of the production in up front. By drilling fewer wells you extend the economic life of the reservoir. In effect spread out that resource over a longer period of time. I would like to particularly point out that the two curves in question in the overlap area that would be appropriate would be the green one and the blue one. The blue one is the 80 acres spacing. That would be four wells in our 320 acres block that was simulated and the green one is the 64 acre spacing. As you can see there is very little incremental production that is gained by going to the additional well. In fact this difference is something on the order of ten percent. You gain ten percent incremental gas production but your cost have gone up 25% in going from four wells to five wells.

Mr. Bunn

This is what you are showing that after 20 years the well has totally drained. Is that right.

Dr. Wilson

Yes to the point of, right. Actually for some of these it occurs much earlier than that. That 20 year cut off is really only appropriate for the 80

acre. If you look at the 20 acre spacing its life is going to be four or five years.

Mr. Bunn

All right. How can you relate this to the degasification that they are using for the Pocahontas seam now?

Dr. Wilson

I am not familiar really with that degasing scheme. I do know that those are very close to actively mined areas.

Mr. Bunn

That is what I am trying to say. It is hard for me to believe that Occidental would have two companies operating so close as you do and not know how to correlate the degasification wells and the experience you have had from degasing the coal from those wells and not know where it reaches some kind of value to you on your determination of these wells. Where they should be spaced.

Dr. Wilson

Well we certainly have utilized vent hole production data some that was published back in the late 70's as part of GRI studies to verify our computer modeling. So we are able to accurately match the observed vent rates during that GRI program.

Mr. Bunn

I guess it is a fair assumption to ask or to assume, that is a horrible word to use in front of these attorney's here but you are going to drain this acreage before you mine. Is that correct?

Dr. Wilson

I think drain is a relative, it is kind of relative. I go back to the Langmuir isotherm exhibit. One will never get, in this particular case, one will never get no matter how long you wait all of the gas that is in there. You have to make an economic judgement really as to what is the optimum, how long you want to really suck on these wells to desorp the gas from. Again, you reach points of diminishing returns. It is economically based. The economics would be different I believe for degasing a well as opposed where you are trying to economically produce a well.

Mr. Starkey

Dr. Wilson, you may have explained this earlier, but your model is based on these assumptions in exhibit 12. Are these assumptions from your experience and calculations?

Dr. Wilson

Well the assumptions are a combination of several things and there are firm numbers. Very firm numbers and there are some that are softer. Probably the softest ones that I have shown you are

on. Some of the numbers like porosity we assume 47, that I think is a very firm number, it can't be much off of that. Some of those are log determined values. Again you can go to the literature and pick those up as well. Formation temperature is a pretty firm number. The gas viscosity is a really firm number. Other numbers, for instance I don't see it here, initial reservoir pressure I think that one is a pretty firm number. We can put a gauge down vent holes and determine those. That is how that one was determined.

Mr. Counts

Mr. Starkey for purposes of this model I think it is important to remember that the first commercial production in coalbed methane really occurred in 1982. This is virtually a new untapped resource which we really don't have a lot of data on. There is a lot of studies out there on it. There is of course some production in Virginia but very limited. The vast majority of production is in the Southern Appalachian Basin and in Colorado in the four corners area. So we have really come up with the firmest numbers that we could. But we have just really tried to generate all the empirical data that we could with regard to some of those other numbers.

Mr. Starkey

I guess my thought was triggered by questions of the affiliate company or sister company having experience in this area and whether we used much of that.

Dr. Wilson

We have used some of their data although primarily it has been production related data from the late 70's.

Mr. Counts

From that standpoint also Mr. Starkey I am not aware of any coalbed methane that is being produced commercially within the Commonwealth of Virginia right save and except that in Dickenson County and the Nora field right now. I would have to assume Dr. Wilson that there is some data that you would like to have access to with regard to production that you aren't able to obtain.

Dr. Wilson

That is correct.

Mr. Bunn

Can you tell us what is your spacing on your degas wells on your Island Creek operations?

Dr. Wilson

No I can't.

differently from ordinary gas, natural gas well?

Dr. Wilson I think insofar as it doesn't impact mine safety, that concern would make it special, if it does not impact mine safety I would not assume that it would be any different.

Mr. Starkey What would happen if it impacted mine safety? If it wasn't economical to sell you would just blow it off?

Dr. Wilson Safety should be the overriding concern.

Mr. Starkey It would be another degasification hole?

Mr. Counts Provisions of the Oil and Gas Act and Regulations and Emergency Orders and various other measures provide for the venting of gas for safety purposes. Mr. Bunn with regard to your line of questioning if you would like to break and go back to Mr. Lewellen for a couple of minutes, if you would like to explore that line Mr. Lewellen is with Island Creek, we would be happy to do that.

Mr. Bunn That is the reason that I was trying to ask those questions why he was here. When he said he was with Island Creek and you said hold it. Our first duty of this Board is to preserve the natural resources and use them most efficiently and to explore them as efficiently as we can.

Mr. Counts Absolutely

Mr. Bunn We recognize that we are wasting a natural resource right now but it is for safety purposes. I think anybody in this room can understand that. But I just wanted to know if there is some kind of way that two companies can work together to maximize the recovery of this without stopping a complete mining operation. But to capture as much gas as possible to maximize the use of the natural resource.

Mr. Counts It is my understanding, Mr. Bunn, that Island Creek and Oxy both have every intention of trying to maximize these resources. I could not agree with you more. I think Virginia has lost a tremendous amount of a valuable natural resource as a result of the fact that perhaps, of course as we indicated recently 1982 was the first commercial recovery. It was only through a result of studies such as rendered by the Department of Energy and Gas Research Institute which was finally able to convince operators that this was actually a viable resource that could be captured economically. Quite frankly I have attended conferences very recently

which said the San Juan Basin is terrific, the Black Warrior is somewhat less than terrific and who knows about the Central Appalachian Basin. Who knows about the Northern Appalachian Basin. I think the jury is still out with regard to how economic those operations can be. I think that certainly it is exciting for Virginia that we now have operators here that are going to undertake that and hopefully it will be extremely economic. It will certainly be beneficial to this state if it is.

Mr. Bunn

O.k. to satisfy myself Tom I would like to, we can go ahead and continue, but I would like to talk to Mr. Lewellen.

Mr. Counts

Since we are already on the subject, Mr. Chairman if you don't have any problems, let me go ahead and call Mr. Lewellen he has already been sworn.

Mr. Fulmer

Lets take a break.

Dr. Whisonant

Lets call the meeting back to order.

Mr. Counts

Thank you Mr. Chairman. I believe we were getting ready to go with Exhibit 14 a chart entitled Coalbed Methane Spacing Study Recovery Factor.

Dr. Wilson

Using our coalbed methane reservoir simulator we were able to determine the percent of coalbed methane gas in place that is recovered as a function of the number of wells we have drilled all for a 320 acre study block that we were using. This is a typical kind of chart that is used in the Oil and Gas industry. The think that is different here is we have used a reservoir simulator specifically designed for coalbed methane. We are able to calculate the initial gas in place. We used the simulator to see how much of that is produced over the economic life of the wells. That determines the total gas that is recovered. We have been able to calculate a percentage. Then that is plotted versus the number of wells that were drilled in that block to obtain that total gas recovered from the 320 acres. As you see if you only drill one well in the block or a 320 acre spacing, one only would recover about 22 or 23 percent according to our simulation study. If one drills an additional well, one does not double the percentage in place recovered. But one still recovers a substantial portion up around 37 or 38 percent. As one progresses and drills more wells you can recover more and more of the resource that is available there. What is typically done in the oil and gas industry is try to get as far up on

this knee of the curve as is economically possible. In this case the bend occurs around the 80 acre spacing. To go to 20 acre spacing one still only recovers 65% of the gas in place, 80 acre spacing I believe that number was actually 56% of the initial gas in place. So even we have drilled to go to 20 acre spacing we have drilled what 12 more wells we incrementally get very little in addition. Particular ones to point out again in going from 80 acre spacing to 64 acre spacing, the reason I have used 64 throughout is that is an even number of wells in a 320 acre block. The incremental is only a little over 1% of the initial gas in place.

Mr. Counts

Dr. Wilson I would like to confirm for the benefit of the Board that this spacing study model is based upon the model that you put together with regard to Buchanan County, Virginia. This is not a generic number picked out that will be applicable to any particular area based upon the assumed data in your model. Correct?

Dr. Wilson

That is correct. It is based on the unique reservoir characteristics that we believe exist in this area.

Mr. Counts

And specifically for the Oakwood Coalbed Gas Field?

Dr. Wilson

That is correct.

Dr. Whisonant

Questions? I have got one. I keep wanting to return to this issue of how fundamentally different Oakwood and Nora are. It looks like we are headed toward two coalbed methane fields with different spacing rules. So my question would concern the last few exhibits. I am assuming that if you had Nora numbers up here the curves would look different. The sixty acre spacing is still more applicable?

Mr. Counts

If I can interrupt for just one moment. I think what we will probably will end up seeing in Virginia as well as a number of other states, are the fact that depending upon reservoir characteristics which certainly Dr. Wilson can testify to. You are going to find a lot of the same formations, even the same seams, will be spaced differently in different areas. Depending upon the thickness, depending upon the permeability etc. For instance there has been a recent request in Alabama to expand spacing which was initially established at 40 acres to 160 acres. Now that is fine that you finally get around to expanding the spacing on that but what happens in a

situation like that is that the correlative rights of those parties who are around those 40 acre squares when they were initially drilled, those correlative rights were violated. They don't have redress now. But we are basically saying here is it is our opinion that the Oakwood Coalbed Gas field represents essentially a separate distinct reservoir from that of the Nora field. Dr. Wilson.

Dr. Wilson

In my opinion I am not privy to the reservoir numbers for that field, but it would have to be studied as a unique case in much the same way as we have done here. It could very well give the 60 acre spacing. Each reservoir has to be considered as a unique reservoir with its properties determining what the optimum value would be. It is not uncommon in oil and gas parts of the country to even have different strata on different spacing. That may be only 20 or 30 feet apart. One might be 640 because of the gas zone and below it or above it might be an oil zone that might be 20 or 40 acre spacing.

Dr. Whisonant

Thank you I thought that is what you had been saying several times. I just wanted to be crystal clear on the record. It will show up as two different spacing rules for adjacent fields.

Mr. Counts

Absolutely

Dr. Whisonant

In fact one previously overlaps the other.

Mr. Counts

As you are aware there are other areas in Virginia, for instance the Richmond basin, Pulaski and Craig counties. We may end up with several different spacing field rules depending upon the reservoir characteristics of each area.

Dr. Whisonant

Thank you.

Mr. Starkey

Dr. Wilson, Mr. Counts said something I would like to pursue. You answered a question I asked awhile ago and I thought you said that once you have a methane well gas in you either put it into production or blow it off. Is that a pretty fair statement?

Dr. Wilson

Or you can keep it shut in. You keep the well capped. Certainly that would be a third option. Generally one would probably either vent or put it into production.

Mr. Starkey I don't know enough about drilling to pick that up so you clarified that for me. That answers my question.

Mr. Counts Dr. Wilson are you familiar with the application filed in this case?

Dr. Wilson Yes I am

Mr. Counts Would you please briefly for the Board summarize the purpose of the application.

Dr. Wilson Yes we seek to get the what we call the Oakwood Coalbed Gas Field, the gas seams associated with that as you have seen as a reservoir producing coal seam gas. In addition we would like the Board to recognize the spacing for this field that would most effectively and efficiently utilize and produce this resource.

Mr. Counts Dr. Wilson the most effective spacing to utilize this resource is also not only in the best interest of Oxy USA but also in the correlative rights of the underlying owners. Am I not correct?

Dr. Wilson That is correct.

Mr. Counts Dr. Wilson are there existing permitted wells in the lands involved which are completed in and producing from coal seams covered in this matter?

Dr. Wilson No

Mr. Counts Have you made a study of other similar coalbed methane gas development in other areas.

Dr. Wilson We have made studies of the Black Warrior Basin area, the San Juan Basin and a few smaller areas although none to the detail that we have presented here.

Mr. Counts How has the development of these areas compare with Oxy's plan of development?

Dr. Wilson They are similar in that they have a water production. All coalbed methane that I am aware of has to a greater or lesser degree a water production phase and they do produce associated water. They are similar in that they all produce gas as the predominant mechanism that is desorbed gas from the coal.

Mr. Counts Does Oxy plan to commingle production from various coal seams through the same bore hole?

Dr. Wilson Yes, we plan to commingle the zones.

Mr. Counts In your opinion is production from such commingled coalbed methane wells from the various coal seams the most efficient and economical way to produce such gas?

Dr. Wilson Yes it is.

Mr. Counts Would you explain to the Board why that is true?

Dr. Wilson There are really only a few reasons, technical reason. And economically it would just not be feasible to produce the gas economically without commingling the zones. Technically there is no reason that one would want to not commingle them.

Mr. Counts Do you also recommend that the special field rules provide for venting as necessary for mine safety and for the testing of wells?

Dr. Wilson Yes I do.

Mr. Counts Do you recommend that a minimum distance of 300' from the unit boundary be maintained for all wells drilled except those requiring location exceptions?

Dr. Wilson Yes

Mr. Counts Do you further recommend a minimum distance between coalbed wells of 800'?

Dr. Wilson Yes I do

Mr. Counts In your opinion Dr. Wilson how large a tract in the Oakwood Coalbed Gas field producing from one or more of these coal seams effectively and efficiently drain?

Dr. Wilson As I showed in my previous exhibits I believe all our evidence indicates that 80 acres is the most appropriate spacing that would efficiently and effectively produce the gas from these seams.

Mr. Counts As Dr. Whisonant has indicated, why should the Board's March 20, 1989 order with regard to the Nora Coalbed Methane Field be modified from 60 to 80 acre units in the overlap which we have discussed?

Dr. Wilson

I think that there are three reasons: the first is I believe it is a different reservoir. We have seen from our geologic testimony and Mr. Lewellen the coal seams that are giving us the predominant gas production mechanisms will not exist in that area. They pinch out. In addition the second reason would be that we believe that we have higher quality reservoir. In general we have some of the highest gas content coal in the country I believe. The third reason is that such a plan would conform with Island Creek's mining operations.

Mr. Counts

Based on your discussion of the gas content of the coal would you discuss with the Board the GRI report which is listed as Exhibit 15 in the brochure and I would also like to ask the Board to accept this as Exhibit Number 15.

Dr. Whisonant

We accept

Mr. Counts

To show you why we believe we are in the highest quality part of the gas reservoir, our area of interest is essentially this blocked area. This that we have plotted here is an isopac map showing the thicknesses of the Pocahontas coal. As we have said earlier the dominant thing, reservoir parameter is the permeability times the thickness. We are in some of the thicker seams. The highest quality gas content. In general better quality gas, better quality reservoir I should say. As you get away from this area the seams are pinching out and the thicknesses are getting smaller.

Mr. Counts

I would also like to point out for the Board, if I may, I know that all of you on the Board know your geography in terms of Southwest Virginia. But to bring into perspective of the Nora field into play. We are looking here at Dickenson County (am I correct, I believe that is correct) and this is the area the extent of the Nora Coalbed Gas Field. You see as you go into Buchanan County the GRI report is indicating the increased thicknesses with regard to the isopac map here. This essentially is the dividing line in terms of the Oakwood Coalbed Gas Field that we requested. We requested that this part of the field be increased to 80 acre spacing with the eastern part of the field also being increased from the statewide spacing to the 80 acre spacing. So I think there is a very direct correlation to our point with regard to our fact that we are essentially dealing with a separate distinct reservoir once you get on over into Buchanan County.

Mr. Counts Dr. Wilson, Mr. Barnes has testified that location exceptions are requested for some seven wells. Have you reviewed these locations and is it your opinion that the correlative rights of the owners will be protected through these exceptions?

Dr. Wilson Yes I have reviewed and it is my opinion they will.

Mr. Counts Does Oxy request that the order resulting from this hearing find that the vertical limits of this field comprise all coal seams below the Tiller seam?

Dr. Wilson Yes it does.

Mr. Counts In your opinion will the granting of the application foster, encourage and promote the safe and efficient exploration for and development, production and utilization and conservation of coalbed methane from the seams underlying the lands involved in the application?

Dr. Wilson Yes

Mr. Counts In your opinion will the granting of the application be in the best interest of conservation, prevention of waste and protection of correlative rights?

Dr. Wilson Yes it is. In terms of conservation the increased spacing as we have indicated is the most efficient and effective way to economically produce this gas. In addition, the coal would be degased so that subsequent planned mining activity in the area would have the benefits of increased safety in their operations.

Mr. Counts Thank you Dr. Wilson. Mr. Chairman I have no further questions of this witness.

Dr. Whisonant Any questions from the Board. Mr. Counts I have one. Would you and or your witnesses, please express clearly again the need for confidentiality concerning this endeavor. The issue came up earlier and I am not sure we are quite clear as to why this must be so treated.

Mr. Counts Certainly. The Virginia Oil and Gas Act requires that an in order to obtain confidentiality an operator must so request. Coalbed methane is a new resource which is being just now being explored in Virginia. With regard to for instance if we were looking at the eastern part of the state and developing a major reservoir there there is a tremendous amount of testing from both a geologic

and engineering standpoint and a geophysical standpoint that have to be done. There has to be some incentive to the operator to be able to perform all these tests, to drill core holes, to evaluate the reservoirs etc. Being able to protect the information, I think is given throughout the conservation schemes of most all states, that protection of this information has found to be justifiable in terms of furthering the interest of the Conservation Board and essentially that is what we are requesting here. This is a new resource. There is new technologies being developed everyday. The request for holding this information confidential, if I am not mistaken Tom, I believe that is for a maximum period of two years. Which the legislature has granted in order to be able to say that o.k. the operator is entitled to some consideration with regard to confidentiality but there should also be a compelling public interest with regard to not having that period extend into infinity. So what we have requested here is two year confidentiality with regard to the testing results of these wells.

Dr. Whisonant

Thank you Mr. Counts. Any other questions?

Mr. Counts

Thank you sir. Are you ready for closing remarks Mr. Chairman?

Dr. Whisonant

Please

Mr. Counts

I think we have shown that existing statewide rules clearly are inadequate for the development of coalbed methane underlying the proposed Oakwood Coalbed Gas Field as indicated by the evidence presented today. Adherence to statewide rules will result in drainage significantly outside the boundary established by statewide spacing and, therefore, will not protect the correlative rights of those individuals outside the approximate 18 acre radial units or 23 acre square units created under statewide rules. With respect to the request for modification of the Nora Coalbed Gas Field we have put on evidence that the Oakwood Coalbed Gas Field involves essentially a separate distinct reservoir with one or more coal seams present and secondly greater thickness of seams. Hopefully our evidence has indicated that and supported that. Also it is illustrated by evidence outside that preparation by Oxy including the GRI report which we just reviewed. In addition to the evidence put on by Oxy USA to that effect, this also supported by numerous industry publications including the Gas Research

Institute Report. In addition, our evidence has shown that the Oakwood Coalbed Gas Field is a better quality reservoir with more seams present. More gas per cubic feet and also the fact that it conforms with Island Creek's areas of operation. In this application Oxy is concerned with being required to drill more wells than are necessary to develop the field. That is why we need the maximum efficient spacing available and that is why we have requested the 80 acre spacing. If we had to drill more wells then hopefully as I have shown on my diagram that would result in economic and physical waste. For the owner, less than maximum efficient spacing will also result in drainage and waste. I think it is important to recognize in Virginia that spacing is prospective and that for instance some states do require that a number of wells be drilled in a given area before spacing will be allowed. As you have indicated your concern this order, other orders may well in fact be modified in the future. What I think is extremely important to realize though from the Board's standpoint and the Board is charged with the protection of correlative rights and prevention of waste. If we look at an 80 acre unit and we assume that one will maximally drain an 80 acre unit but if we consider the fact for some reason as I indicated the spacing in Virginia is prospective. So we don't have all the data we would like to have. We can't confirm for certain that it is 79 acres, 80, 81 etc. but from the Board's standpoint I think it is extremely important that we not space the area to small. If the area gets spaced too small there is no relief available for the correlative rights of those parties that have been impacted. There reservoir outside this area if that is spacing statewide or other, has been drained and there is no relief, no recourse available to them. What is important to the Board in terms of the Board considering any request for spacing as flip back to the other paper and go back to the same untidy unit, is the fact that relief is available to the extent that later on the Board were to find that it had spaced to large of an area. Now this is from the standpoint of increased density which I think will be most appropriate in Virginia in all likelihood. That opposed to one well in this particular area you would be able to drill two wells or the Board could come in and despace the area and for instance lay down 40 units or stand up 40 units. What is important to realize is that the maximum, the maximum efficient spacing should be established for this field for the protection of correlative rights. In the event that spacing proves ends up proving it

is larger than is necessary, there is recourse and the correlative rights of these individuals end up being protected. In the event, however, that the Board were to space the area too small there is no recourse and the correlative rights are violated. On behalf of Oxy USA I respectfully request that the 80 acre spacing and the additional relief requested by Oxy in this matter be granted. I would like to thank very much the members of the Board and also you Mr. Chairman for your time.

Dr. Whisonant

Thank you Mr. Counts. Is there anyone else present here today that wishes to be heard before the Board on this matter. If so please come forward and identify yourself.

Rand Sterling

Mr. Chairman, my name is Rand Sterling I am a staff attorney with Equitable Resources in Kingsport we have just several brief comments if we may. First we would request that we be given an opportunity to provide you with written comments and we would suggest possibly a two week period. We did not receive actual notice of this hearing. We heard of this hearing, there was constructive notice by publication but we did not have a full and complete opportunity to review the application. Furthermore there are materials that have been submitted today that we would like to be able to review. We obviously have not brought with us our engineers or geologists. This is an order or this request or application does have the effect of modifying an existing order. We feel that due process would be best served if in the future for all interested parties and operators that actual notice be provided. Furthermore we would request that if we could if the application is in public record if we could take a copy of that with us or that could be provided so that our engineers and geologists could have an opportunity to review that.

Mr. Counts

They are a matter of public record with regard to the package as submitted.

Mr. Sterling

So we may be able to obtain a copy of that so that we can take that back with us and review it with our group.

Mr. Counts

In terms of the major exhibits we don't have any additional copies.

Mr. Fulmer

We can provide it in fact George Mason already has a copy of it.

Mr. Sterling Oh he does? I wasn't aware of it.

Mr. Fulmer We will supply you with another copy. There isn't any problem with that.

Mr. Sterling If at all possible we would appreciate having the opportunity of having the two week period to review the application so that our people can have an opportunity to review that and make written comments at that time. Thank you for your time.

Dr. Whisonant Questions, thank you. Anyone else. Would you please come forward and identify yourself.

Mr. Edwards Yes sir, my name is Michael Edwards I am president of Edwards & Harding Petroleum Company. My comments are similar to those of Mr. Sterling of EREX in that the area of the proposed spacing order here affects part of the area that our company has under lease. As matter of fact it affects part of the area that the Board has created units that our company is operator of and we would also like to request a similar period to review and comment on the order. Thank you.

Dr. Whisonant Thank you Mr. Edwards. Questions? Anyone else. Thank you everyone this hearing is closed.

Mr. Fulmer Wait, let me ask a couple of technical questions here to just clarify up a few things just for the record Rick. Noting the date of the application was dated the 7th we received. I know at that time the emergency legislation wasn't passed but it was signed on the fourth. So technically I am asking some questions. The relief sought is under 45.1-357.3?

Mr. Counts That is correct.

Mr. Fulmer That is correct, you want to amend your application sir?

Mr. Counts Yes sir, so amended.

Mr. Fulmer For your spacing are you asking relief under 45.1-357.2 dealing with statewide spacing?

Mr. Counts Mr. Fulmer with regard to 357.2 obviously that is the statewide spacing for coalbed methane development. That is obviously applicable to statewide rules and also 45.1-301. We are asking that we receive this relief even considering the statewide rules, save and except from statewide. We

want something over and above the statewide spacing for these units.

Mr. Fulmer

Am I correct in seeing in your application you mention in section three page five of the application, minimum distance between vertically drilled coalbed methane degasification wells. Do you mean gob wells or vertical vent holes, that nature?

Mr. Counts

I will have to ask for some technical expertise on that. Mr. Fulmer I am advised that will be essentially anything but gob wells.

Mr. Fulmer

Anything but gob wells.

Mr. Counts

Yes sir

Mr. Fulmer

Like I said I am just trying to get this on for the record to make sure we get all of this correct. For your gob wells, when they go on production will that be 80 acre units? Or will you want less?

Mr. Counts

At the present time the request for relief we have made addresses only the vertically drilled wells. We are not at this time addressing gob wells.

Dr. Whisonant

Thank you Mr. Fulmer. Other questions, then the hearing is closed. Thank you very much.

Mr. Counts

Thank you Mr. chairman and members of the Board.

EXHIBIT LISTING OF OXY USA, INC.

1. Grid Map
2. Approximate Extent of Field Overlap and Relationship
3. Plat
4. Stratigraphic Column of The Pennsylvanian Age Coal Seams, Oakwood Coalbed Gas Field
5. Location Map of the NW-SE Cross Section of the Tiller To Pocahontas #2 Horizon
6. Stratigraphic Cross Section of the Tiller To Poca. #2 Horizon, Drawn by Lewellen
7. Air Permeability Distribution For Pocahontas Coal
8. Permeability of Pocahontas Coal vs. Hydrostatic Stress
9. Pocahontas Coal Capillary Pressure
10. Pocahontas Coal Water/Gas Relative Permeability
11. CBM Spacing Study Langmuir Desorption Isotherm
12. CBM Study Reservoir Parameters Assumed
13. CBM Spacing Study Cumulative Production
14. CBM Spacing Study Recovery Factor
15. Isopach Map of the Pocahontas No. 3 Coal Bed

EXHIBIT #1

PLAT PREPARED BY OXY USA

ON FILE IN THE DIVISION OF GAS AND OIL
230 CHARWOOD DRIVE
ABINGDON, VIRGINIA

APPROXIMATE EXTENT OF FIELD OVERLAP AND RELATIONSHIP

- EREX NORA COALBED GAS FIELD
- OAKWOOD COALBED GAS FIELD

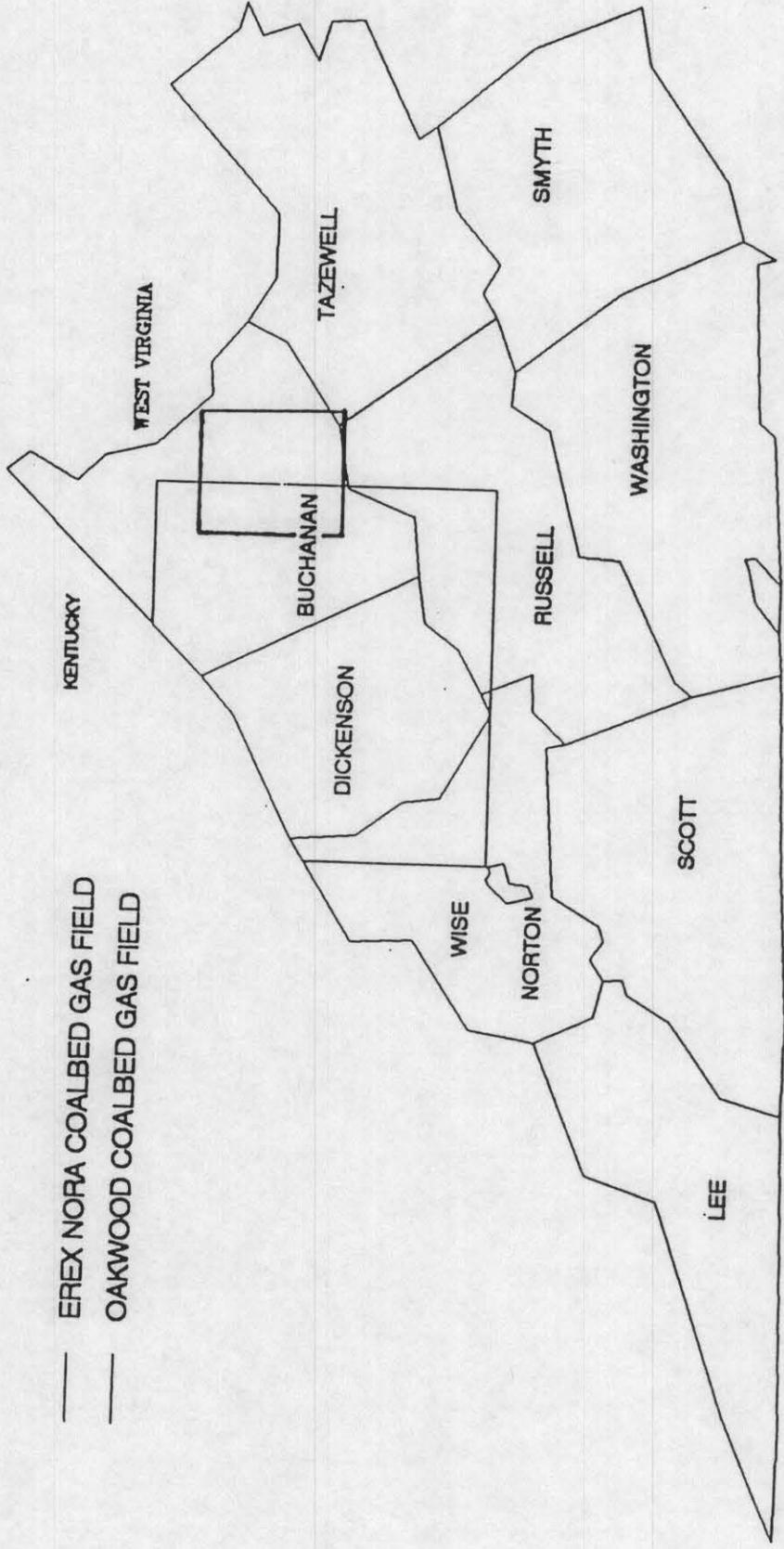


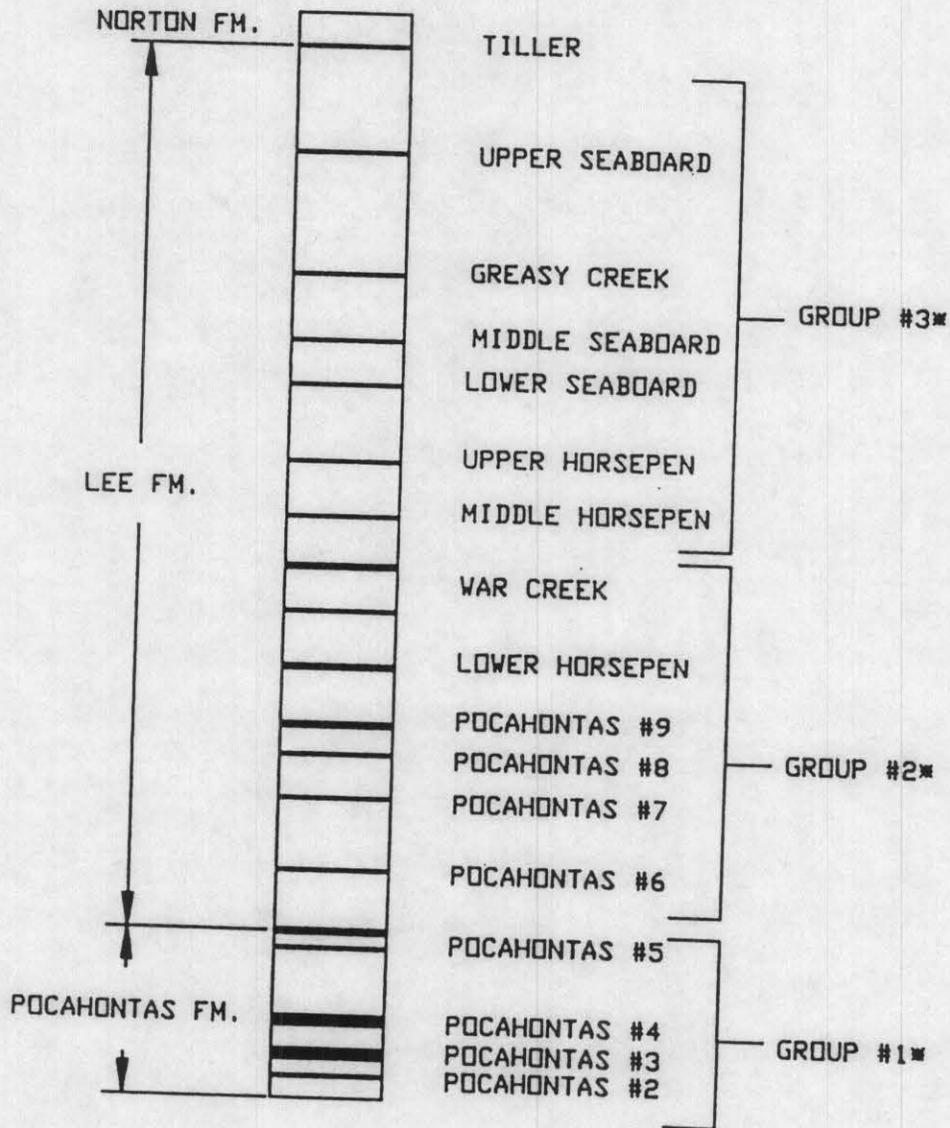
EXHIBIT #3

PLAT PREPARED BY OXY USA

ON FILE IN THE DIVISION OF GAS AND OIL
230 CHARWOOD DRIVE
ABINGDON, VIRGINIA

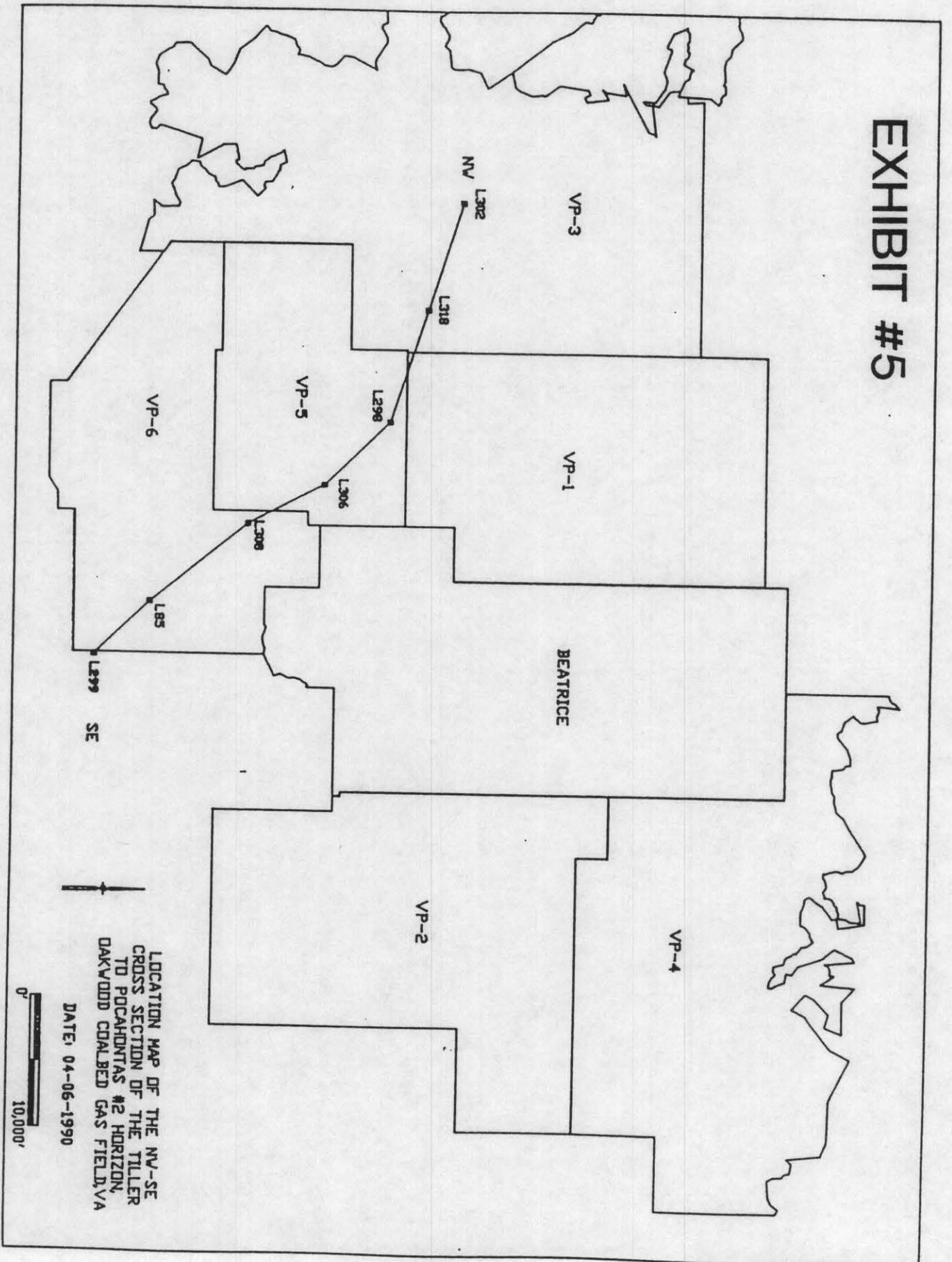
EXHIBIT #4

STRATIGRAPHIC COLUMN OF THE PENNSYLVANIAN AGE COAL SEAMS, OAKWOOD COALBED GAS FIELD, VA.



* seams are grouped in the order of importance based on thickness and continuity.

EXHIBIT #5

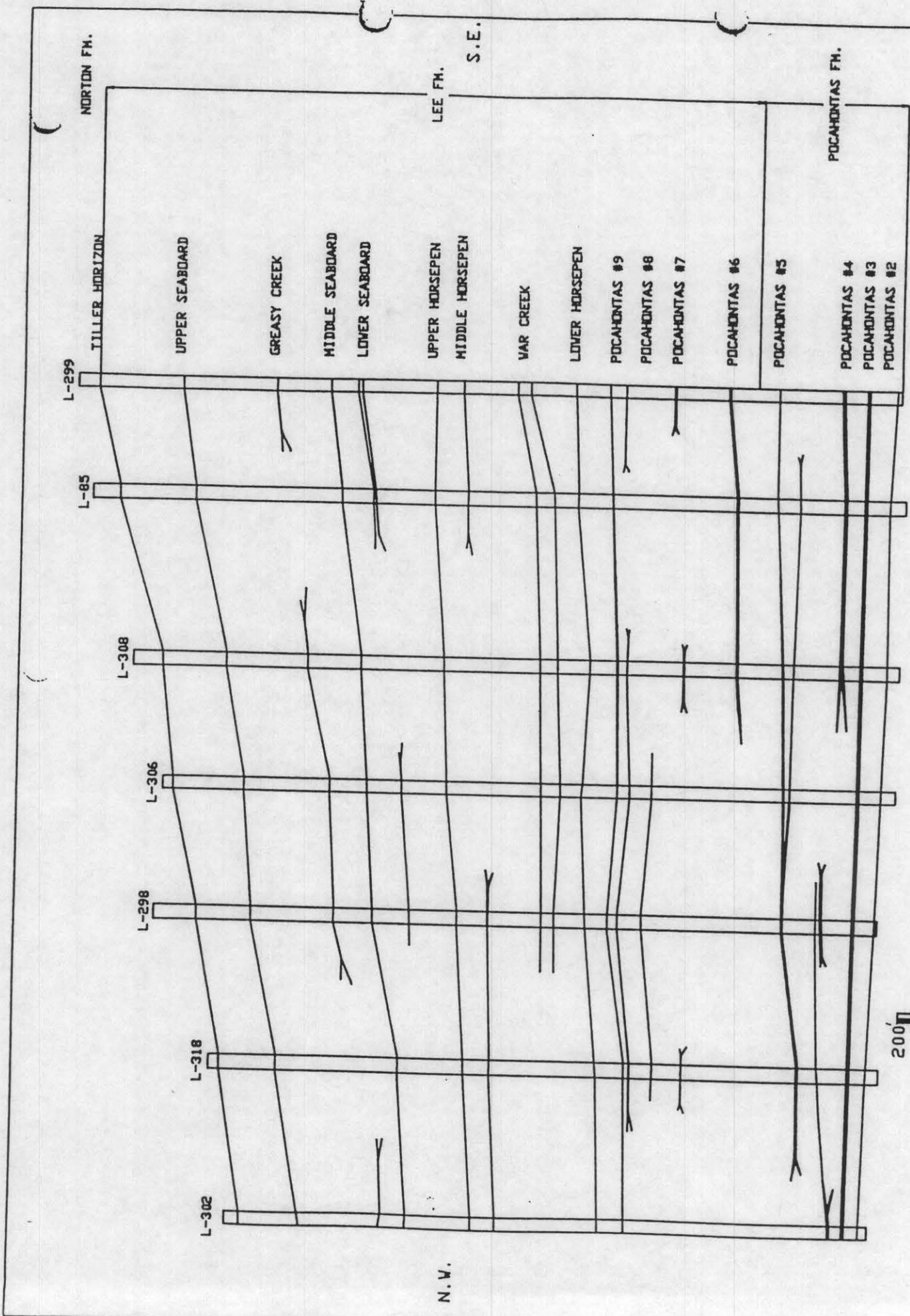
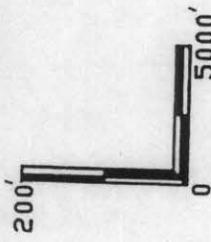


LOCATION MAP OF THE NV-SE
CROSS SECTION OF THE TILLER
TO POCAHONTAS #2 HORIZON,
DABWOOD COALBED GAS FIELD, VA
DATE: 04-06-1990



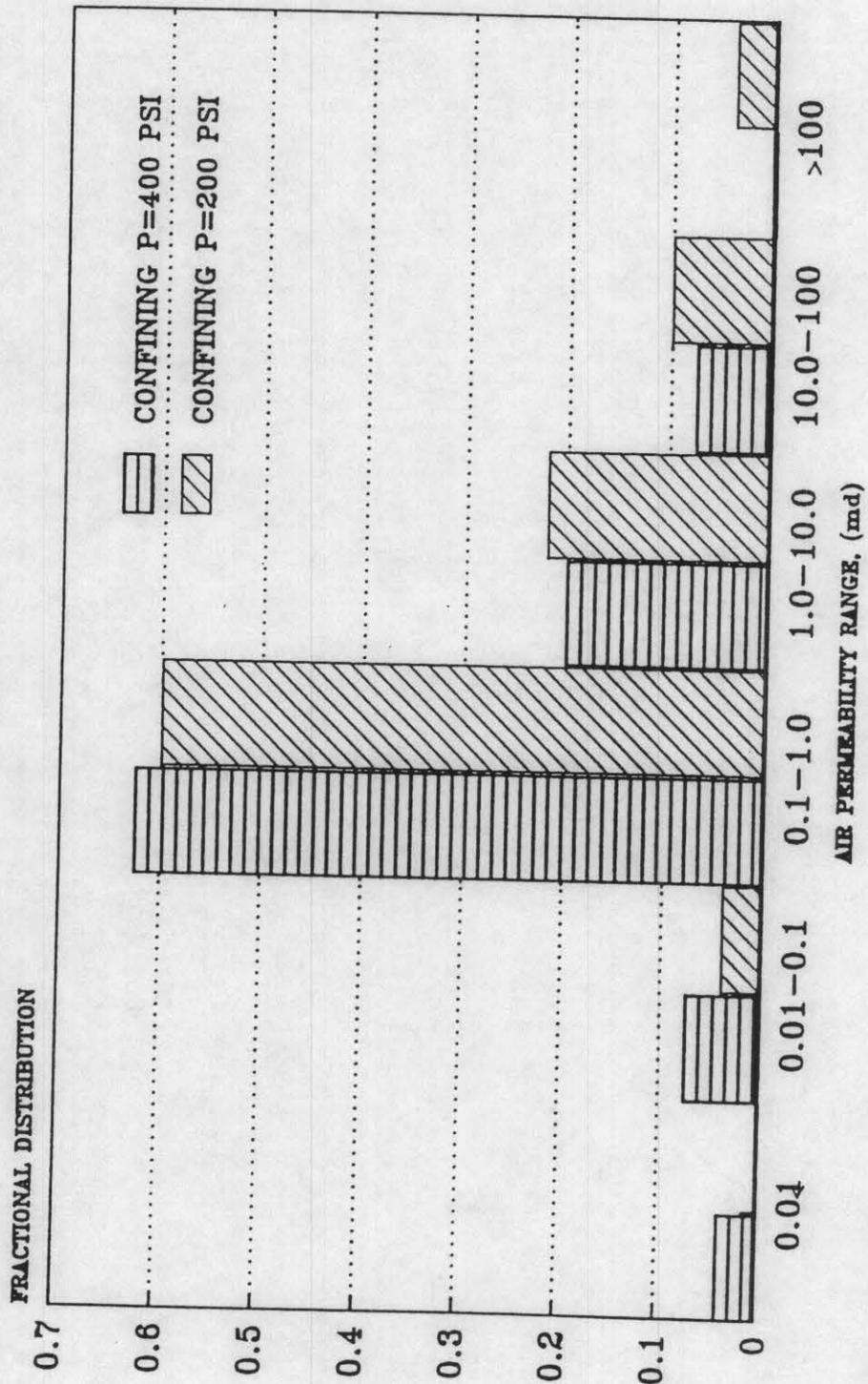
STRATIGRAPHIC CROSS SECTION OF THE
TILLER TO POCAHONTAS #2 HORIZON,
DANWOOD COALBED GAS FIELD, VA.
DATE: 04-06-1990
DRAWN BY: D. LEVELLEN

DATUM: BASE OF THE POCA. #3 SEAM
COAL SEAM THICKNESS NOT TO SCALE



N.V.

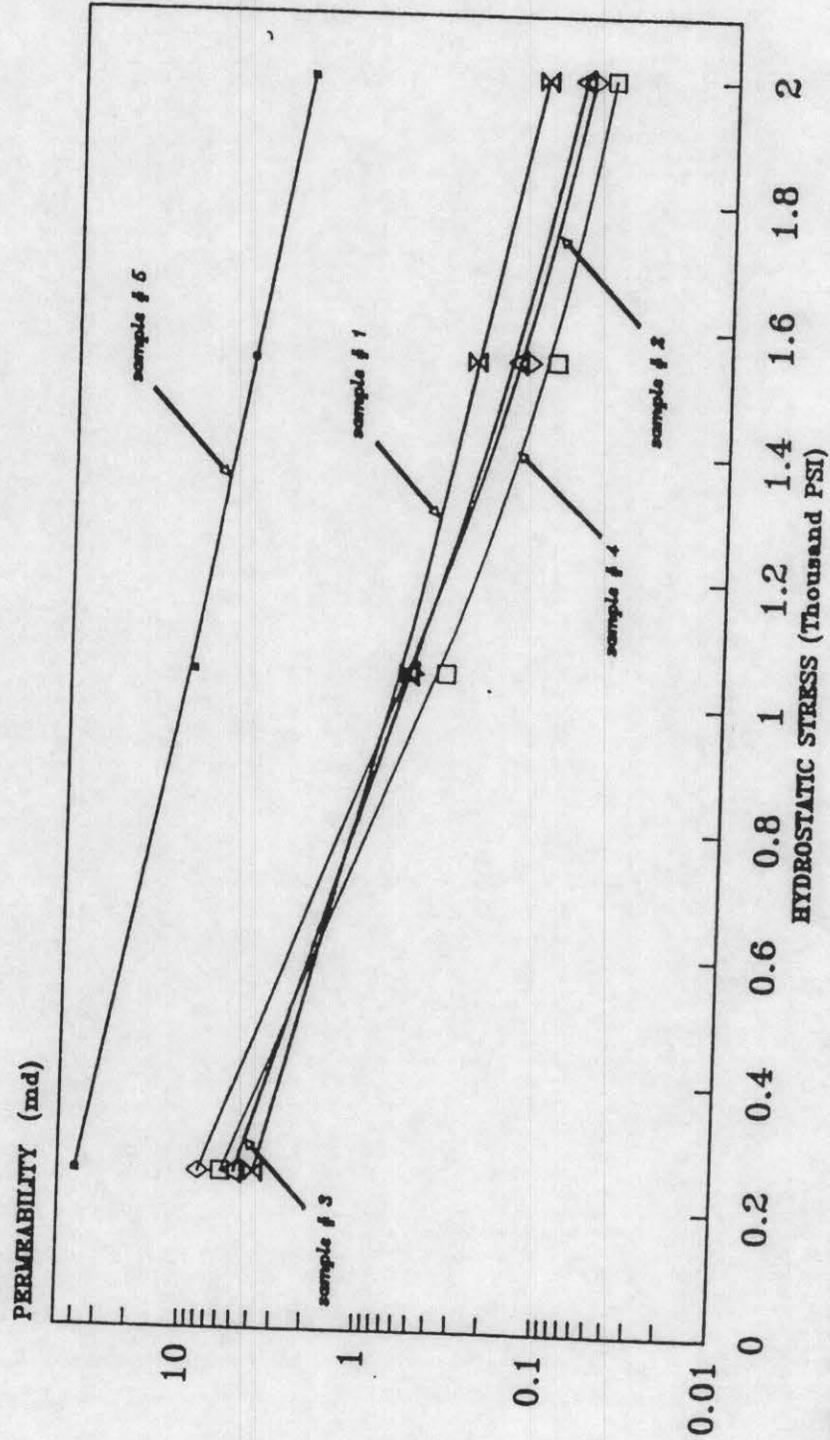
AIR PERMEABILITY DISTRIBUTION FOR POCAHONTAS COAL



SOURCE: M.K. Dabbous, et al.
SPEJ (Dec. 1974) p. 563f.

EXHIBIT #7

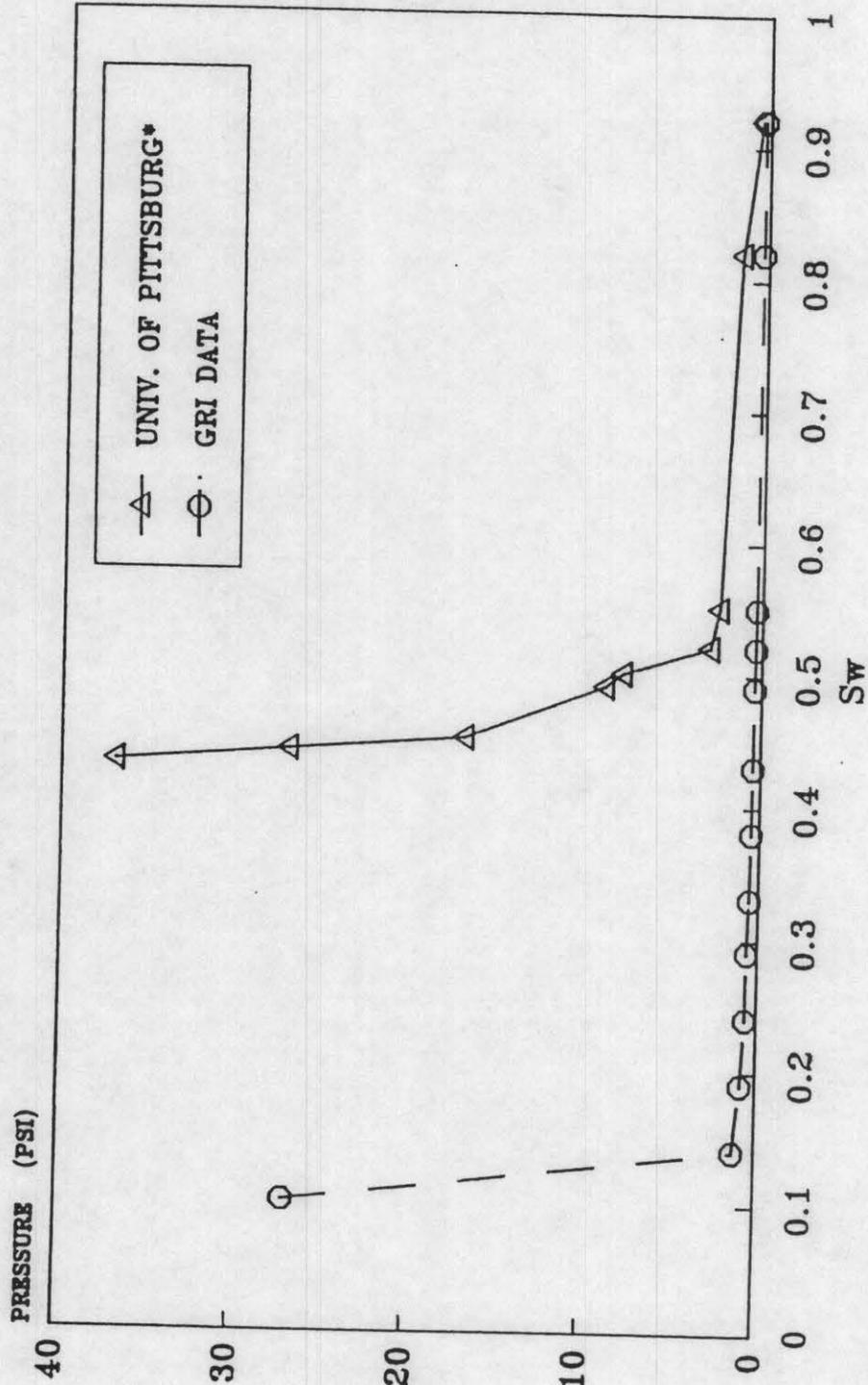
PERMEABILITY OF POCAHONTAS COAL VS HYDROSTATIC STRESS



SOURCE: W.H. Somerton, et al., Int. J. Rock Mech. 12 pp. 129-145 (1975)

EXHIBIT #8

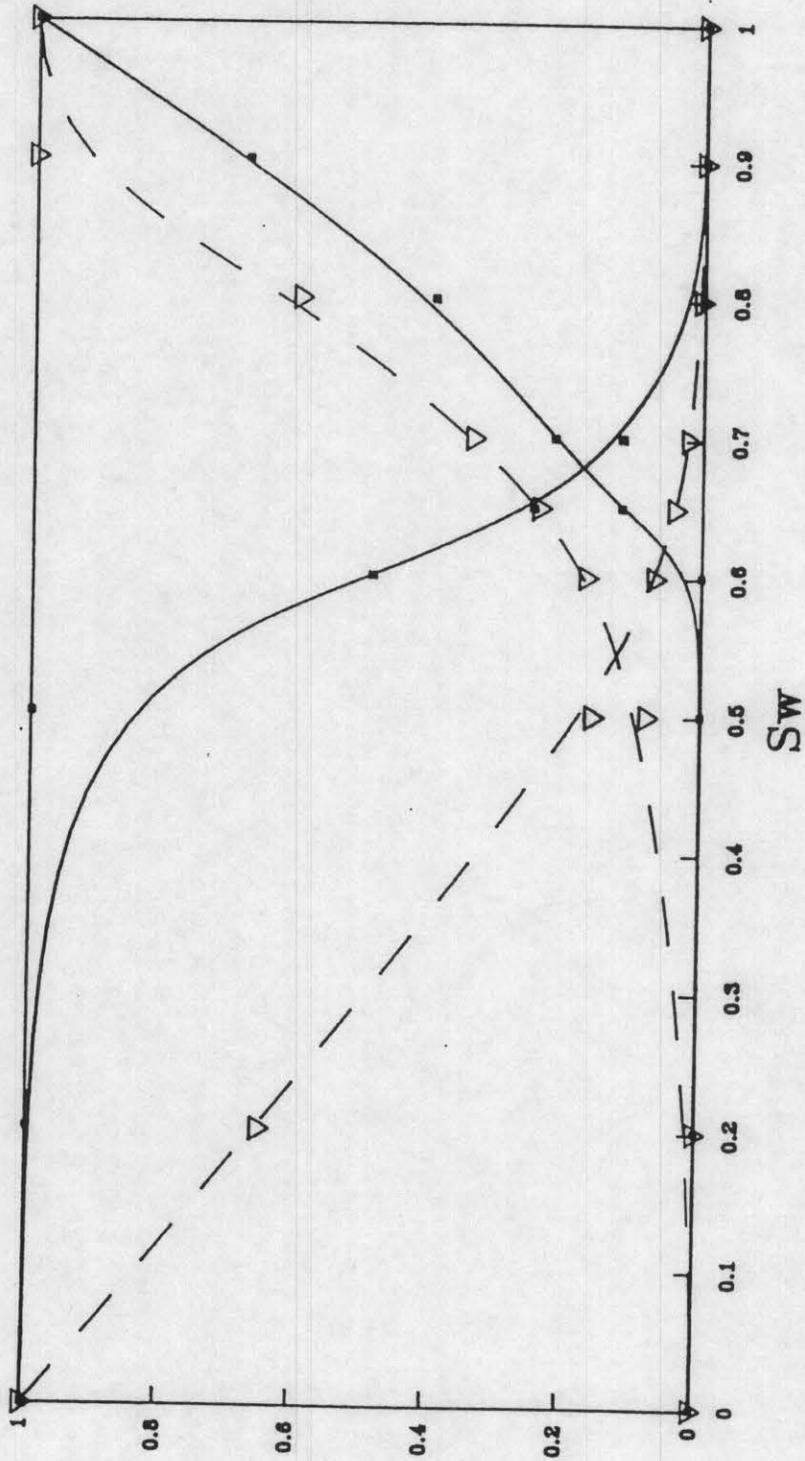
POCAHONTAS COAL CAPILLARY PRESSURE



*SOURCE: M.K. Dabbous, et al. SPEJ
(Oct. 1976) p. 261f

EXHIBIT #9

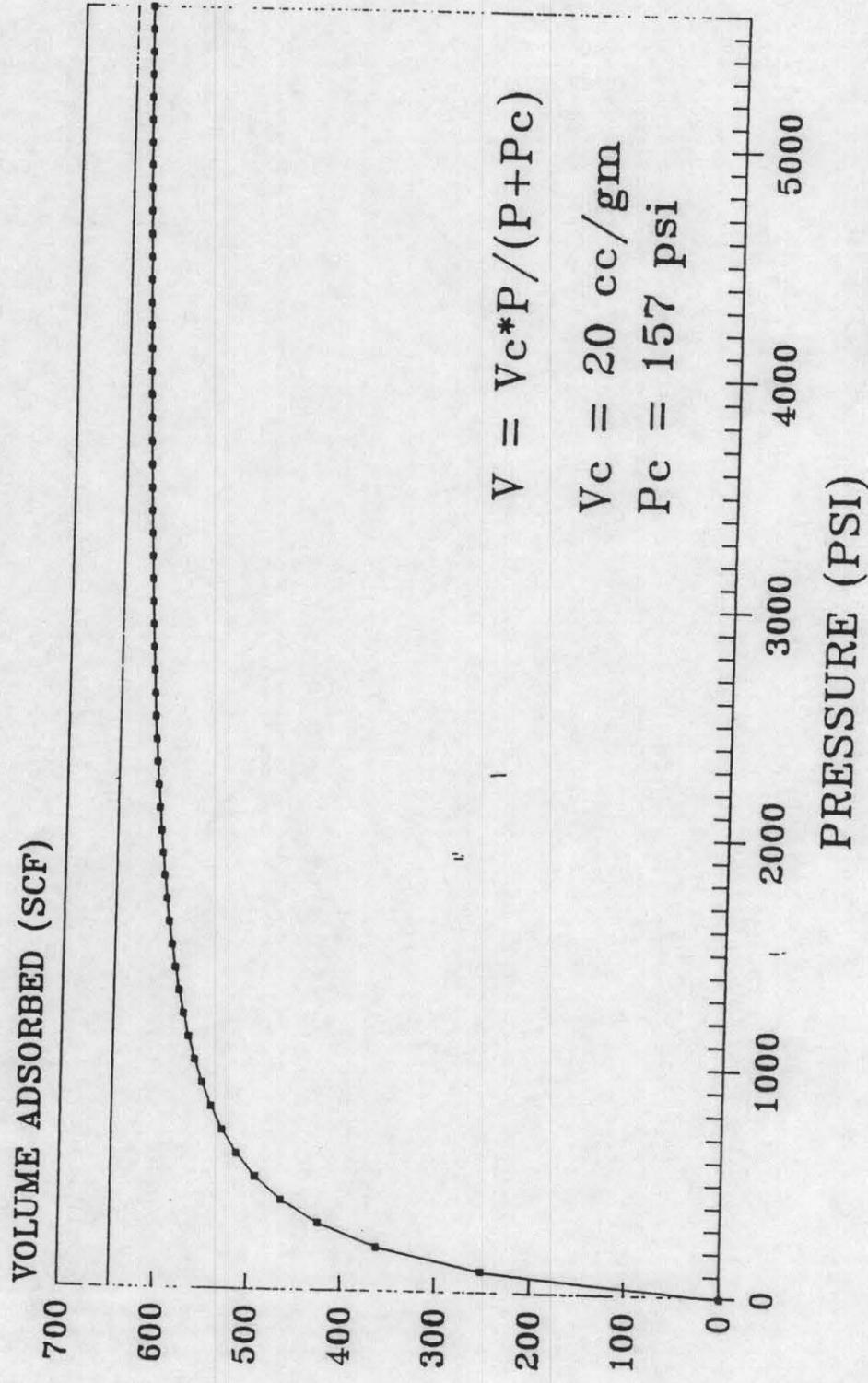
POCAHONTAS COAL WATER/GAS RELATIVE PERMEABILITY



—○— K_r - - - ▽ - - - K_{rg} - · - · ▽ - · - · K_{rw}

*SOURCE: A.A. Reznite, et al. SPEJ (Dec. 1974) p. 556f.

CBM SPACING STUDY LANGMUIR DESORPTION ISOTHERM



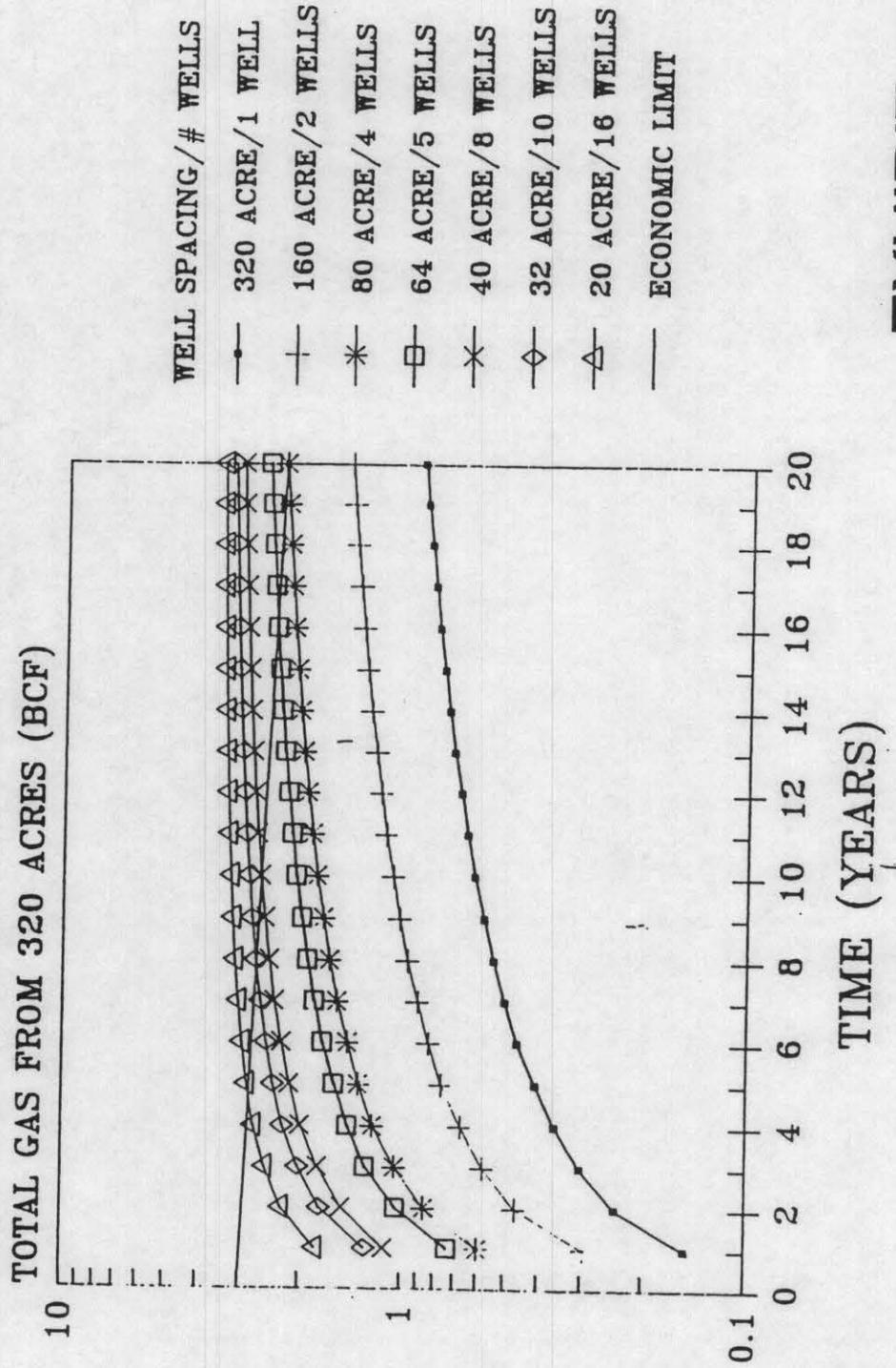
CBM SPACING STUDY

RESERVOIR PARAMETERS ASSUMED

AVERAGE RESERVOIR DEPTH, FT	2000
NET RESERVOIR THICKNESS, FT	13
ABSOLUTE PERMEABILITY, MD	2
POROSITY, %	4
INITIAL RESERVOIR PRESSURE, PSI	673
INITIAL WATER SATURATION, %	70
FORMATION TEMPERATURE, DEG F	75
FORMATION COMPRESS., 1/PSI	0.000017
DESORPTION VOLUME CONST., CC/GM	20.2
DESORPTION PRESS. CONST., PSI	157
DESORPTION TIME CONSTANT, DAYS	0.231
NATURAL FRACTURE SPACING, IN	0.25
MATRIX PERMEABILITY, MD	0.0
MATRIX POROSITY, %	2.4
STORATIVITY RATIO, FRACTION	0.62
COAL DENSITY, CC/GM	1.36
DIFFUSIVITY COEFF., SQ FT/DAY	20.4
WATER COMPRESSIBILITY, 1/PSI	0.000003
WATER FORM. VOL. FACTOR, CF/SCF	1.0
GAS VISCOSITY, CP	0.01
GAS GRAVITY, FRACTION	0.60

EXHIBIT #12

CBM SPACING STUDY CUMULATIVE PRODUCTION



CBM SPACING STUDY RECOVERY FACTOR

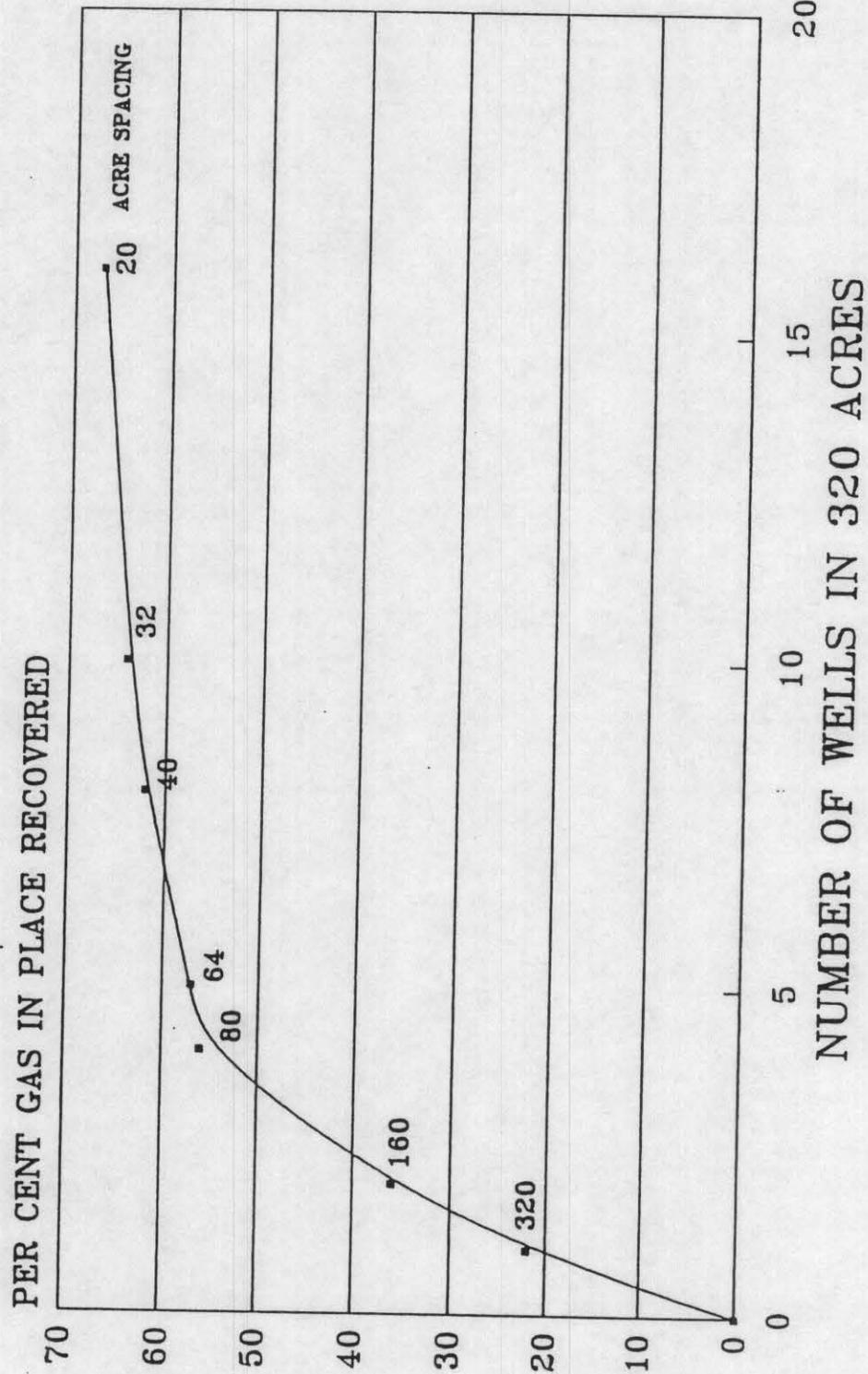
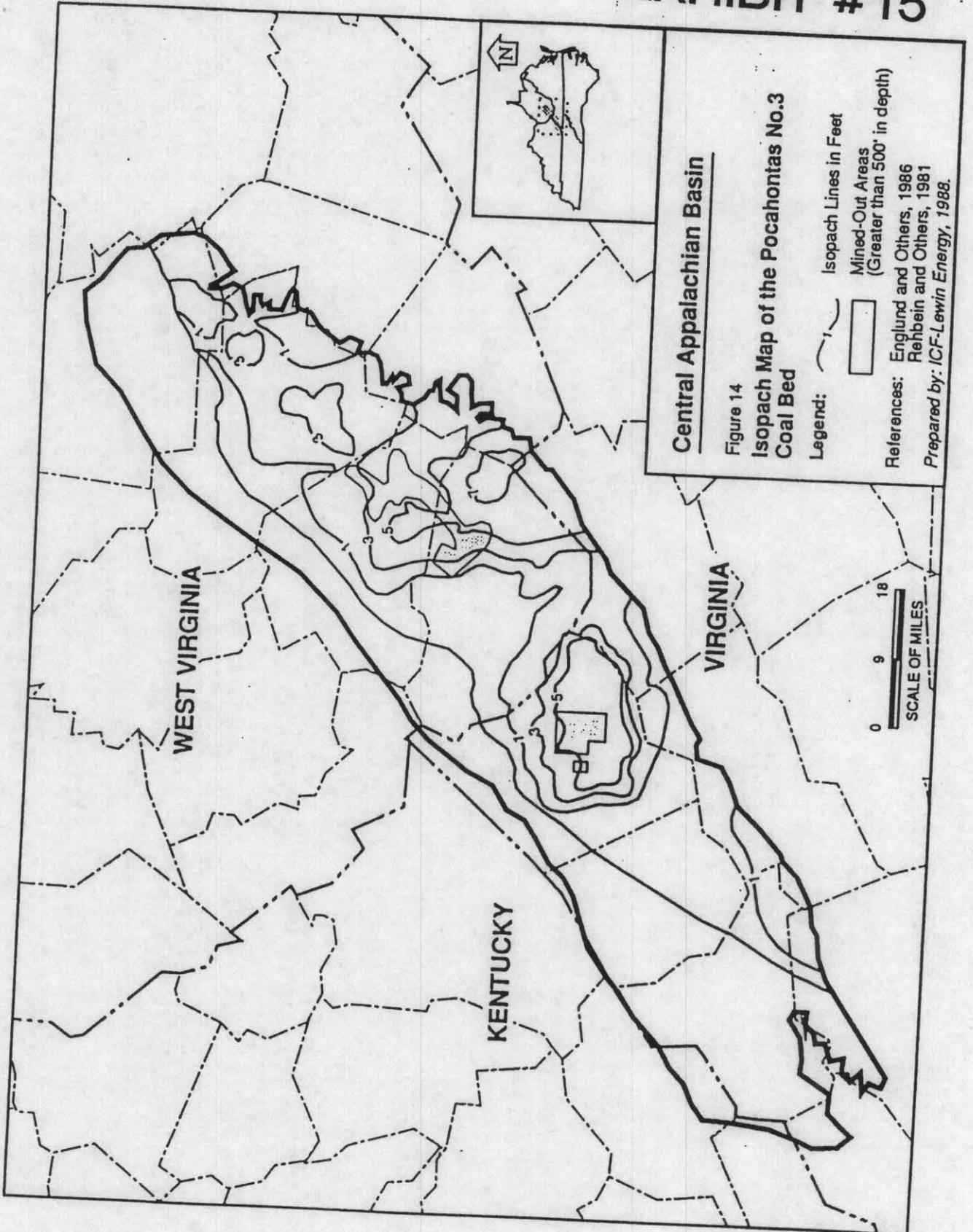


EXHIBIT #15



Central Appalachian Basin

Figure 14
Isopach Map of the Pocahontas No.3
Coal Bed

- Legend:
- Isopach Lines in Feet
 - Mined-Out Areas (Greater than 500' in depth)

References: Englund and Others, 1986
Rehbein and Others, 1981
Prepared by: ICF-Lewin Energy, 1988.

0 9 18
SCALE OF MILES

VIRGINIA OIL AND GAS CONSERVATION BOARD

SPACING HEARING

OAKWOOD COALBED GAS FIELD

REQUESTED BY OXY USA., INC.

APRIL 10, 1990

BUCHANAN COUNTY BOARD OF SUPERVISOR'S ROOM

GRUNDY, VIRGINIA

BOARD MEMBERS PRESENT

Mr. Benny Wampler, Chairman

Dr. Robert Whisonant

Mr. Jim Bunn

Mr. Chester Starkey

Mr. Tom Fulmer, State Oil & Gas Inspector

Ms. Diane Davis, Secretary

Counsel for Oxy USA, Inc. - Mr. Richard Counts

Mr. Wampler

Good afternoon ladies and gentlemen, my name is Benny Wampler and I am Assistant Director for Mining for the Virginia Department of Mines, Minerals and Energy. I am going to ask each Board member to introduce themselves.

The following members were present: Dr. Robert Whisonant, Mr. Jim Bunn, Mr. Chester Starkey, Mr. Wampler, Tom Fulmer State Oil & Gas Inspector, Diane Davis Secretary

Mr. Wampler

Thank you. The purpose of the hearing today is to hear arguments and evidence concerning the request of Oxy USA, Incorporated for the establishment of drilling units and spacing for the Oakwood Coalbed Gas Field. We will now ask Mr. Counts to present the evidence to the Board.

Mr. Counts

Thank you Mr. Chairman and members of the Board. Mr. Chairman, as you have indicated, the Board has convened today to hear Oxy's request for the issuance of an Order granting 80 acre spacing to cover the lands involved in this application. Also appearing today on behalf of Oxy USA in addition to the expert witnesses which we will call, I would like to introduce to the Board Ms. Patricia Patton, counsel for Oxy USA, along with John McKinnis with the firm of Counts, McKinnis and Scott. In order to develop some perspective, I would also like to before we get into the hearing pass out some of the exhibits. I think it will help in terms of going through the application. I will be making reference to these, Mr. Chairman, during the course and introducing a number of these as exhibits in the hearing.

Mr. Wampler

Thank you

Mr. Counts

Mr. Chairman and members of the Board, as you are aware the current spacing state wide field rules in Virginia today is based on approximately 19 acre radial spacing. The spacing sought and requested by Oxy today is based on 80 acre spacing. This exhibit which will be introduced during the hearing essentially shows the area sought to be spaced by Oxy which is overlaid by a grid system and the dark lines you see here also entail the Island Creek mine boundaries. This is the entire area sought to be spaced. Essentially right now the western half of this area, all of this area to my left here is currently spaced under an order which the Board issued last year granting 60 acre spacing to Equitable Resources. The area to the east is currently under state wide spacing rules which as I

indicated provide for 19 acre spacing. Mr. Chairman with leave of the Board I would like to go into just briefly to what spacing is for the benefit for the public and what the reasons are why we requested this relief. With your permission I will do that.

Mr. Wampler

Go ahead

Mr. Counts

Essentially the production and development of oil and gas early on was governed strictly by the common law of doctrine of the rule of capture. Under that doctrine if you assume that you have an 80 acre unit and if you further assume that the most efficient and economical way to drain that unit is to locate one well bore in the center of that unit and that one well bore would in fact drain that unit under the rule of capture as a result of the fact that say landowner A owns this unit and they are surrounded by adverse landowners all around as opposed to drilling this well in the center of this unit and maximally drain this unit, the most prudent location to drill this well is going to be on the outer perimeter. The purpose of all conservation laws and schemes throughout the country are for the protection of correlative rights and the prevention of waste. I think we can see here without the benefit of spacing laws and conservation laws that would not be effective. As soon as landowner A drills a well here, landowner B will offset that well as close to landowner A's property line as is possible. We already have two wells where essentially one well would have drained this entire area. As soon as this occurs A will counter by drilling here B to protect will drill here etc. What this results in is two types of waste, economic and physical waste. From an economic standpoint we have drilled a significant number of wells, lets say eight where really one well would have drained this field or this unit of this particular gas. We have physical waste from the standpoint that as opposed to producing this well prudently landowner A is required to produce the gas or produce the oil or the hydrocarbons as quickly as they can get them out of the ground. That will end up leaving a significant amount of hydrocarbons and will not efficiently drain the reservoir. Further graduation of that is that once conservation laws were implemented statewide rules were first enacted, statewide rules are basically are reasonable basis to assume that anywhere within a particular region, particularly within that state that a well will drain a specific number of acres. As I indicated in Virginia, that is based on 19 acre spacing. Coalbed

methane spacing to my knowledge in terms to the wells being drilled throughout the United States basically those goes from some 40 acres to units that are as much as 320 acres in the Fruitland formation in Colorado. As I indicated in Virginia the spacing is now on 19 acre radial basis that is on statewide basis. With regard to the Nora field which covers the western half, the Nora Coalbed Gas Field which covers the western half of the acreage which we have sought to have spaced today that is based on 60 acres and the spacing which Oxy is requesting today is based on 80 acre units. Primarily the purpose of todays hearing is to demonstrate why 80 acre spacing is necessary to govern operations in the area sought to be spaced by Oxy's application. It is necessary from a statewide standpoint to insure that correlative rights and the prevention of waste is protected. I think that you can indicate if you have got an 80 acre unit such as this unit here and you are drilling on statewide rules of a 19 acre radius, the correlative rights of these individuals outside that radius are going to be violated. In addition from the standpoint of the overlap between the area sought to be spaced under this order and the Nora Coalbed Gas Field rules as promulgated by the Board last year that the modification of the overlap of the Nora Coalbed Gas Field is necessary to change with geologic conditions in order to conform to Island Creek's mine boundaries and for the prevention of waste and the protection of correlative rights. Mr. Chairman with that aside I would like to go ahead and call my first witness if there are no questions from the Board. Mr. Starkey.

Mr. Starkey

If you will excuse me but where did you get that 19 acre figure?

Mr. Counts

That is just out of my calculator in terms of trying to take a look at the I think the wells now being drilled statewide spacing is on a 500' radius. That is on a radial basis. I think on a square that would be probably about 23 or 24 acres.

Mr. Starkey

That is for natural gas?

Mr. Counts

Coalbed methane Mr. Starkey. Strictly coalbed methane.

Mr. Wampler

Any other questions of the Board. O.k. proceed.

Mr. Counts

I would like to call as my first witness Mr. Marty Wirth.

Mr. Marty Edward Wirth

Mr. Counts Mr. Wirth who are you employed by and in what capacity?

Mr. Wirth I am employed by Oxy USA, Inc. and I am a coalbed methane project land manager.

Mr. Counts Mr. Wirth have you ever testified before the Virginia Department of Mines, Minerals & Energy?

Mr. Wirth No

Mr. Counts Mr. Wirth would you advise the Board in terms of your background please and your education?

Mr. Wirth I hold a degree in human relations and I have completed numerous professional landman and law educational courses resulting in numerous certified professional landman credits. I am a member of various professional associations and organizations as American Association of Professional Landman, International Right-of-Way Associations and organizations of such.

Mr. Counts Mr. Wirth would you state your work experience with Oxy?

Mr. Wirth I have been employed for almost 13 years with Oxy USA with the majority of my experience being in contract negotiations and lease and surface acquisition, division orders, environmental aspects in the oil and gas industry and negotiations with royalty and surface owners.

Mr. Counts Mr. Chairman I would like to offer Mr. Wirth as an expert witness in this matter.

Mr. Wampler All right

Mr. Counts Mr. Wirth do your responsibilities include the lands involved here and the surrounding area?

Mr. Wirth Yes it does.

Mr. Counts How long have you worked in or been familiar with this area?

Mr. Wirth In the Appalachian area approximately seven years.

Mr. Counts Do your duties involve the lands that are subject to this application?

Mr. Wirth Yes

Mr. Counts Are you familiar with the spacing application and the relief requested?

Mr. Wirth Yes sir

Mr. Counts Is Oxy the owner of the right to drill a well in the lands involved herein so as to produce coalbed methane?

Mr. Wirth Yes sir

Mr. Counts Would you indicate what type of leasehold position that Oxy has acquired.

Mr. Wirth We have acquired numerous oil and gas leases, coalbed methane leases from the various ownership aspect.

Mr. Counts In otherwords, Oxy has a significantly sole position underlying the lands sought to be spaced?

Mr. Wirth Yes sir

Mr. Counts Mr. Wirth what is the boundary of the field Oxy seeks to have spaced?

Mr. Wirth The boundary in the field for this application will be from the north boundary latitude line of 37 degrees, 17 minutes, 30 seconds; the eastern boundary line of longitude line of 81 degrees, 52 minutes, 30 seconds; a southern boundary latitude line of 37 degrees, 07 minutes, 30 seconds and a western boundary line being a longitude line of 82 degrees, 07 minutes, 30 seconds.

Mr. Counts Mr. Wirth would you point that out on the plat that you have prepared.

Mr. Wirth Sure, The exhibit I was referring to was the north boundary line of 37 17 30 here would be your eastern boundary line, southern boundary line and your western boundary line.

Mr. Counts Mr. Wirth was this plat prepared by you or under your direction?

Mr. Wirth Yes sir it was

Mr. Counts How does this plat differ from the one attached as Exhibit A to Oxy's application?

from a lease line and a 1000' between each coalbed methane well).

Mr. Counts

Mr. Wirth could you indicate the eastern most boundary of the Nora Coalbed Gas Field?

Mr. Wirth

The eastern most boundary will be 82 degrees 00 minutes 00 seconds.

Mr. Counts

Thank you sir. Does Oxy request modification of the Board's March 20th, 1989 order such that the drilling units contained in that portion of the Nora Coalbed Gas Field bounded on the north by latitude line 37 degrees 17 minutes 30 seconds on the east by longitude line 82 degrees on the south by latitude line 37 degrees 07 minutes 30 seconds and on the west by longitude line 82 degrees 07 minutes 30 seconds be modified so as to establish in such area 80 acre units?

Mr. Wirth

Yes we do.

Mr. Counts

Mr. Wirth you also have an exhibit that depicts the overlap between the Nora Coalbed Methane Field and Oxy's proposed field?

Mr. Wirth

Yes

Mr. Counts

Would you show that to the Board please sir? Mr. Chairman and members of the Board this exhibit is also on page two of your book.

Mr. Wirth

The green outline is the current approximate area of the Nora Coalbed Gas Field, the red is the application which we are here today to discuss.

Mr. Counts

Mr. Chairman I would like to offer this plat into evidence as Exhibit Number Two.

Mr. Wampler

O.k.. so noted

Mr. Counts

Mr. Wirth what name does Oxy propose for the pool underlying this proposed field?

Mr. Wirth

What we are going to ask for is the Oakwood Coalbed Gas Field.

Mr. Counts

Does Oxy request that this order be effective as of today?

Mr. Wirth

Yes we do

percent or ten percent under lease. I am concerned from a precedence standpoint that it not reflect that any operator have a burden of having even a majority of acreage under lease. But Oxy does has, as Mr. Wirth has indicated, a significant amount of acreage under lease in this situation.

Dr. Whisonant Thank you

Mr. Wirth You are welcome

Mr. Bunn Is it Marty?

Mr. Wirth Yes sir

Mr. Bunn O.k. what I would like to know are you the one we are going to address the questions to on this 80 acre spacing?

Mr. Counts Mr. Bunn we will have a geologist and engineer testify with regard to the spacing request with regard to drainage and answer technical questions.

Mr. Bunn That is fine.

Mr. Wampler Any other questions? Thank you Mr. Wirth.

Mr. Counts Mr. Chairman the next witness I would like to call is Mr. Robert Barnes.

Mr. Robert Allen Barnes was sworn in

Mr. Counts Mr. Barnes, who are you employed by and in what capacity?

Mr. Barnes Employed as a drilling specialist by Oxy USA, Incorporated.

Mr. Counts Have you previously testified before the Department of Mines, Minerals & Energy?

Mr. Barnes No sir

Mr. Counts Would you state your education for the Board please sir?

Mr. Barnes I have a degree in accounting from New Mexico State University.

Mr. Counts Would you indicate your work experience?

Mr. Barnes I have been employed by Oxy USA for 11 1/2 years as a drilling specialist in the Rocky Mountain region.

Mr. Counts Would you advise the Board as to your areas of responsibility at Oxy?

Mr. Barnes I was responsible for supervising drilling and completion operations, permitting and production operations in that region.

Mr. Counts Would you list your professional associations.

Mr. Barnes I am a member of the Society of Petroleum Engineers, International Association of Drilling Contractors.

Mr. Counts Mr. Chairman, I would like to offer Mr. Barnes as an expert witness in this matter. Mr. Barnes are you familiar with the well work permit applications filed by Oxy USA with the Inspector's office?

Mr. Barnes Yes sir

Mr. Counts As of this date, how many applications have been filed?

Mr. Barnes Fourteen applications

Mr. Counts Does each of the applications involve lands located in the proposed Oakwood Coalbed Gas Field?

Mr. Barnes Yes sir

Mr. Counts Can you depict the proposed locations of these wells on a map?

Mr. Barnes Yes sir we have a map with the locations plotted on them.

Mr. Counts Would you present that to the Chairman please. Mr. Chairman I would like to offer this plat into evidence as Exhibit Number Three.

Mr. Wampler O.k.

Mr. Counts Mr. Barnes were these permit applications filed based on statewide spacing laws?

Mr. Barnes Yes sir initially.

Mr. Counts Have permits been issued to Oxy for any of these fourteen applications?

Mr. Barnes We received permits for CBMI-2, 3 and 4.

Mr. Counts The other 11 applications are pending?

Mr. Barnes Yes sir

Mr. Counts Does Oxy request that the spacing for these fourteen proposed wells be modified to conform to and be consistent with the spacing requested, the 80 acre spacing requested by Oxy in its application?

Mr. Barnes Oxy has set a period of 90 days effective as of the date of the issuance of the order be allowed to submit new well plats based on 80 acre spacing.

Mr. Counts Is the reason for this to accommodate the proposed wells to the new field rules?

Mr. Barnes Yes sir

Mr. Counts Mr. Barnes are you familiar with the application filed in this case?

Mr. Barnes Yes sir

Mr. Counts What sort of spacing is requested?

Mr. Barnes Oxy is requesting 80 acre square with 300' set back in the unit boundary making the well locations a minimum of 800' between wells.

Mr. Counts Do each of the proposed wells involved in the 14 applications you spoke of conform to the requested spacing?

Mr. Barnes No sir, seven of the proposed 14 are located within the 300' setback area.

Mr. Bunn Hold it what was that now?

Mr. Barnes On the smaller grid there is a block inside a block. The picture frame around the larger block is the setback area. Seven of the wells we have before the Commission are in this setback area.

Mr. Counts That is essentially our request for location exceptions as noted in their application. We will go further into that to Mr. Bunn. Mr. Barnes was it necessary to spot wells at these locations due to topographic considerations, economic constraints and to conform to Island Creek's plan of operations?

Mr. Barnes Yes sir

Mr. Counts Will you identify for the Board the six proposed wells which are located within 300' of the unit

boundary where offsetting ownership is common to the unit where the location exceptions are requested?

Mr. Barnes

We have grid system set up. Letters by numbers. Well number B-29 which has also been permitted under I-9 is in the setback area, the L-24 is also in the setback area, the P-26 which is called the I-8 is in the setback area, the Q-26 which is the I-10 is setback, the V-34 is in the setback area, the X-11 is in the setback area.

Mr. Counts

Mr. Barnes in addition to the six you have just listed for the Board do you also request a location exception for well number 1-5 located in unit X-10?

Mr. Barnes

Yes sir, this would be location right here.

Mr. Counts

Mr. Barnes in terms of trying to attempt to develop a well location for that well what types of consideration did you encounter in terms of locating the well?

Mr. Barnes

We were under pretty steep terrain. We had drainage problems and there are also dwellings in the area. These all played a part in location selection.

Mr. Counts

Did you also have discussion with regard to Island Creek in terms of mining operations in terms of locating this well?

Mr. Barnes

Yes sir

Mr. Counts

I assume that the location conforms with those discussions?

Mr. Barnes

Yes sir we have been approved by Island Creek.

Mr. Counts

Mr. Barnes are the owners of the offsetting units to those units which you have requested location exception, I apologize to the Board I have already gone through that one. Mr. Barnes does Oxy request that the Board grant location exceptions for these seven wells?

Mr. Barnes

Yes sir

Mr. Counts

Mr. Chairman I don't have any further questions of Mr. Barnes.

Mr. Wampler

Any questions from members of the Board?

Mr. Bunn

Yes

Mr. Counts Mr. Bunn we will also have a reservoir engineer that will be giving data on reservoirs.

Mr. Bunn Do you have all the property leased in these areas where you are in the setback area?

Mr. Barnes The fourteen wells listed on this map are at least 1250' from any adverse leases.

Mr. Wampler Thank you

Mr. Counts Mr. Chairman I would like to call Mr. Dennis Lewellen.

Mr. Dennis G. Lewellen was sworn in

Mr. Counts Mr. Lewellen would you state who you are employed by.

Mr. Lewellen I am the division geologist in Virginia for Island Creek Company. I have been here since 1987.

Mr. Counts In what capacity are you employed?

Mr. Lewellen As the Division Geologist I am responsible for the exploration drilling program, underground geologic mine mapping, I will take care of any groundwater problems we have as are related to the mining operations. I have also reviewed the E-logs of gas wells or ventilation holes that are drilled on our property. I have a certain amount of responsibilities in roof control as it is related to poor top and that sort of thing.

Mr. Counts Mr. Lewellen would you also state for the Board your educational background?

Mr. Lewellen I have a masters degree in coal geology from Eastern Washington University which is out in Cheney, Washington. I am a PhD candidate in coal geology at the University of Kentucky, Lexington.

Mr. Counts Would you indicate any professional associations that you are a member of?

Mr. Lewellen I am a member of AAPG (American Association of Petroleum Geologists), AIPG (American Institute of Professional Geologists) and I am a member of VMI (Virginia Mining Institute).

Mr. Counts Mr. Lewellen do you have other experience which this Board might find favorable with regard to this matter?

Mr. Lewellen

Yes in terms of roof control, I have looked at the hydraulic fracs in other mines at the Jim Walter #4 Mine in the Black Warrior Basin and I have seen some of the fracs in the roof at the Buchanan #1 mine which is adjacent to our VP#6 mine. I have looked at some of the stuff we have done in ventilation holes in our VP#6 mine.

Mr. Counts

Mr. Chairman I would like to offer Mr. Lewellen as an expert witness in this matter.

Mr. Wampler

All right

Mr. Counts

Mr. Lewellen in order for the Board to understand the necessity for coming up with a special set of rules for the production from the various coal seams underlying this field, would you please describe the general geological history and lithology of such coal seams for the area.

Mr. Lewellen

The coal seams that we are interested in are in the coal measures, the upper carboniferous or Pennsylvanian seams and I have a strat column here which I can show you. What you have here is a stratigraphic column of the coal seams, the Pennsylvanian Age coal seams of the Oakwood Coalbed Gas Field. The formations that we are dealing with are the Lee formation and the Pocahontas formation and we are interested in the Pocahontas 9 through Pocahontas 2, the Lower Horsepen, War Creek, Middle and Upper Horsepen, Lower Seaboard, Middle Seaboard, Greasy Creek and Upper Seaboard. Basically we are looking at all the coal seams below the Tiller seam. In terms of economic importance based upon gas content, continuity, lateral continuity of the coal seam and thickness, the most important coal seams are labeled here in group one which are the three and four seams and in group two the War Creek, Lower Horsepen and Pocahontas are particularly important to us and then the group 3. Most of the coal that you see here is a low vol. bituminous although some of the stuff in the upper portion in group 3 probably gets into the mid vol. range. Gas contents will vary between about 230 to 697 to 700 cubic feet per ton. Really the group ones are the most important to us.

Mr. Bunn

What was it now?

Mr. Lewellen

It ranges quite widely from 230 to about 690 700.

Mr. Bunn

Cubic feet

Mr. Lewellen Per ton

Mr. Counts Mr. Lewellen would you indicate generally for the Board how these coal primarily are different from those in Dickenson County where the predominant part of the Nora Coalbed Gas Field spacing is located?

Mr. Lewellen I believe in our case they are probably looking at something higher in the section, perhaps around the Tiller in that interval. Our seams it is a different set of coalseams, we are much deeper in terms of the coal measure section.

Mr. Starkey Excuse me I missed the question.

Mr. Counts I asked Mr. Lewellen if he would indicate for the Board how the difference in the coal from the Dickenson County, where primarily the Nora Coalbed Gas Field lies as opposed to Buchanan County where Oxy's request for spacing is.

Mr. Starkey Thank you

Mr. Counts Mr. Chairman I would like to offer this coal strat column chart into evidence as Exhibit Number Four.

Mr. Starkey Let me ask a question here if I may. Do you have a figure on the BTU content of this gas?

Mr. Lewellen Of the methane?

Mr. Starkey Yes

Mr. Lewellen Most of the numbers will range between 960 to 1010 we seem to average around 977 BTU.

Mr. Starkey Does this come out under rock pressure?

Mr. Lewellen No, this is coming out of coal seams and of course it will be under hydrostatic pressure but basically we bring it down to atmospheric pressure or try to get it as low as we can. It is a low pressure reservoir.

Mr. Counts Mr. Lewellen what coal seams are underlying the proposed boundaries of the Oakwood Coalbed Gas Field do you anticipate will be developed. I think you have already indicated that.

Mr. Lewellen We anticipate to develop all the ones I named plus any unnamed seams. There are numerous riders and liters and very thin discontinuous seams in this area as well.

Mr. Counts Do you also have maps depicting cross-sections with regard to the coal.

Mr. Lewellen Yes I do, I have a location map and a cross-section I will show you.

Mr. Starkey Before you leave this, maybe I didn't understand when you went back and answered the question on the range of the cubic feet of methane per ton were you speaking about your drilling area here?

Mr. Lewellen Yes in our area.

Mr. Starkey I thought it didn't sound right, o.k. I understand now.

Mr. Lewellen Before I go into the cross-section, I will first just show you a location map and how this cross-section fits in with the Island Creek properties. This map here shows the seven mine properties at Island Creek, VP#3, 1, Beatrice, 5, 6, 2 and 4. We have four active mines on the west side of the property and then Beatrice 2 and 4 are presently inactive. I have got a scale here. The cross-section is shown here it runs northwest/southeast. The first hole is L-302 on the northwest and on the southeast end it is L-299. Now I will bring up the cross-section here. This cross-section shows the coal seams which we are interested in developing. We will be going down as deep as the Pocahontas #2 which lies about 40' below the 3 seam which is the datum here. The holes you see on the northwest is L-302 and then it just goes on through seven different core holes to L-299 which is on the southeast. You have got a scale here of about 0-5000 for horizontal and 0-200 for vertical. The coal seams you see on this cross-section aren't to scale. I had to thicken them up so that you could see them.

Mr. Counts Mr. Lewellen should all the coal seams below the Tiller be involved in any order resulting from this hearing?

Mr. Lewellen Yes sir

Mr. Counts Mr. Chairman I would like to offer Mr. Lewellen's location map as **Exhibit Number Five** and the strat cross section as **Exhibit Number Six**.

Mr. Wampler O.k. it will be so accepted.

Mr. Counts Thank you sir. Mr. Lewellen based on your study is the area described as the Oakwood Coalbed Gas Field wholly underlain by the several coal seams you named?

Mr. Lewellen Yes, the most continuous is the Poca 3, Pocahontas #3, then the other coal seams I had mentioned tend to be more sporadic, come and go.

Mr. Counts Mr. Lewellen we see in the strat chart and the cross-section, would you also with regard to the exhibit one get in terms of perspective for the Board indicate visavis the area sought to be spaced, what the relationships are of these seams and how that impacts the area requested by Oxy.

Mr. Lewellen All right in our program the areas we are most interested in in terms where we have the thickest coal, the most numerous and best gas content lie in this area here in the east and central portion of our properties. Then as you go to the northwest the gas contents, off in this direction, the gas contents tend to get lower. The number of coal seams diminishes and they do get somewhat thinner. The reason this is occurring is most of the section we are looking at is pinching out into the Lee Formation sandstones. Overall this fits pretty well with what our mine planning is and how we can best develop it.

Mr. Counts Mr. Lewellen should the Board's order provide that all coalbed gas wells now or later drilled in this field be declared exploratory wells so as to qualify for the two year period of confidentiality provided for in Virginia Code for all logs, surveys and other reports filed with the Inspector?

Mr. Lewellen Yes sir

Mr. Counts Mr. Lewellen is it your professional opinion that 80 acre spacing is necessary to allow conformity with Island Creek's mine boundaries?

Mr. Lewellen Yes sir

Mr. Counts Does the area sought to be spaced including the overlap essentially conform with Island Creek's mine boundary as depicted on the front cover of the material submitted to the Board?

Mr. Lewellen Yes it does

Mr. Counts Mr. Lewellen am I correct in that the eastern half of Island Creek's mine boundary is presently covered by the Nora Coalbed Gas Field spacing order? Excuse me the western boundary?

Mr. Lewellen Yes it is covered by that.

Mr. Counts In your opinion Mr. Lewellen will the granting of the application be in the best interest of conservation, prevention of waste and protection of correlative rights?

Mr. Lewellen Yes sir

Mr. Counts Thank you Mr. Lewellen. Mr. Chairman I have no further questions of this witness.

Mr. Wampler Mr. Lewellen I would like to ask you a question on the confidentiality. I would like for you to explain more why that you recommend that that be considered exploratory and when you are asking the Board to set this up throughout the field why it should be considered exploratory and held confidential.

Mr. Lewellen Well we will be putting a lot of time and money into collecting data on the stratigraphy and the reservoir characteristics and a number of other things which will be beneficial to us. It will help us out in our long term development of this field.

Mr. Counts Mr. Chairman I would also like to have Mr. Wilson who will be my next witness to address the confidentiality question as well.

Mr. Wampler O.k.

Mr. Bunn Is it the right time now Rick for me to ask about the 80 acre?

Mr. Counts Next one sir.

Mr. Bunn All right that will be fine.

Dr. Whisonant I want to be sure I am oriented now relative to the, you can't hear, I just want to stay caught up on how the Nora production compares to this. Now Nora coal seams that you are developing are above stratigraphically or below?

Mr. Lewellen The Nora coal seams are above us as near as we can tell because looking at the regional geology I know that most of these seams that we are dealing with

pinch out. We don't know exactly what the Nora field consists of considering that that data is confidential.

Dr. Whisonant

I am also curious about how deep are these wells? I can't tell from your cross-section relative to say ground surface or sea level or some plane?

Mr. Lewellen

The Pocahontas #3 seam is at sea level roughly in our area. The section will roughly be 1500' to the southeast and it loses about 300' to the northwest. So it will be between 1200 and 1500' of section and that is starting at stream drainage. So three seams at sea level basically.

Dr. Whisonant

Thank you

Mr. Counts

Mr. Lewellen is it essentially your position, to follow up on Dr. Whisonant's question, that the coals basically commencing with the Buchanan County line and running to the west essentially constitute a separate and distinct reservoir.

Mr. Lewellen

Yes sir I think so.

Mr. Counts

That would be due to?

Mr. Lewellen

We are lower in the section stratigraphic section.

Mr. Counts

Relative thickness of coal as well as coals pinching out disappearing?

Mr. Lewellen

Our coal, the three seam is generally about six feet and as we go to the east and northwest these coals will pinch out and get thinner.

Mr. Counts

Thank you Mr. Chairman

Mr. Starkey

On this production per ton, will that vary I assume in different areas?

Mr. Lewellen

It will vary with the rank of the coal. It will vary with the ash content. Generally the higher the rank the more gas. The ash content even though you may have a high rank coal if you have a high ash content you won't have as much gas. If you are too close to the surface and get within three or four hundred feet a lot of that gas will leak off. There are a lot of different variabilities in the gas contents. That is why you see such a wide range. Plus we were taking.

Mr. Starkey

Did you quote a range?

Mr. Lewellen Yes it was between about 230 and 700.

Mr. Starkey In this field.

Mr. Lewellen Yes

Mr. Starkey What about other fields. Do you have experience and knowledge of other fields other ranges you spoke of acreage going up

Mr. Lewellen I would say if you wanted to pick an average number, what I have seen like in the Black Warriors is probably running about 400 cubic feet per ton. Out west I have seen that number to. It seems to be hovering around there between 200, 400 and 600.

Mr. Starkey This was what was the high range, up to 230

Mr. Lewellen Yes, yes

Mr. Starkey What was the low range?

Mr. Lewellen The low range would be around 230 or so.

Mr. Starkey I thought that was the high range?

Mr. Lewellen The higher the number the more gas you have got. So 700 cubic feet per ton is about as high as it gets.

Mr. Starkey Do you expect to get that here?

Mr. Lewellen In places we will. We have gotten samples like that, yes sir.

Mr. Starkey Is there a minimum figure for economic purposes...

Mr. Lewellen We figure looking at what we have got the limited data we have is it is going to average around 400 cubic feet per ton.

Mr. Starkey And that is economical?

Mr. Lewellen Yes sir. Economically there are other factors other than just gas content that come into play. But that is an important factor.

Mr. Starkey I guess I am trying to relate this some way to the 80 acre figure. If it is lower do you want more acreage?

Mr. Lewellen When Weldon comes up he can discuss that with you. He will answer your question better than I can.

Mr. Bunn In this if you will, did you find that the gas is pretty much in all the seams. It is just that they dissipate faster or that you find it in all seams above drainage as well as below drainage?

Mr. Lewellen I will find gas in all the below drainage seams once you get below the water table. What happens when you get above drainage, above water table is occasionally you get a little bit of gas but most of it has bled off through just increased permeability of the surrounding strata. But the strata around here is pretty tight so once you get below the ground water table it will keep the gas in it.

Mr. Starkey Is there any by products of this that you want to capture?

Mr. Lewellen From the coalbed what you basically get is 96 percent methane, a little bit of Co2 and some inerts. So it is very dry gas and very pure.

Mr. Wampler O.k. thank you very much.

Mr. Counts Mr. Chairman I would like to call my next witness Mr. Weldon J. Wilson

Mr. Weldon J. Wilson was sworn in

Mr. Counts Mr. Wilson who are you employed by and in what capacity?

Dr. Wilson I am employed by Oxy USA, Inc. I am an engineering advisor for that firm. I have worked in that capacity for a total of 7 1/2 years.

Mr. Counts Would you state for the Board please your educational background

Dr. Wilson I have a PhD in physics from Oklahoma State University. I have attended numerous industry short courses and seminars on reservoir simulation, coalbed methane production, hydraulic fracture simulation.

Mr. Counts Would you also state for the Board any professional associations.

Dr. Wilson I am a member of the Society of Petroleum Engineers, the American Physical Society, Society of Industrial and Applied Mathematician, the Society of Exploration Geophysicist.

Mr. Counts Thank you, Mr. Chairman I would like to offer Mr. Wilson as an expert witness in this case.

Mr. Wampler O.k.

Mr. Counts Mr. Wilson does your responsibilities with Oxy USA include the lands involved in this application?

Dr. Wilson Yes they do.

Mr. Counts Are you familiar with the geological data available in this area?

Dr. Wilson Yes

Mr. Counts Have you made a study of the lands involved here and the surrounding area?

Dr. Wilson Yes I have

Mr. Counts Would you discuss with the Board the data used in making those studies.

Dr. Wilson We used predominantly data taken from literature along with a computer coalbed reservoir simulator that was developed initially by Gas Research Institute. The data was taken from studies funded by the Department of Energy, U. S. Bureau of Mines and the Gas Research Institute. Some background in those the Gas Research Institute was founded back in the 70's to more effectively utilize our gas resources in this country. It takes funding from users and then uses that money to fund fundamental research to all phases of natural gas. The Department of Energy naturally has strategic interest in utilization of gas resources as well as does the Bureau of Mines.

Mr. Counts Mr. Wilson are you familiar with whether the Gas Research Institute or GRI has been involved in any studies in Virginia?

Dr. Wilson Yes they have some of which we have been associated with in conjunction with them.

Mr. Counts Have any of those lands involved lands in Buchanan County Virginia?

Dr. Wilson Yes they have.

Mr. Counts Are you aware of any reports that have been prepared by GRI with regards to this data?

Dr. Wilson

Yes

Mr. Counts

Would you indicate for the Board the names of any of those reports?

Dr. Wilson

They have a quarterly report on the coalbed methane. They have regional reports for the Central Appalachian region. They are continually coming out with specialized reports not only of a data collection nature but also of field instrumentation, reservoir computer models that would help utilize the resource.

Mr. Counts

Thank you Mr. Wilson, Mr. Chairman I am going to be using several exhibits now in connection with Mr. Wilson's testimony and for the sake of expediency I would like to go ahead and go through several of those now and have those admitted as exhibits. They are all in the book you have in front of you. Exhibit Number Seven a chart entitled Air Permeability Distribution for Pocahontas Coal Exhibit Number Eight a chart entitled Permeability of Pocahontas Coal vs. Hydrostatic Stress Exhibit Number Nine entitled Pocahontas Coal Capillary Pressure Exhibit Number Ten a chart entitled Pocahontas Coal Water/Gas Relative Permeability Exhibit Number Eleven a chart entitled CBM Spacing Study Langmuir Desorption Isotherm. Thank you Mr. Chairman. Mr. Wilson will you go into a more complete discussion with regard to what these exhibits reveal and indicate to the Board what type of factors you have considered in terms of building your computer model.

Dr. Wilson

Yes, let me go over each one in turn. For convenience we are talking, I have got overhead, these are reproductions of what you have in your booklets. All of these exhibits I will be talking about here they were data taken from the literature, the sources I have previously mentioned. They are publicly available in the scientific and engineering literature. They were used as the basis for the computer modeling study which I will subsequently show. One of the key reservoir parameters that is important in trying to determine a spacing is the permeability. This is a series of tests done on Pocahontas coal from the Beatrice mine that was done at the University of Pittsburgh under the auspice of the Gas Research Institute. This has been published in 1974 in the Society of Petroleum Engineer's Journal. What it shows basically if you look at it is a tremendous variability in the permeability of coal even though these samples may have been taken

only a few feet apart. You will have some that will be over a hundred millidarcies. This would be a very good conductive coal that would transmit its gas through the well bore very effectively. You have the majority of the samples, around the 50 or 60 percent range, that are around the one millidarcy range. That would transmit the gas less effectively to the well bore. It would probably indicate that one would need to stimulate the well in some fashion. The depth at which coal is buried is an important factor on its permeability. One measure of that is what kind of confining stress you do these tests at and that is the two different bar types. You will notice that there is basically good agreement between these two tests because of the very low difference in pressures.

Mr. Wampler

Excuse me before you remove that I would like to take questions as we go so you won't have to pick out the one we are asking questions about. If we ask a question we are going to cover later tell us.

Mr. Bunn

So you are saying about 60 percent of the coal that they fall in the range of .1 to 1...

Dr. Wilson

Of these samples that were taken, roughly 60 percent of them fell within that range.

Mr. Bunn

That is millidarcies.

Dr. Wilson

It is millidarcies.

Dr. Whisonant

Dr. Wilson, those confining pressures, generally is that burial depth the main determinant there. Or something else?

Dr. Wilson

Yes the burial depth and the reservoir pressure that you are working at. These confining pressures, what you should probably keep in mind is it would be the burial depth, the overburden pressure as it is called minus the rock pressure, the full pressure of the fluid that is in there.

Dr. Whisonant

I presume that the 200-400 range is roughly equivalent to what you figure will be the case at Oakwood.

Dr. Wilson

On this series of tests it really isn't. At some portion of the reservoir there may well be that. I have another shot on the next photo that will show you where we expect more....

Dr. Whisonant

O.k.

Dr. Wilson I think this will probably answer the question better as to where we expect to be.

Mr. Wampler This is Exhibit Eight you are discussing. It will be helpful to us to number those.

Dr. Wilson O.k. What this is is a plot of five different samples of again Pocahontas #3 coal. It is actually showing you the relationship between the stress at which you were performing the test, the hydrostatic stress and the permeability of the coal. So one can effectively think of this scale as being tied to the depth at which the coal is buried. Again, you will notice that there is a fair amount of scatter. That occasionally you will get, in this case, one sample out of five it has a permeability that is ten to fifteen times greater than the other samples. I think that is something real that is occurring in the reservoir. That you will see that kind of variations over very small differences in strata probably.

Mr. Counts Dr. Wilson in considering the permeability or considering maximum spacing what kind of an impact does the permeability have on maximum spacing so as to insure protection of correlative rights.

Dr. Wilson The higher the permeability, then the larger the spacing that will effectively drain an area. If you have a very low permeability reservoir your wells have to be quite close together to effectively drain it. The range that we would expect, we are in the range of roughly 15,000 to 2,000 feet deep. One psi per foot of overburden. So we are in the 15,000-2,000 psi overburden pressure and our reservoir pressure is about 700. So if you take the difference between those so we are, whatever that is, maybe 800 in that range so basically this data agrees pretty well with the previous data that was done at a range of hydrostatic stress that we are not that interested in and that it falls around one to two with an occasional one being up at 10 or 20 milidarcy. Again this was, I believe this was DOE funding, University of California Berkley published International Journal of Rock Mechanics 1975.

Mr. Wampler Any questions on Exhibit Eight. I would like to take a ten minute recess please.

Mr. Counts Mr. Chairman I believe we were getting ready to start with Exhibit Number Nine now.

Dr. Whisonant Excuse me Mr. Counts let me just inform everyone here that our regular chairman, Mr. Wampler, had to leave. I will taking over if things don't go quite as smoothly as possible please bear with me. But we will do our best. Lets resume the testimony then.

Mr. Counts Thank you sir. Dr. Wilson I believe we are at Exhibit Nine.

Dr. Wilson Exhibit Nine, again data is available in the literature for Pocahontas coal Beatrice mine. There is actually two sets of data. One which we call the University of Pittsburgh data I believe this was DOE funded. That is the red curve. The blue is a GRI funded in one of the GRI reports. What this shows is how much pressure it takes to move gas through the pore spaces of the coal. That is a fundamental piece of information that we need to know because we know the pressure in these coal seams is very low. If there is not enough intrinsic reservoir pressure there, then even though the gas may exist there wouldn't be enough pressure to blow it through to overcome the capillary forces and blow it into the well bore when we drill it down.

Mr. Starkey Dr. Wilson you don't do any forcing any exhilarated as you do in natural gas wells?

Dr. Wilson We would upon drilling a well you draw that down as much as you can either by pumping water off of the formation or trying to get the wellbore pressure as low as possible. What I am talking about here is the difference in pressure between far out in the reservoir and near to the well bore. That pressure difference is what pulls the gas in towards you. If you don't have, what these curves are showing, if you don't have something at least on the order of 30 or 40 psi, you don't pull the gas toward you.

Mr. Starkey I guess my question is if you don't have it, you just leave it?

Dr. Wilson That is right, the gas will not move. What our model that I will show you later actually inputs is this red curve and we have to tabulate it and all those data points are placed into our computer simulator.

Dr. Whisonant Dr. Wilson, excuse us just a minute, Mr. Fulmer wants to ask a question.

Mr. Fulmer The GRI data you have plotted on there is that the most recent data?

Dr. Wilson That has vintage of about 1983, 1984 and I cannot tell you if they have updated it since then or not. So it is in that time.

Mr. Fulmer So it is much younger than the University of Pittsburgh is?

Dr. Wilson Neither one of these from a reservoir engineering standpoint is giving us bad information, is telling us something bad from our perspective. These pressures are very low. Typically if you go out in the Rockies and are trying to develop a tight gas reservoir out there they may be up in the 100's so it tells us we shouldn't have a problem in two things. One pulling the gas toward us and also cleaning up any hydraulic fracture fluids that we might have injected into the formation. They shouldn't have a problem of just staying around.

Mr. Bunn What type of liquids or fracing type substances would you be using?

Dr. Wilson We would probably use a range of fluids. There are three different kinds of fracturing fluids that people would use. A nitrogen foam which would be 50 or 60 percent of the water that had been foamed up. They would use just plain water. They would use a viscosified water in which you placed a guar gum gel in it to viscosify it. We would do the least damaging of those. Again we would probably in a development project of this sort there is no doubt we would do some of each kind.

Mr. Counts Dr. Wilson as related to spacing how rapidly you can move the gas through the reservoir is really a function of the permeability and thickness of the coal. Is that not correct?

Dr. Wilson That is correct. The product of the permeability times the net thickness of the coal is directly related to the rate at which we can pull the gas out. The flow rate of any well that might be there.

Mr. Counts Would it be correct to state then the greater the thickness, and increase permeability the greater the production and the increase drainage.

Dr. Wilson That is correct.

Mr. Counts Thank you sir.

Dr. Wilson The next exhibit I believe is Exhibit Ten. I would like to talk about that now. Coalbed methane is

typically produced not only from this data that I am showing you here for the Pocahontas coal but throughout the country. It also has associated water production with it. That is what these the curves of this exhibit attempt to exemplify. Again this was kind of busy but I have shown two different sources of data to give you some feeling for what kind of ranges of reservoir values one might expect even from a particular seam and a particular mine area. The one set of data which I have labeled GRI data that is the triangles or the solid lines is, I am sorry it is the dash lines and triangles is the GRI data and the other set of data which is the solid lines and the dots is the University of Pittsburgh published back in 1974 on the Pocahontas #3 coal seam.

Mr. Bunn

Let me ask. Could you tell me what the scales are there. What is going across the bottom and what is going up and down.

Dr. Wilson

What is being plotted along here is the water saturation as it currently exists. That is something that changes as you look at this plot as you produce the well you produce more and more water so typically one would start out for coalbeds one would start out at high water saturations and as you produce the coal that gas you would also produce water and this water saturation would go in this direction as you produce the well. The vertical scale runs from 0 to 1. It is a relative measure of how well that particular fluid would flow. So for instance, let me just concentrate on one of these curves to give you a feel for it, say the red one. The red one is the relative permeability of water. As we start off the reservoir we would expect it to be very high water saturation. So its relative permeability to water would be very high. That means that only water would flow initially it is high relative permeability of water. As one produces more and more water the amount of water that would actually flow at any given time is decreasing. Its relative permeability is decreasing. At some point you begin to produce gas and that is this solid blue curve. So as I get down and produce the reservoir where I am at an average water saturation of 70% I am flowing partially gas which is the blue curve and partially water although it is easier to flow the water at this point than it is the blue curve which is the gas. As I continue to produce the reservoir my water production drops and my gas production increases. The blue curve.

At some point late in the life we would be producing almost totally gas.

Mr. Bunn

At what point is the well economical to operate?

Dr. Wilson

That is not easy to answer. From this chart there are certainly lots of coalbed methane gas reservoirs that would be economic to operate realizing that they were going to start off flowing maybe for the first year or two nothing but water. So you could be out here on this part of the curve and produce it backwards and you have to run the specific economics for that case. We are in a very fortunate situation I think in that regard as far as the Pocahontas #3 seam is concerned.

Mr. Bunn

So you are saying you are past the 70% range going in right?

Dr. Wilson

I suspect from our modeling studies, it is very difficult to get hard numbers here, I suspect we are going to start initially in this range right here. Which means we don't have to go through this two year period of flowing water. I think somewhere in between 80 percent and 60 percent is where this coal seam should lie. Which means you will be getting gas production almost immediately.

Mr. Counts

Do you have a question Mr. Chairman?

Dr. Whisonant

Any questions?

Mr. Starkey

I am probably the only one in the room that doesn't know this. Do you have some responsibility for the disposal of that water?

Mr. Counts

Yes, absolutely sir. Those regulations and rules are promulgated by Mr. Fulmer's office.

Mr. Starkey

O.k. thank you.

Mr. Counts

The next will be Exhibit Number Eleven.

Dr. Wilson

The final or the most important variables I haven't shown you everything that is input into the simulator by any means but that as you are more familiar is the desorption isotherm. If one puts, in the case I have done it for a ton of coal, if one puts a ton of coal in a canister and starts pumping in methane under pressure, raising the methane pressure, what one would find is that more and more of that methane would be absorbed onto the surface of the coal. It would proceed as we increased the

gas pressure since the pressure is high we would be able to force more of them onto the surface and reaches a limiting value and in this case this is for Pocahontas coal that limiting value is about 650 standard cubic feet per ton for this particular sample shown here.

Mr. Bunn

But you are saying here in this field that 230 is about a minimum. Right.

Dr. Wilson

What you also have to consider is what the pressure is one will be working at. In our case we are probably at a reservoir pressure of around 700 so one would come up to this curve here and that is going to give something around 500 standard cubic feet per ton for this particular sample.

Mr. Bunn

In this particular area the minimum would be about 700.

Dr. Wilson

Right as presented earlier the minimum I believe he said was 230 and the maximum was about 700. In terms of our simulation study we have actually input this curve. That is a little better than putting in a specific number because then it can pick up how much gas is absorbed into the coal and would subsequently be desorbed into your gas production. Depending on what reservoir pressure you were at at a given time. The way you actually work it of course in a reservoir is that one starts at the initial reservoir pressure and one proceeds in this direction as you decrease the average reservoir pressure by producing the well. The gas then desorbes out of the coal and that is what is actually produced by the gas well.

Mr. Bunn

Tell me this formula here.

Dr. Wilson

This is the formula that is actually used in our model. It is the Langmuir Isotherm model that you maybe see in the literature occasionally. It is characterized by two constants, volume constant and a pressure. These two values here are the ones that were used and it generated this plot. I put that up there because often they just refer to it as Langmuir and no one ever seems to write down the equations. But that is it.

Dr. Whisonant

Questions

Mr. Counts

Dr. Wilson, utilizing the data that you just demonstrated to the Board were you able to project a

model depicting the maximum spacing which could be efficiently drained.

Dr. Wilson

Yes I was.

Mr. Counts

Before we go further into that would you mind explaining to the Board how using one of your exhibits how your data was imputed into your model.

Dr. Wilson

The next exhibit I believe is 12. This is a summary from a typical run that I might make of again there is a lot of data here but let me pick out one. For instance the permeability, in the case that I will be showing you today I used a permeability of two millidarcies. The way that was arrived at was going back to exhibit number 8 one would get into the range in which we were expecting, come up for the hydrostatic stress, come up and we have got in this case five different curves and then would take a weighted average to obtain the two millidarcies.

Mr. Counts

Mr. Chairman I would like to offer into evidence the following exhibits at this time. Exhibit Number Twelve which is entitled Coalbed Methane Spacing Study Reservoir Parameters Assumed, Exhibit Number Thirteen chart entitled Coalbed Methane Spacing Study Cumulative Production, Exhibit Number Fourteen chart entitled Coalbed Methane Spacing Study Recovery Factor. All of these exhibits are also in the folder before you.

Dr. Whisonant

Thank you

Mr. Counts

Dr. Wilson what did your model reveal as to the maximum efficient spacing for the field?

Dr. Wilson

Well, using these assumed parameters that were again taken predominantly from the literature we were able to project, using our computer simulator, these forecasts for the cumulative production from the 320 acre block. What we did was actually run the simulator for a variety of different cases shown here. We assumed in the first case that we had one well in the center of the 320 acre block. That is this bottom curve which shows its cumulative production over a 20 year span production. We then re-ran the simulator with the same reservoir parameters assuming that we 160 acre spacing or two wells in that 320 acre block. That was this next curve and we proceeded again to look at additional wells if we drilled four wells in that 320 acres which is 80 acre spacing, five wells which turns into 64 acres, eight wells which would be 80 acre

spacing, ten wells which is the 32 acres spacing and 16 wells or 20 acre spacing. What we saw upon doing that and just looking at this series of curves is by increasing the number of wells one drills in 320 acres one does not proportionately get the additional gas that one might expect. In fact you reach a point of diminishing returns. As you see these curves are getting clumped closer and closer together even though you may have drilled as many as twelve additional wells between one curve to the other. Another line that we use for our purposes is a cut off line. As you produce these wells the rate is also declining and this cut off line is where it crosses a particular curve indicates where the rate dropped below 25 mcf a day which is what we were using as a minimum economic break.

Mr. Bunn

25

Dr. Wilson

Twenty-five

Mr. Bunn

25 what now

Dr. Wilson

Mcf per day What you see from that is if you are at a very small spacing 20 acres that yes you can produce an amount of gas but economically from those 16 wells you would only produce it during the first four years. So by drilling more wells you accelerate your production. You get more of the production in up front. By drilling fewer wells you extend the economic life of the reservoir. In effect spread out that resource over a longer period of time. I would like to particularly point out that the two curves in question in the overlap area that would be appropriate would be the green one and the blue one. The blue one is the 80 acres spacing. That would be four wells in our 320 acres block that was simulated and the green one is the 64 acre spacing. As you can see there is very little incremental production that is gained by going to the additional well. In fact this difference is something on the order of ten percent. You gain ten percent incremental gas production but your cost have gone up 25% in going from four wells to five wells.

Mr. Bunn

This is what you are showing that after 20 years the well has totally drained. Is that right.

Dr. Wilson

Yes to the point of, right. Actually for some of these it occurs much earlier than that. That 20 year cut off is really only appropriate for the 80

acre. If you look at the 20 acre spacing its life is going to be four or five years.

Mr. Bunn

All right. How can you relate this to the degasification that they are using for the Pocahontas seam now?

Dr. Wilson

I am not familiar really with that degasing scheme. I do know that those are very close to actively mined areas.

Mr. Bunn

That is what I am trying to say. It is hard for me to believe that Occidental would have two companies operating so close as you do and not know how to correlate the degasification wells and the experience you have had from degasing the coal from those wells and not know where it reaches some kind of value to you on your determination of these wells. Where they should be spaced.

Dr. Wilson

Well we certainly have utilized vent hole production data some that was published back in the late 70's as part of GRI studies to verify our computer modeling. So we are able to accurately match the observed vent rates during that GRI program.

Mr. Bunn

I guess it is a fair assumption to ask or to assume, that is a horrible word to use in front of these attorney's here but you are going to drain this acreage before you mine. Is that correct?

Dr. Wilson

I think drain is a relative, it is kind of relative. I go back to the Langmuir isotherm exhibit. One will never get, in this particular case, one will never get no matter how long you wait all of the gas that is in there. You have to make an economic judgement really as to what is the optimum, how long you want to really suck on these wells to desorp the gas from. Again, you reach points of diminishing returns. It is economically based. The economics would be different I believe for degasing a well as opposed where you are trying to economically produce a well.

Mr. Starkey

Dr. Wilson, you may have explained this earlier, but your model is based on these assumptions in exhibit 12. Are these assumptions from your experience and calculations?

Dr. Wilson

Well the assumptions are a combination of several things and there are firm numbers. Very firm numbers and there are some that are softer. Probably the softest ones that I have shown you are

on. Some of the numbers like porosity we assume 42, that I think is a very firm number, it can't be much off of that. Some of those are log determined values. Again you can go to the literature and pick those up as well. Formation temperature is a pretty firm number. The gas viscosity is a really firm number. Other numbers, for instance I don't see it here, initial reservoir pressure I think that one is a pretty firm number. We can put a gauge down vent holes and determine those. That is how that one was determined.

Mr. Counts

Mr. Starkey for purposes of this model I think it is important to remember that the first commercial production in coalbed methane really occurred in 1982. This is virtually a new untapped resource which we really don't have a lot of data on. There is a lot of studies out there on it. There is of course some production in Virginia but very limited. The vast majority of production is in the Southern Appalachian Basin and in Colorado in the four corners area. So we have really come up with the firmest numbers that we could. But we have just really tried to generate all the empirical data that we could with regard to some of those other numbers.

Mr. Starkey

I guess my thought was triggered by questions of the affiliate company or sister company having experience in this area and whether we used much of that.

Dr. Wilson

We have used some of their data although primarily it has been production related data from the late 70's.

Mr. Counts

From that standpoint also Mr. Starkey I am not aware of any coalbed methane that is being produced commercially within the Commonwealth of Virginia right save and except that in Dickenson County and the Nora field right now. I would have to assume Dr. Wilson that there is some data that you would like to have access to with regard to production that you aren't able to obtain.

Dr. Wilson

That is correct.

Mr. Bunn

Can you tell us what is your spacing on your degas wells on your Island Creek operations?

Dr. Wilson

No I can't.

differently from ordinary gas, natural gas well?

Dr. Wilson I think insofar as it doesn't impact mine safety, that concern would make it special, if it does not impact mine safety I would not assume that it would be any different.

Mr. Starkey What would happen if it impacted mine safety? If it wasn't economical to sell you would just blow it off?

Dr. Wilson Safety should be the overriding concern.

Mr. Starkey It would be another degasification hole?

Mr. Counts Provisions of the Oil and Gas Act and Regulations and Emergency Orders and various other measures provide for the venting of gas for safety purposes. Mr. Bunn with regard to your line of questioning if you would like to break and go back to Mr. Lewellen for a couple of minutes, if you would like to explore that line Mr. Lewellen is with Island Creek, we would be happy to do that.

Mr. Bunn That is the reason that I was trying to ask those questions why he was here. When he said he was with Island Creek and you said hold it. Our first duty of this Board is to preserve the natural resources and use them most efficiently and to explore them as efficiently as we can.

Mr. Counts Absolutely

Mr. Bunn We recognize that we are wasting a natural resource right now but it is for safety purposes. I think anybody in this room can understand that. But I just wanted to know if there is some kind of way that two companies can work together to maximize the recovery of this without stopping a complete mining operation. But to capture as much gas as possible to maximize the use of the natural resource.

Mr. Counts It is my understanding, Mr. Bunn, that Island Creek and Oxy both have every intention of trying to maximize these resources. I could not agree with you more. I think Virginia has lost a tremendous amount of a valuable natural resource as a result of the fact that perhaps, of course as we indicated recently 1982 was the first commercial recovery. It was only through a result of studies such as rendered by the Department of Energy and Gas Research Institute which was finally able to convince operators that this was actually a viable resource that could be captured economically. Quite frankly I have attended conferences very recently

which said the San Juan Basin is terrific, the Black Warrior is somewhat less than terrific and who knows about the Central Appalachian Basin. Who knows about the Northern Appalachian Basin. I think the jury is still out with regard to how economic that those operations can be. I think that certainly it is exciting for Virginia that we now have operators here that are going to undertake that and hopefully it will be extremely economic. It will certainly be beneficial to this state if it is.

Mr. Bunn

O.k. to satisfy myself Tom I would like to, we can go ahead and continue, but I would like to talk to Mr. Lewellen.

Mr. Counts

Since we are already on the subject, Mr. Chairman if you don't have any problems, let me go ahead and call Mr. Lewellen he has already been sworn.

Mr. Fulmer

Lets take a break.

Dr. Whisonant

Lets call the meeting back to order.

Mr. Counts

Thank you Mr. Chairman. I believe we were getting ready to go with Exhibit 14 a chart entitled Coalbed Methane Spacing Study Recovery Factor.

Dr. Wilson

Using our coalbed methane reservoir simulator we were able to determine the percent of coalbed methane gas in place that is recovered as a function of the number of wells we have drilled all for a 320 acre study block that we were using. This is a typical kind of chart that is used in the Oil and Gas industry. The think that is different here is we have used a reservoir simulator specifically designed for coalbed methane. We are able to calculate the initial gas in place. We used the simulator to see how much of that is produced over the economic life of the wells. That determines the total gas that is recovered. We have been able to calculate a percentage. Then that is plotted versus the number of wells that were drilled in that block to obtain that total gas recovered from the 320 acres. As you see if you only drill one well in the block or a 320 acre spacing, one only would recover about 22 or 23 percent according to our simulation study. If one drills an additional well, one does not double the percentage in place recovered. But one still recovers a substantial portion up around 37 or 38 percent. As one progresses and drills more wells you can recover more and more of the resource that is available there. What is typically done in the oil and gas industry is try to get as far up on

this knee of the curve as is economically possible. In this case the bend occurs around the 80 acre spacing. To go to 20 acre spacing one still only recovers 65% of the gas in place, 80 acre spacing I believe that number was actually 56% of the initial gas in place. So even we have drilled to go to 20 acre spacing we have drilled what 12 more wells we incrementally get very little in addition. Particular ones to point out again in going from 80 acre spacing to 64 acre spacing, the reason I have used 64 throughout is that is an even number of wells in a 320 acre block. The incremental is only a little over 1% of the initial gas in place.

Mr. Counts

Dr. Wilson I would like to confirm for the benefit of the Board that this spacing study model is based upon the model that you put together with regard to Buchanan County, Virginia. This is not a generic number picked out that will be applicable to any particular area based upon the assumed data in your model. Correct?

Dr. Wilson

That is correct. It is based on the unique reservoir characteristics that we believe exist in this area.

Mr. Counts

And specifically for the Oakwood Coalbed Gas Field?

Dr. Wilson

That is correct.

Dr. Whisonant

Questions? I have got one. I keep wanting to return to this issue of how fundamentally different Oakwood and Nora are. It looks like we are headed toward two coalbed methane fields with different spacing rules. So my question would concern the last few exhibits. I am assuming that if you had Nora numbers up here the curves would look different. The sixty acre spacing is still more applicable?

Mr. Counts

If I can interrupt for just one moment. I think what we will probably will end up seeing in Virginia as well as a number of other states, are the fact that depending upon reservoir characteristics which certainly Dr. Wilson can testify to. You are going to find a lot of the same formations, even the same seams, will be spaced differently in different areas. Depending upon the thickness, depending upon the permeability etc. For instance there has been a recent request in Alabama to expand spacing which was initially established at 40 acres to 160 acres. Now that is fine that you finally get around to expanding the spacing on that but what happens in a

situation like that is that the correlative rights of those parties who are around those 40 acre squares when they were initially drilled, those correlative rights were violated. They don't have redress now. But we are basically saying here is it is our opinion that the Oakwood Coalbed Gas field represents essentially a separate distinct reservoir from that of the Nora field. Dr. Wilson.

Dr. Wilson

In my opinion I am not privy to the reservoir numbers for that field, but it would have to be studied as a unique case in much the same way as we have done here. It could very well give the 60 acre spacing. Each reservoir has to be considered as a unique reservoir with its properties determining what the optimum value would be. It is not uncommon in oil and gas parts of the country to even have different strata on different spacing. That may be only 20 or 30 feet apart. One might be 640 because of the gas zone and below it or above it might be an oil zone that might be 20 or 40 acre spacing.

Dr. Whisonant

Thank you I thought that is what you had been saying several times. I just wanted to be crystal clear on the record. It will show up as two different spacing rules for adjacent fields.

Mr. Counts

Absolutely

Dr. Whisonant

In fact one previously overlaps the other.

Mr. Counts

As you are aware there are other areas in Virginia, for instance the Richmond basin, Pulaski and Craig counties. We may end up with several different spacing field rules depending upon the reservoir characteristics of each area.

Dr. Whisonant

Thank you.

Mr. Starkey

Dr. Wilson, Mr. Counts said something I would like to pursue. You answered a question I asked awhile ago and I thought you said that once you have a methane well gas in you either put it into production or blow it off. Is that a pretty fair statement?

Dr. Wilson

Or you can keep it shut in. You keep the well capped. Certainly that would be a third option. Generally one would probably either vent or put it into production.

Mr. Starkey I don't know enough about drilling to pick that up so you clarified that for me. That answers my question.

Mr. Counts Dr. Wilson are you familiar with the application filed in this case?

Dr. Wilson Yes I am

Mr. Counts Would you please briefly for the Board summarize the purpose of the application.

Dr. Wilson Yes we seek to get the what we call the Oakwood Coalbed Gas Field, the gas seams associated with that as you have seen as a reservoir producing coal seam gas. In addition we would like the Board to recognize the spacing for this field that would most effectively and efficiently utilize and produce this resource.

Mr. Counts Dr. Wilson the most effective spacing to utilize this resource is also not only in the best interest of Oxy USA but also in the correlative rights of the underlying owners. Am I not correct?

Dr. Wilson That is correct.

Mr. Counts Dr. Wilson are there existing permitted wells in the lands involved which are completed in and producing from coal seams covered in this matter?

Dr. Wilson No

Mr. Counts Have you made a study of other similar coalbed methane gas development in other areas.

Dr. Wilson We have made studies of the Black Warrior Basin area, the San Juan Basin and a few smaller areas although none to the detail that we have presented here.

Mr. Counts How has the development of these areas compare with Oxy's plan of development?

Dr. Wilson They are similar in that they have a water production. All coalbed methane that I am aware of has to a greater or lesser degree a water production phase and they do produce associated water. They are similar in that they all produce gas as the predominant mechanism that is desorbed gas from the coal.

Mr. Counts Does Oxy plan to commingle production from various coal seams through the same bore hole?

Dr. Wilson Yes, we plan to commingle the zones.

Mr. Counts In your opinion is production from such commingled coalbed methane wells from the various coal seams the most efficient and economical way to produce such gas?

Dr. Wilson Yes it is.

Mr. Counts Would you explain to the Board why that is true?

Dr. Wilson There are really only a few reasons, technical reason. And economically it would just not be feasible to produce the gas economically without commingling the zones. Technically there is no reason that one would want to not commingle them.

Mr. Counts Do you also recommend that the special field rules provide for venting as necessary for mine safety and for the testing of wells?

Dr. Wilson Yes I do.

Mr. Counts Do you recommend that a minimum distance of 300' from the unit boundary be maintained for all wells drilled except those requiring location exceptions?

Dr. Wilson Yes

Mr. Counts Do you further recommend a minimum distance between coalbed wells of 800'?

Dr. Wilson Yes I do

Mr. Counts In your opinion Dr. Wilson how large a tract in the Oakwood Coalbed Gas field producing from one or more of these coal seams effectively and efficiently drain?

Dr. Wilson As I showed in my previous exhibits I believe all our evidence indicates that 80 acres is the most appropriate spacing that would efficiently and effectively produce the gas from these seams.

Mr. Counts As Dr. Whisonant has indicated, why should the Board's March 20, 1989 order with regard to the Nora Coalbed Methane Field be modified from 60 to 80 acre units in the overlap which we have discussed?

Dr. Wilson

I think that there are three reasons: the first is I believe it is a different reservoir. We have seen from our geologic testimony and Mr. Lewellen the coal seams that are giving us the predominant gas production mechanisms will not exist in that area. They pinch out. In addition the second reason would be that we believe that we have higher quality reservoir. In general we have some of the highest gas content coal in the country I believe. The third reason is that such a plan would conform with Island Creek's mining operations.

Mr. Counts

Based on your discussion of the gas content of the coal would you discuss with the Board the GRI report which is listed as Exhibit 15 in the brochure and I would also like to ask the Board to accept this as Exhibit Number 15.

Dr. Whisonant

We accept

Mr. Counts

To show you why we believe we are in the highest quality part of the gas reservoir, our area of interest is essentially this blocked area. This that we have plotted here is an isopac map showing the thicknesses of the Pocahontas coal. As we have said earlier the dominant thing, reservoir parameter is the permeability times the thickness. We are in some of the thicker seams. The highest quality gas content. In general better quality gas, better quality reservoir I should say. As you get away from this area the seams are pinching out and the thicknesses are getting smaller.

Mr. Counts

I would also like to point out for the Board, if I may, I know that all of you on the Board know your geography in terms of Southwest Virginia. But to bring into perspective of the Nora field into play. We are looking here at Dickenson County (am I correct, I believe that is correct) and this is the area the extent of the Nora Coalbed Gas Field. You see as you go into Buchanan County the GRI report is indicating the increased thicknesses with regard to the isopac map here. This essentially is the dividing line in terms of the Oakwood Coalbed Gas Field that we requested. We requested that this part of the field be increased to 80 acre spacing with the eastern part of the field also being increased from the statewide spacing to the 80 acre spacing. So I think there is a very direct correlation to our point with regard to our fact that we are essentially dealing with a separate distinct reservoir once you get on over into Buchanan County.

Mr. Counts Dr. Wilson, Mr. Barnes has testified that location exceptions are requested for some seven wells. Have you reviewed these locations and is it your opinion that the correlative rights of the owners will be protected through these exceptions?

Dr. Wilson Yes I have reviewed and it is my opinion they will.

Mr. Counts Does Oxy request that the order resulting from this hearing find that the vertical limits of this field comprise all coal seams below the Tiller seam?

Dr. Wilson Yes it does.

Mr. Counts In your opinion will the granting of the application foster, encourage and promote the safe and efficient exploration for and development, production and utilization and conservation of coalbed methane from the seams underlying the lands involved in the application?

Dr. Wilson Yes

Mr. Counts In your opinion will the granting of the application be in the best interest of conservation, prevention of waste and protection of correlative rights?

Dr. Wilson Yes it is. In terms of conservation the increased spacing as we have indicated is the most efficient and effective way to economically produce this gas. In addition, the coal would be degased so that subsequent planned mining activity in the area would have the benefits of increased safety in their operations.

Mr. Counts Thank you Dr. Wilson. Mr. Chairman I have no further questions of this witness.

Dr. Whisonant Any questions from the Board. Mr. Counts I have one. Would you and or your witnesses, please express clearly again the need for confidentiality concerning this endeavor. The issue came up earlier and I am not sure we are quite clear as to why this must be so treated.

Mr. Counts Certainly. The Virginia Oil and Gas Act requires that an in order to obtain confidentiality an operator must so request. Coalbed methane is a new resource which is being just now being explored in Virginia. With regard to for instance if we were looking at the eastern part of the state and developing a major reservoir there there is a tremendous amount of testing from both a geologic

and engineering standpoint and a geophysical standpoint that have to be done. There has to be some incentive to the operator to be able to perform all these tests, to drill core holes, to evaluate the reservoirs etc. Being able to protect the information, I think is given throughout the conservation schemes of most all states, that protection of this information has found to be justifiable in terms of furthering the interest of the Conservation Board and essentially that is what we are requesting here. This is a new resource. There is new technologies being developed everyday. The request for holding this information confidential, if I am not mistaken Tom, I believe that is for a maximum period of two years. Which the legislature has granted in order to be able to say that o.k. the operator is entitled to some consideration with regard to confidentiality but there should also be a compelling public interest with regard to not having that period extend into infinity. So what we have requested here is two year confidentiality with regard to the testing results of these wells.

Dr. Whisonant

Thank you Mr. Counts. Any other questions?

Mr. Counts

Thank you sir. Are you ready for closing remarks Mr. Chairman?

Dr. Whisonant

Please

Mr. Counts

I think we have shown that existing statewide rules clearly are inadequate for the development of coalbed methane underlying the proposed Oakwood Coalbed Gas Field as indicated by the evidence presented today. Adherence to statewide rules will result in drainage significantly outside the boundary established by statewide spacing and, therefore, will not protect the correlative rights of those individuals outside the approximate 18 acre radial units or 23 acre square units created under statewide rules. With respect to the request for modification of the Nora Coalbed Gas Field we have put on evidence that the Oakwood Coalbed Gas Field involves essentially a separate distinct reservoir with one or more coal seams present and secondly greater thickness of seams. Hopefully our evidence has indicated that and supported that. Also it is illustrated by evidence outside that preparation by Oxy including the GRI report which we just reviewed. In addition to the evidence put on by Oxy USA to that effect, this also supported by numerous industry publications including the Gas Research

Institute Report. In addition, our evidence has shown that the Oakwood Coalbed Gas Field is a better quality reservoir with more seams present. More gas per cubic feet and also the fact that it conforms with Island Creek's areas of operation. In this application Oxy is concerned with being required to drill more wells than are necessary to develop the field. That is why we need the maximum efficient spacing available and that is why we have requested the 80 acre spacing. If we had to drill more wells then hopefully as I have shown on my diagram that would result in economic and physical waste. For the owner, less than maximum efficient spacing will also result in drainage and waste. I think it is important to recognize in Virginia that spacing is prospective and that for instance some states do require that a number of wells be drilled in a given area before spacing will be allowed. As you have indicated your concern this order, other orders may well in fact be modified in the future. What I think is extremely important to realize though from the Board's standpoint and the Board is charged with the protection of correlative rights and prevention of waste. If we look at an 80 acre unit and we assume that one will maximally drain an 80 acre unit but if we consider the fact for some reason as I indicated the spacing in Virginia is prospective. So we don't have all the data we would like to have. We can't confirm for certain that it is 79 acres, 80, 81 etc. but from the Board's standpoint I think it is extremely important that we not space the area too small. If the area gets spaced too small there is no relief available for the correlative rights of those parties that have been impacted. There reservoir outside this area if that is spacing statewide or other, has been drained and there is no relief, no recourse available to them. What is important to the Board in terms of the Board considering any request for spacing as flip back to the other paper and go back to the same untidy unit, is the fact that relief is available to the extent that later on the Board were to find that it had spaced to large of an area. Now this is from the standpoint of increased density which I think will be most appropriate in Virginia in all likelihood. That opposed to one well in this particular area you would be able to drill two wells or the Board could come in and despace the area and for instance lay down 40 units or stand up 40 units. What is important to realize is that the maximum, the maximum efficient spacing should be established for this field for the protection of correlative rights. In the event that spacing proves ends up proving it

is larger than is necessary, there is recourse and the correlative rights of these individuals end up being protected. In the event, however, that the Board were to space the area too small there is no recourse and the correlative rights are violated. On behalf of Oxy USA I respectfully request that the 80 acre spacing and the additional relief requested by Oxy in this matter be granted. I would like to thank very much the members of the Board and also you Mr. Chairman for your time.

Dr. Whisonant

Thank you Mr. Counts. Is there anyone else present here today that wishes to be heard before the Board on this matter. If so please come forward and identify yourself.

Rand Sterling

Mr. Chairman, my name is Rand Sterling I am a staff attorney with Equitable Resources in Kingsport we have just several brief comments if we may. First we would request that we be given an opportunity to provide you with written comments and we would suggest possibly a two week period. We did not receive actual notice of this hearing. We heard of this hearing, there was constructive notice by publication but we did not have a full and complete opportunity to review the application. Furthermore there are materials that have been submitted today that we would like to be able to review. We obviously have not brought with us our engineers or geologists. This is an order or this request or application does have the effect of modifying an existing order. We feel that due process would be best served if in the future for all interested parties and operators that actual notice be provided. Furthermore we would request that if we could if the application is in public record if we could take a copy of that with us or that could be provided so that our engineers and geologists could have an opportunity to review that.

Mr. Counts

They are a matter of public record with regard to the package as submitted.

Mr. Sterling

So we may be able to obtain a copy of that so that we can take that back with us and review it with our group.

Mr. Counts

In terms of the major exhibits we don't have any additional copies.

Mr. Fulmer

We can provide it in fact George Mason already has a copy of it.

Mr. Sterling Oh he does? I wasn't aware of it.

Mr. Fulmer We will supply you with another copy. There isn't any problem with that.

Mr. Sterling If at all possible we would appreciate having the opportunity of having the two week period to review the application so that our people can have an opportunity to review that and make written comments at that time. Thank you for your time.

Dr. Whisonant Questions, thank you. Anyone else. Would you please come forward and identify yourself.

Mr. Edwards Yes sir, my name is Michael Edwards I am president of Edwards & Harding Petroleum Company. My comments are similar to those of Mr. Sterling of EREX in that the area of the proposed spacing order here affects part of the area that our company has under lease. As matter of fact it affects part of the area that the Board has created units that our company is operator of and we would also like to request a similar period to review and comment on the order. Thank you.

Dr. Whisonant Thank you Mr. Edwards. Questions? Anyone else. Thank you everyone this hearing is closed.

Mr. Fulmer Wait, let me ask a couple of technical questions here to just clarify up a few things just for the record Rick. Noting the date of the application was dated the 7th we received. I know at that time the emergency legislation wasn't passed but it was signed on the fourth. So technically I am asking some questions. The relief sought is under 45.1-357.37

Mr. Counts That is correct.

Mr. Fulmer That is correct, you want to amend your application sir?

Mr. Counts Yes sir, so amended.

Mr. Fulmer For your spacing are you asking relief under 45.1-357.2 dealing with statewide spacing?

Mr. Counts Mr. Fulmer with regard to 357.2 obviously that is the statewide spacing for coalbed methane development. That is obviously applicable to statewide rules and also 45.1-301. We are asking that we receive this relief even considering the statewide rules, save and except from statewide. We

want something over and above the statewide spacing for these units.

Mr. Fulmer

Am I correct in seeing in your application you mention in section three page five of the application, minimum distance between vertically drilled coalbed methane degasification wells. Do you mean gob wells or vertical vent holes, that nature?

Mr. Counts

I will have to ask for some technical expertise on that. Mr. Fulmer I am advised that will be essentially anything but gob wells.

Mr. Fulmer

Anything but gob wells.

Mr. Counts

Yes sir

Mr. Fulmer

Like I said I am just trying to get this on for the record to make sure we get all of this correct. For your gob wells, when they go on production will that be 80 acre units? Or will you want less?

Mr. Counts

At the present time the request for relief we have made addresses only the vertically drilled wells. We are not at this time addressing gob wells.

Dr. Whisonant

Thank you Mr. Fulmer. Other questions, then the hearing is closed. Thank you very much.

Mr. Counts

Thank you Mr. chairman and members of the Board.

EXHIBIT LISTING OF OXY USA, INC.

1. Grid Map
2. Approximate Extent of Field Overlap and Relationship
3. Plat
4. Stratigraphic Column of The Pennsylvanian Age Coal Seams, Oakwood Coalbed Gas Field
5. Location Map of the NW-SE Cross Section of the Tiller To Pocahontas #2 Horizon
6. Stratigraphic Cross Section of the Tiller To Poca. #2 Horizon, Drawn by Lewellen
7. Air Permeability Distribution For Pocahontas Coal
8. Permeability of Pocahontas Coal vs. Hydrostatic Stress
9. Pocahontas Coal Capillary Pressure
10. Pocahontas Coal Water/Gas Relative Permeability
11. CBM Spacing Study Langmuir Desorption Isotherm
12. CBM Study Reservoir Parameters Assumed
13. CBM Spacing Study Cumulative Production
14. CBM Spacing Study Recovery Factor
15. Isopach Map of the Pocahontas No. 3 Coal Bed

EXHIBIT #1

PLAT PREPARED BY OXY USA

ON FILE IN THE DIVISION OF GAS AND OIL
230 CHARWOOD DRIVE
ABINGDON, VIRGINIA

APPROXIMATE EXTENT OF FIELD OVERLAP AND RELATIONSHIP

- EREX NORA COALBED GAS FIELD
- OAKWOOD COALBED GAS FIELD

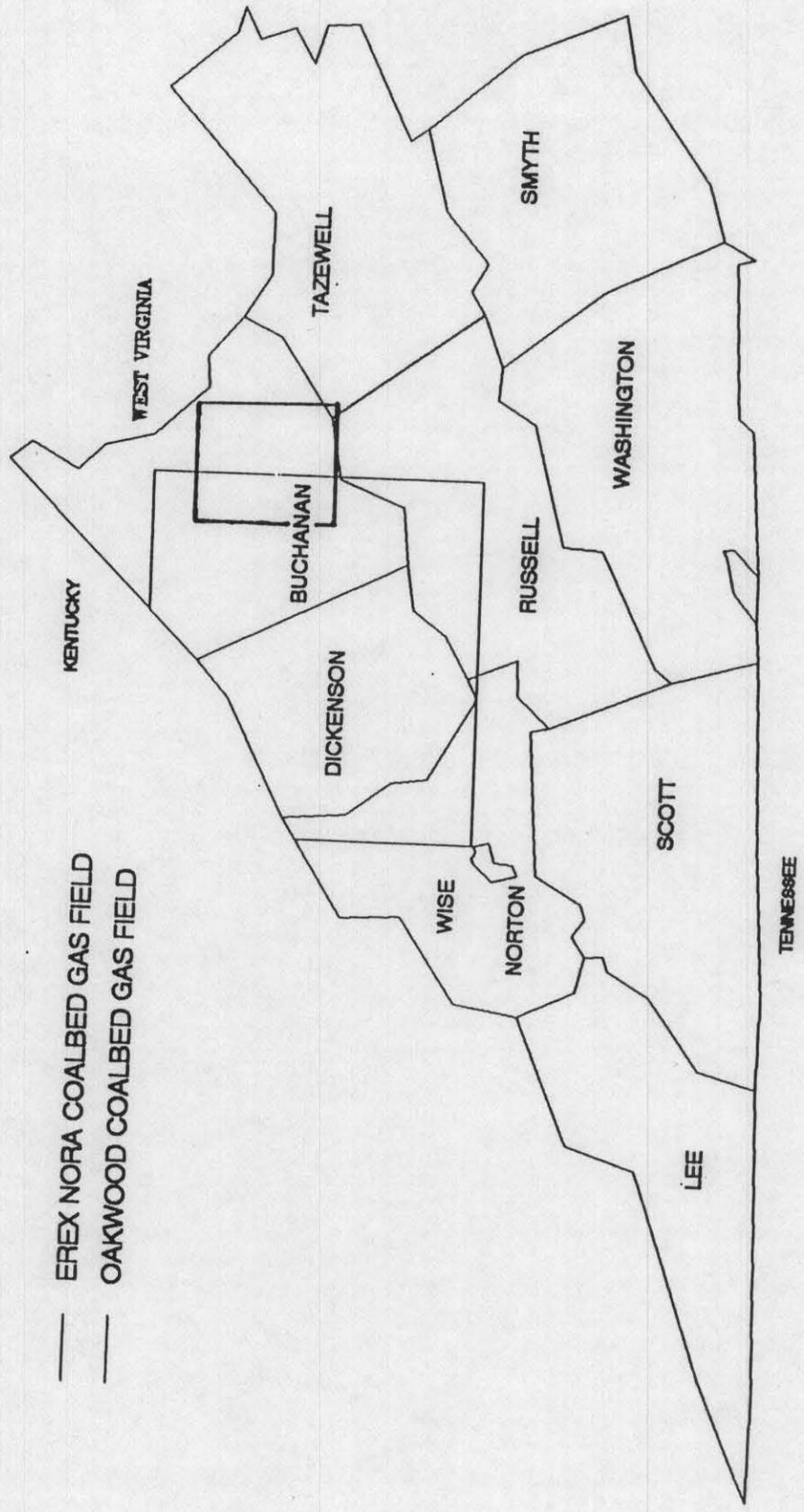


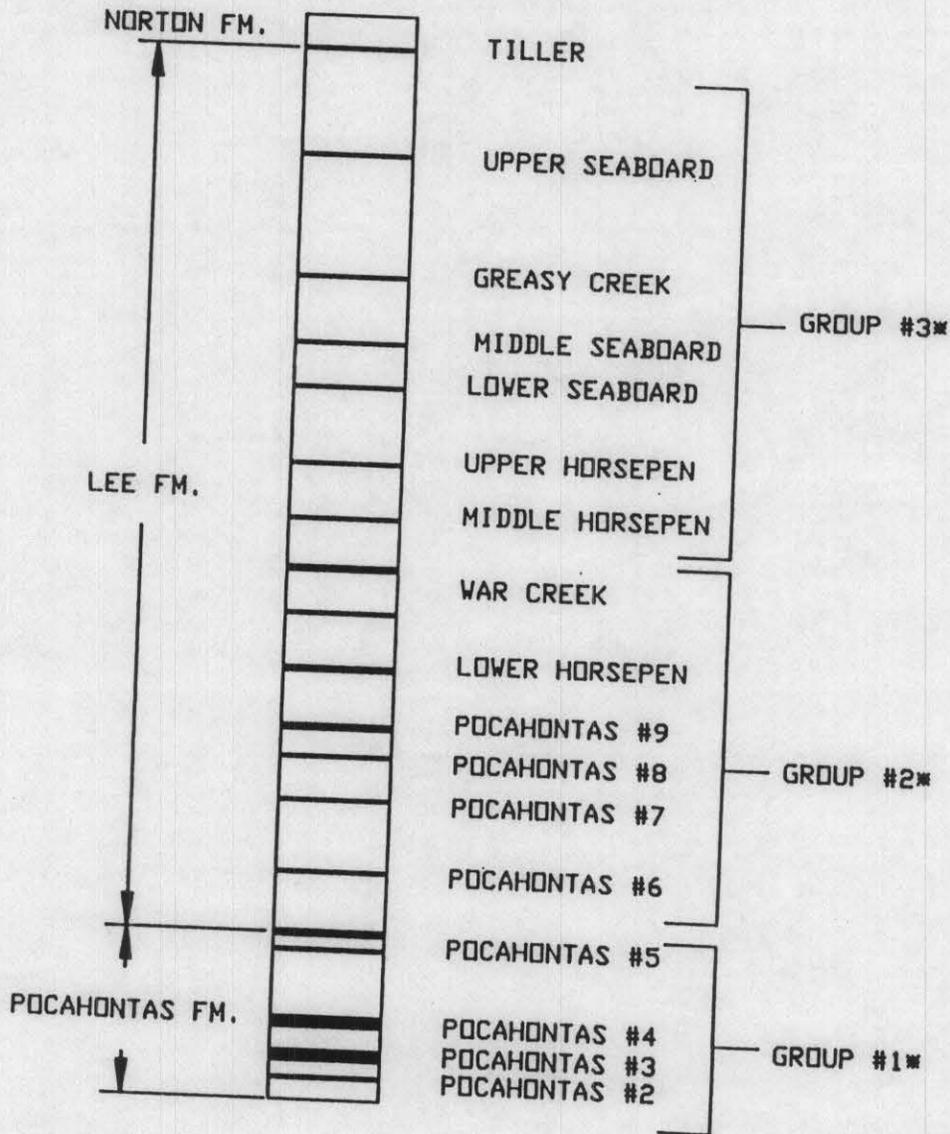
EXHIBIT #3

PLAT PREPARED BY OXY USA

ON FILE IN THE DIVISION OF GAS AND OIL
230 CHARWOOD DRIVE
ABINGDON, VIRGINIA

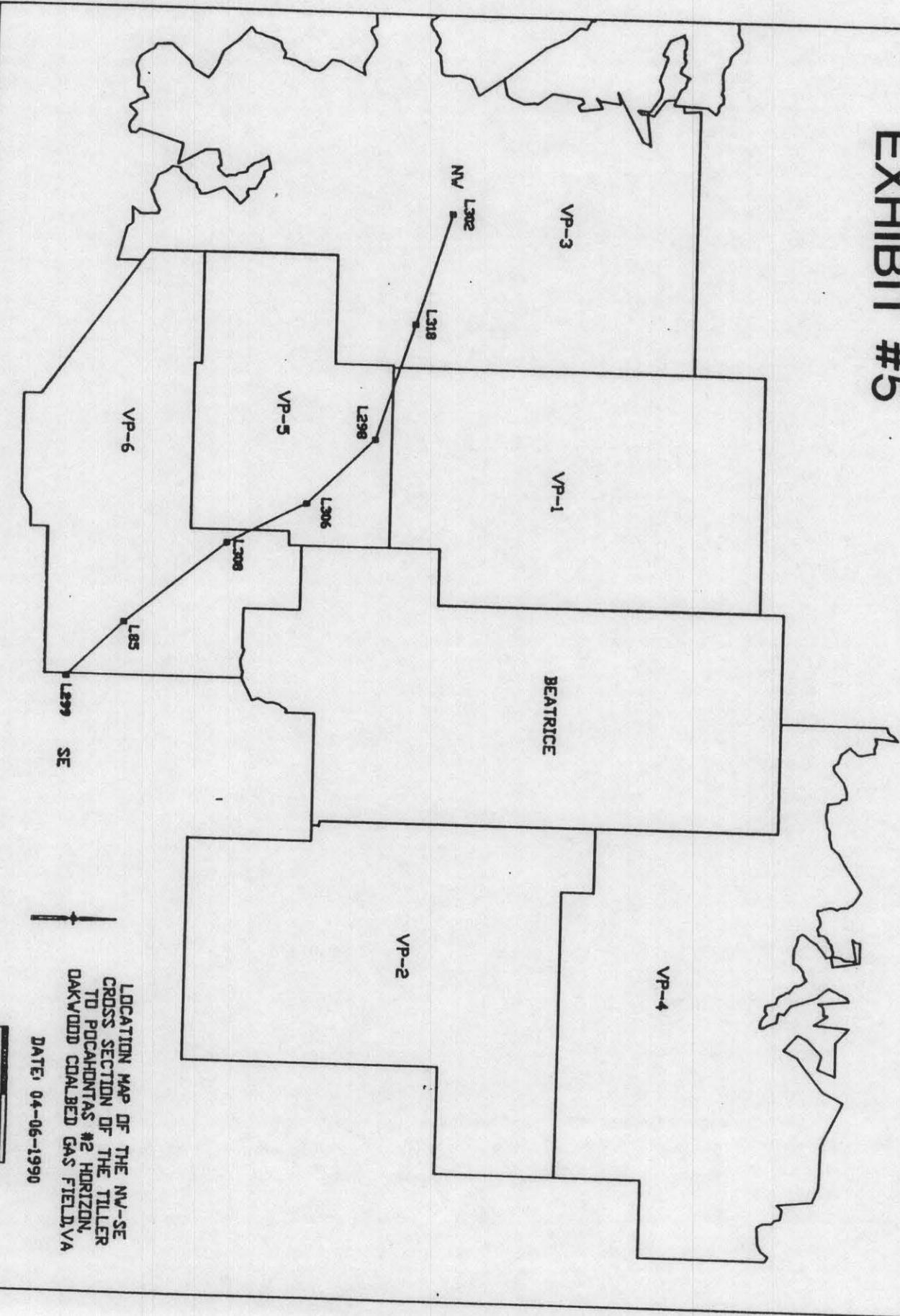
EXHIBIT #4

STRATIGRAPHIC COLUMN OF THE PENNSYLVANIAN AGE COAL SEAMS, DAKWOOD COALBED GAS FIELD, VA.



* seams are grouped in the order of importance based on thickness and continuity.

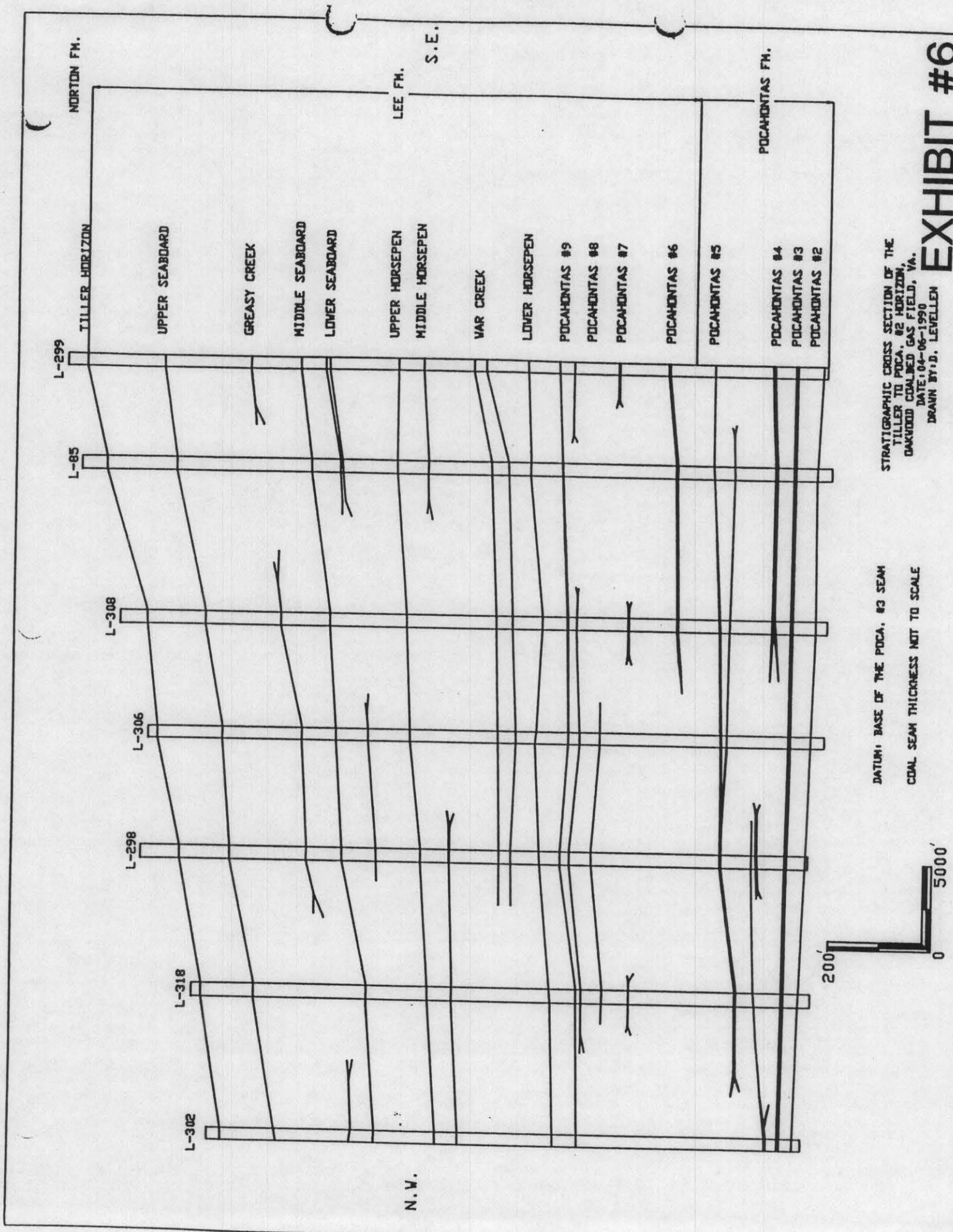
EXHIBIT #5



LOCATION MAP OF THE NV-SE
CROSS SECTION OF THE TILLER
TO POCAHONTAS #2 HORIZON,
DAKWOODD COALBED GAS FIELD, VA

DATE: 04-06-1990





NORTON FH.

TILLER HORIZON

UPPER SEABOARD

GREASY CREEK

MIDDLE SEABOARD

LOWER SEABOARD

UPPER HORSEPEN

MIDDLE HORSEPEN

VAR CREEK

LOWER HORSEPEN

POCAHONTAS #9

POCAHONTAS #8

POCAHONTAS #7

POCAHONTAS #6

POCAHONTAS #5

POCAHONTAS #4

POCAHONTAS #3

POCAHONTAS #2

LEE FH.
S.E.

POCAHONTAS FH.

L-299

L-85

L-308

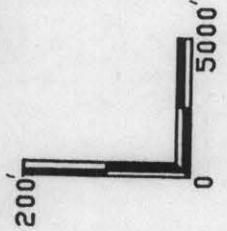
L-306

L-298

L-318

L-302

N.W.

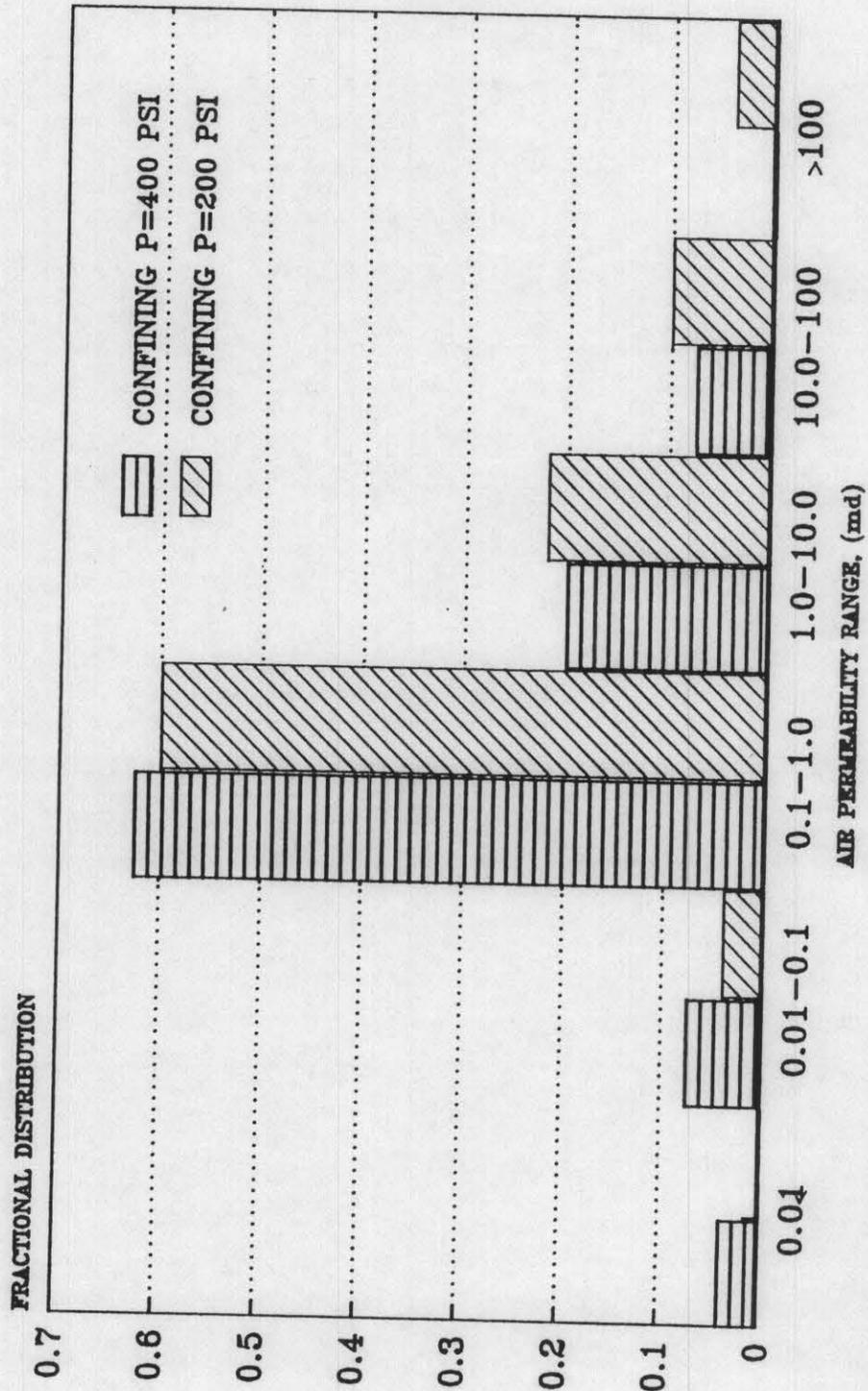


DATUM: BASE OF THE POCA. #3 SEAM
COAL SEAM THICKNESS NOT TO SCALE

STRATIGRAPHIC CROSS SECTION OF THE
TILLER TO POCA. #2 HORIZON,
DANWOOD COALBED GAS FIELD, VA.
DATE: 04-06-1990
DRAWN BY: D. LEVELLEN

EXHIBIT #6

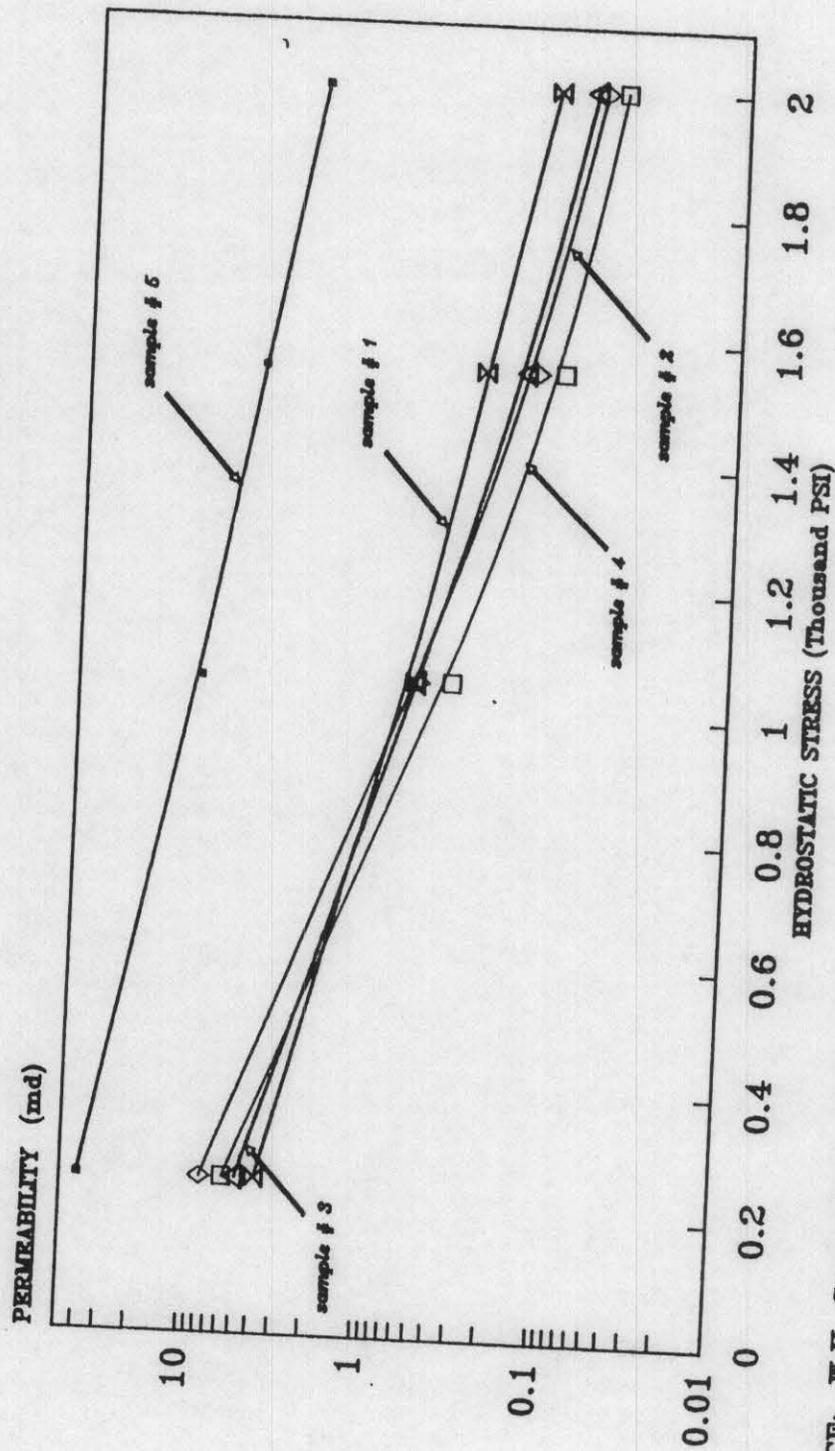
AIR PERMEABILITY DISTRIBUTION FOR POCAHONTAS COAL



SOURCE: M.K. Dabbous, et al.
SPEJ (Dec. 1974) p. 563f.

EXHIBIT #7

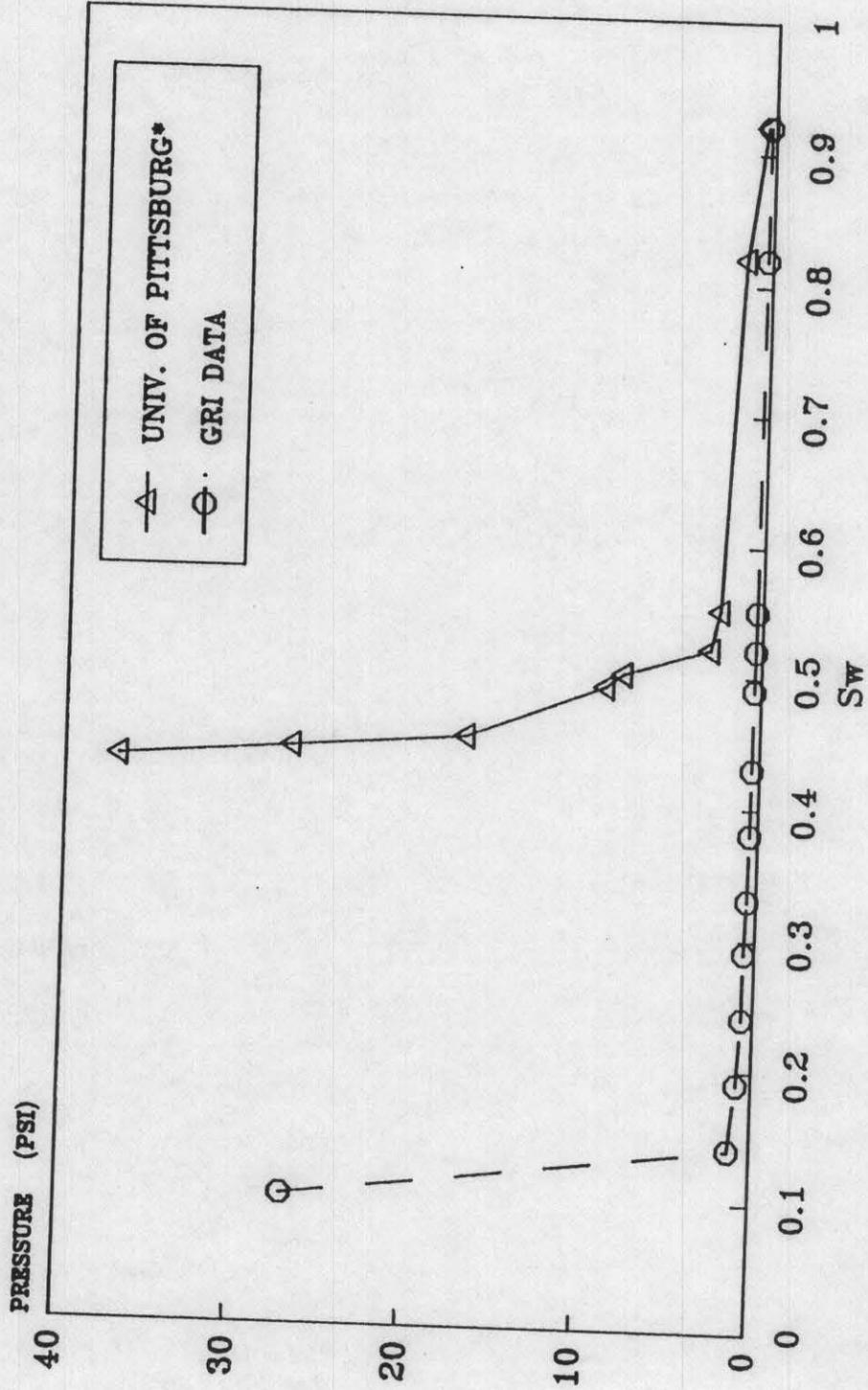
PERMEABILITY OF POCAHONTAS COAL VS HYDROSTATIC STRESS



SOURCE: W.H. Somerton, et al., Int. J.
Rock Mech. 12 pp. 129-145 (1975)

EXHIBIT #8

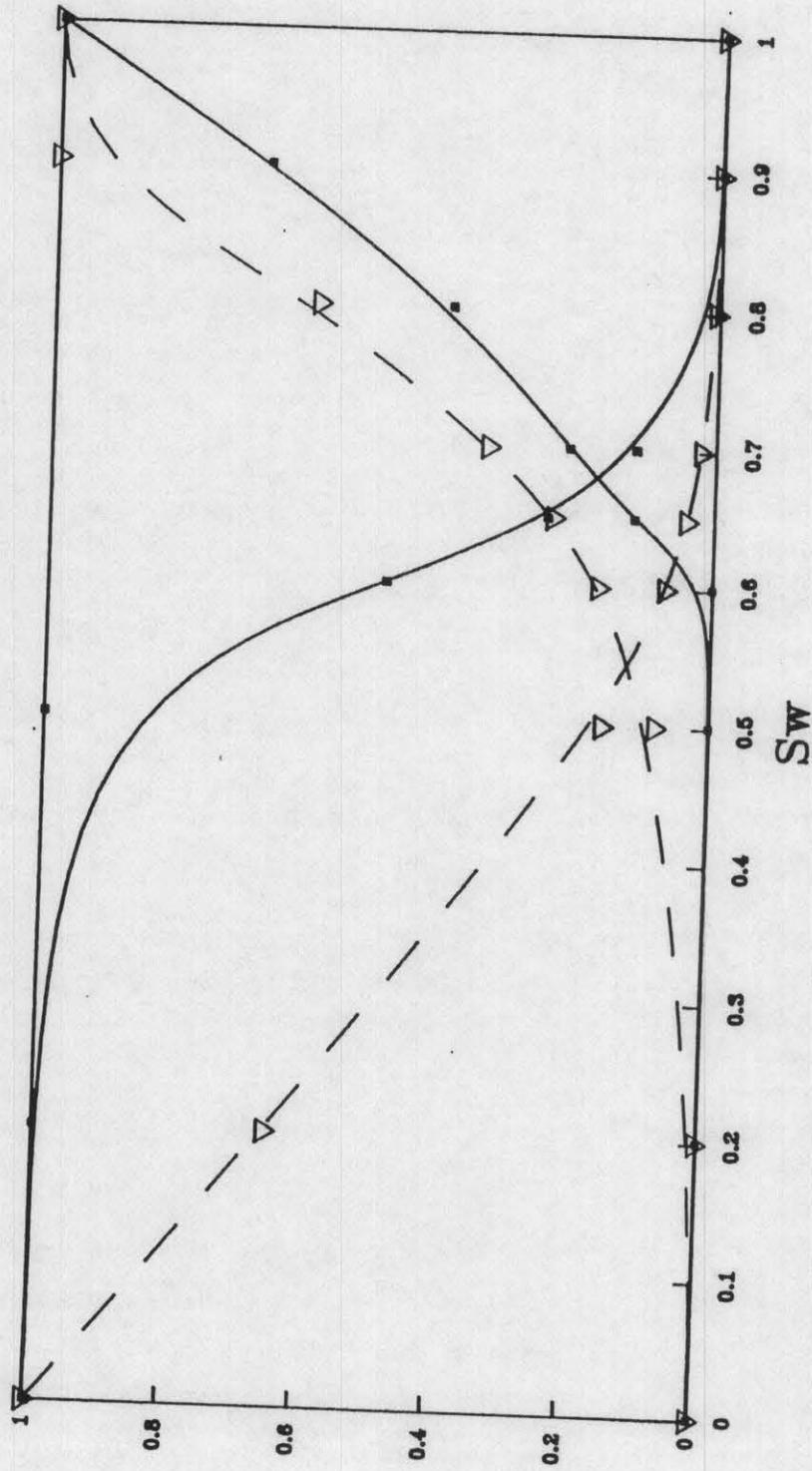
POCAHONTAS COAL CAPILLARY PRESSURE



*SOURCE: M.K. Dabbous, et al. SPEJ
(Oct. 1976) p. 261f

EXHIBIT #9

POCAHONTAS COAL WATER/GAS RELATIVE PERMEABILITY



\circ — K_{rw} \bullet — K_{rg}^* ∇ — K_{rg} \triangle — K_{rw}^*

*SOURCE: A.A. Reznite, et al. SPEJ (Dec. 1974) p. 556f.

EXHIBIT #10

CBM SPACING STUDY LANGMUIR DESORPTION ISOTHERM

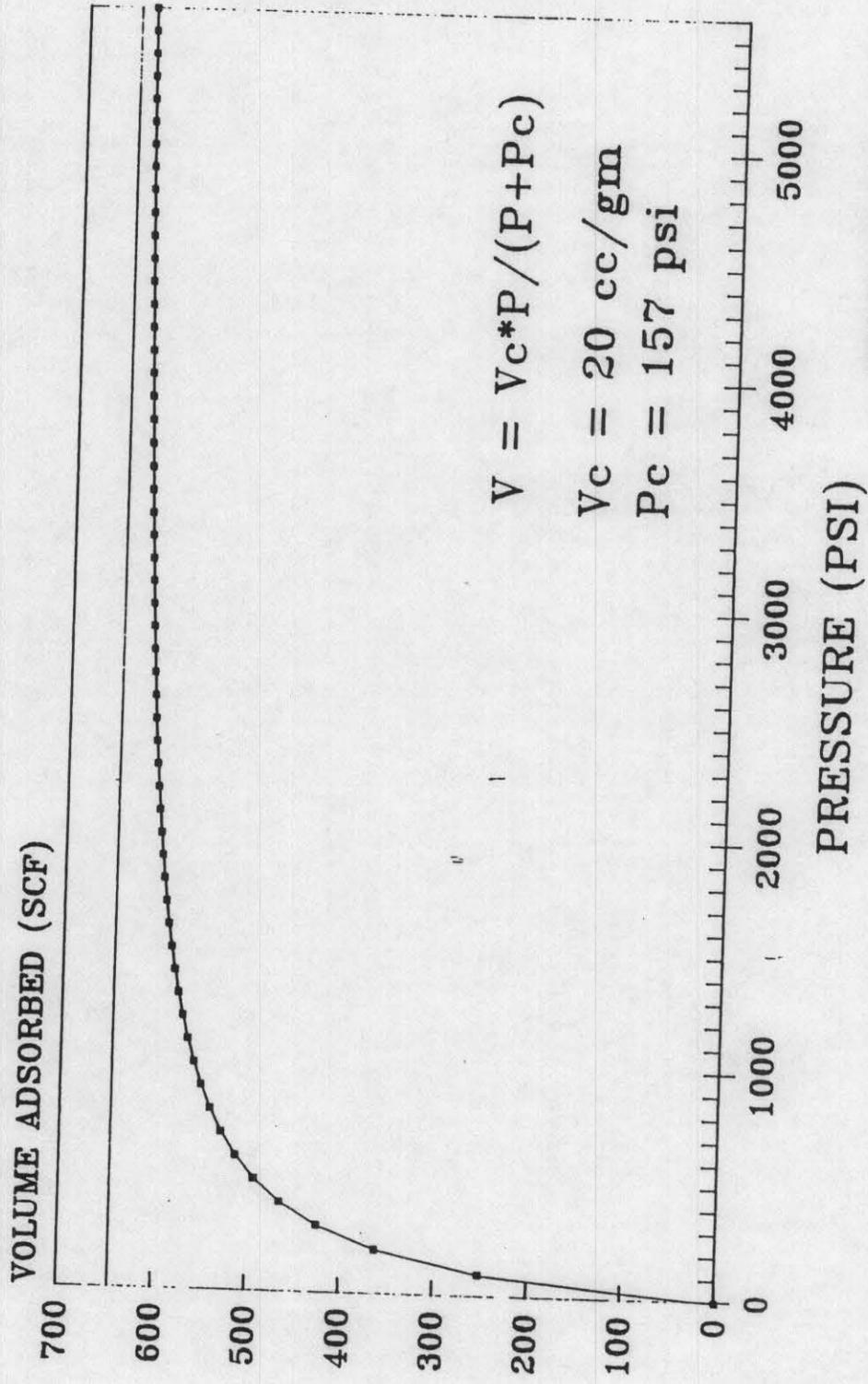


EXHIBIT #11

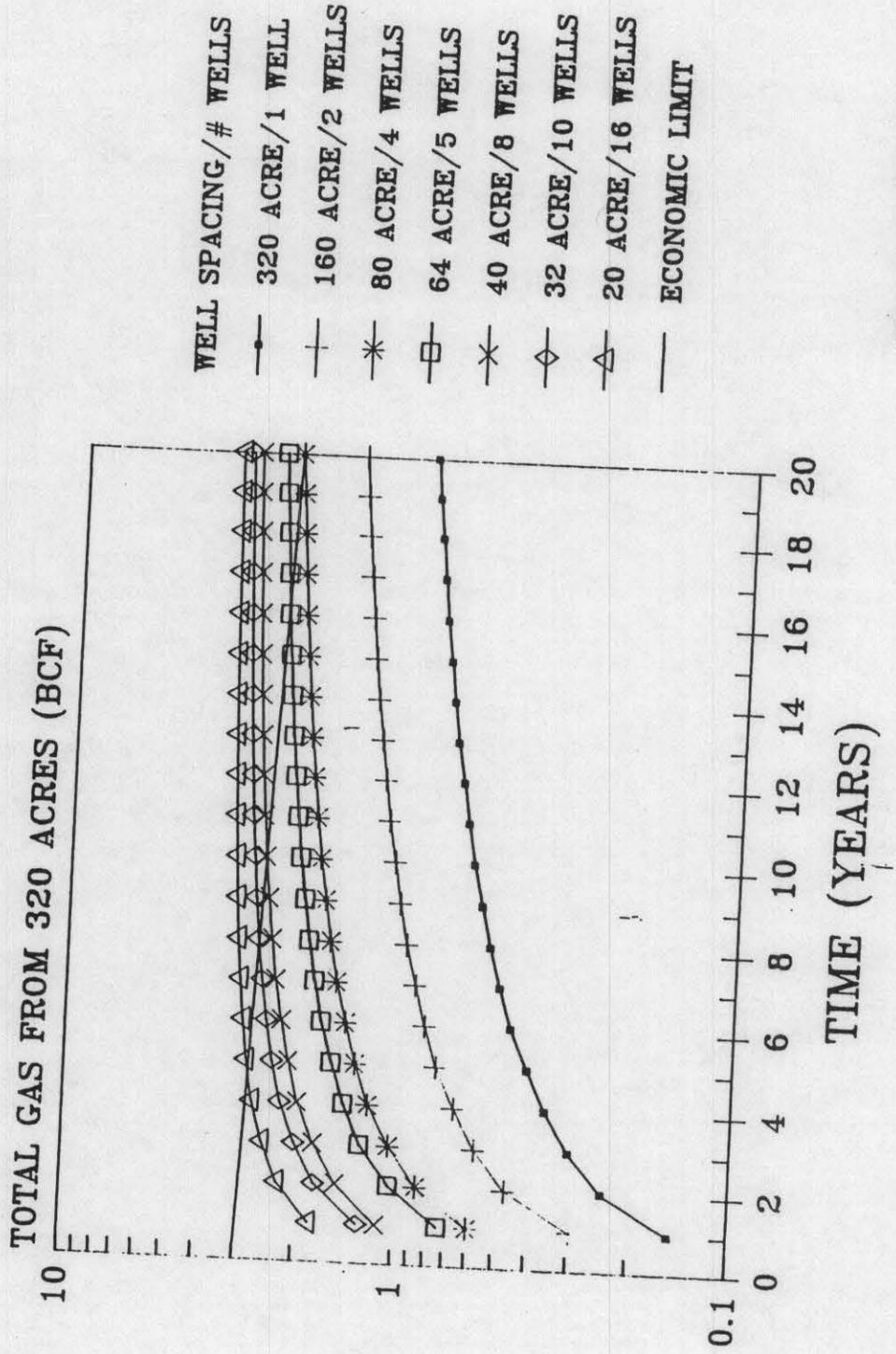
CBM SPACING STUDY

RESERVOIR PARAMETERS ASSUMED

AVERAGE RESERVOIR DEPTH, FT	2000
NET RESERVOIR THICKNESS, FT	13
ABSOLUTE PERMEABILITY, MD	2
POROSITY, %	4
INITIAL RESERVOIR PRESSURE, PSI	673
INITIAL WATER SATURATION, %	70
FORMATION TEMPERATURE, DEG F	75
FORMATION COMPRESS., 1/PSI	0.000017
DESORPTION VOLUME CONST., CC/GM	20.2
DESORPTION PRESS. CONST., PSI	157
DESORPTION TIME CONSTANT, DAYS	0.231
NATURAL FRACTURE SPACING, IN	0.25
MATRIX PERMEABILITY, MD	0.0
MATRIX POROSITY, %	2.4
STORATIVITY RATIO, FRACTION	0.62
COAL DENSITY, CC/GM	1.36
DIFFUSIVITY COEFF., SQ FT/DAY	20.4
WATER COMPRESSIBILITY, 1/PSI	0.000003
WATER FORM. VOL. FACTOR, CF/SCF	1.0
GAS VISCOSITY, CP	0.01
GAS GRAVITY, FRACTION	0.60

EXHIBIT #12

CBM SPACING STUDY CUMULATIVE PRODUCTION



CBM SPACING STUDY RECOVERY FACTOR

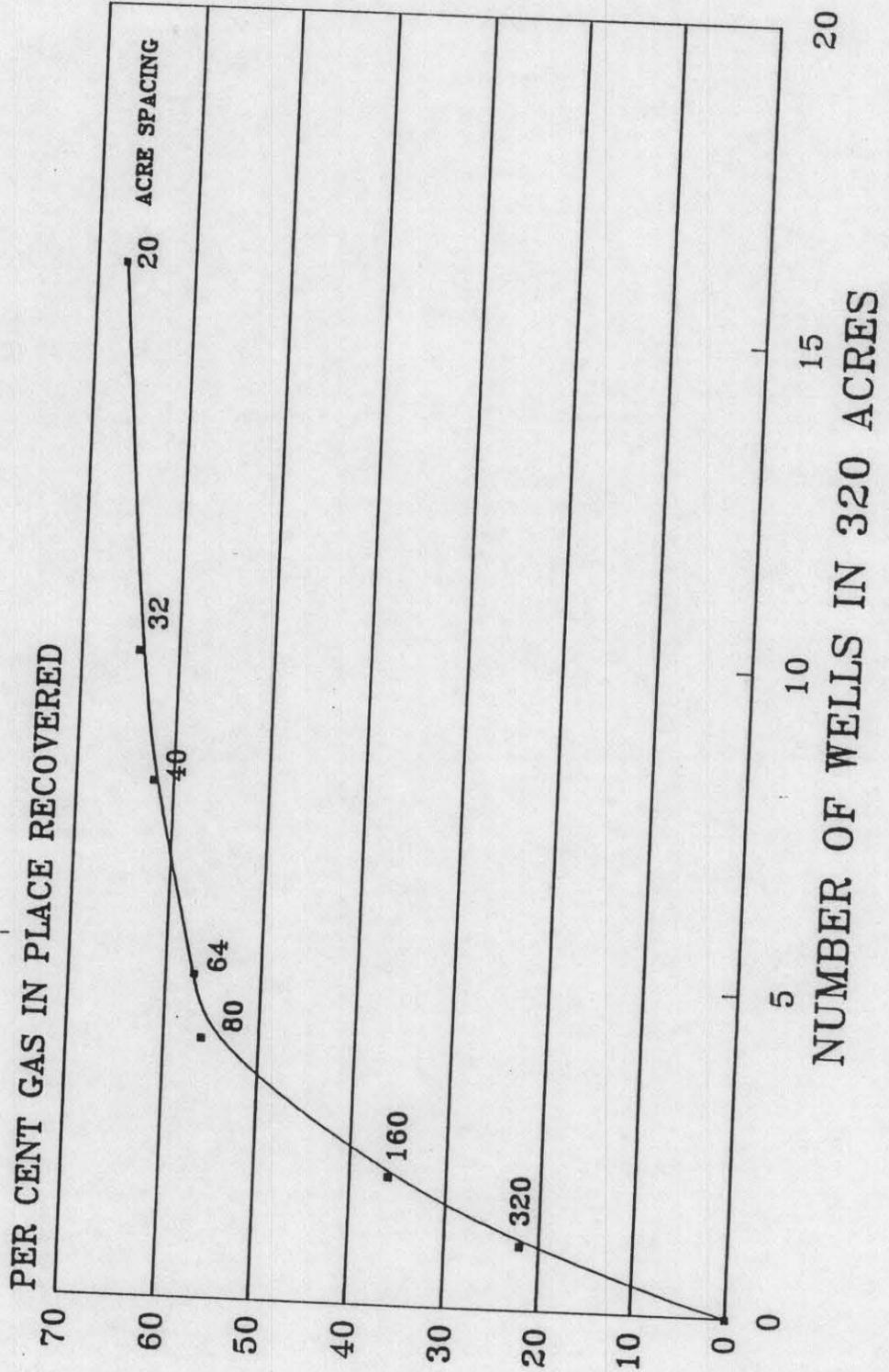
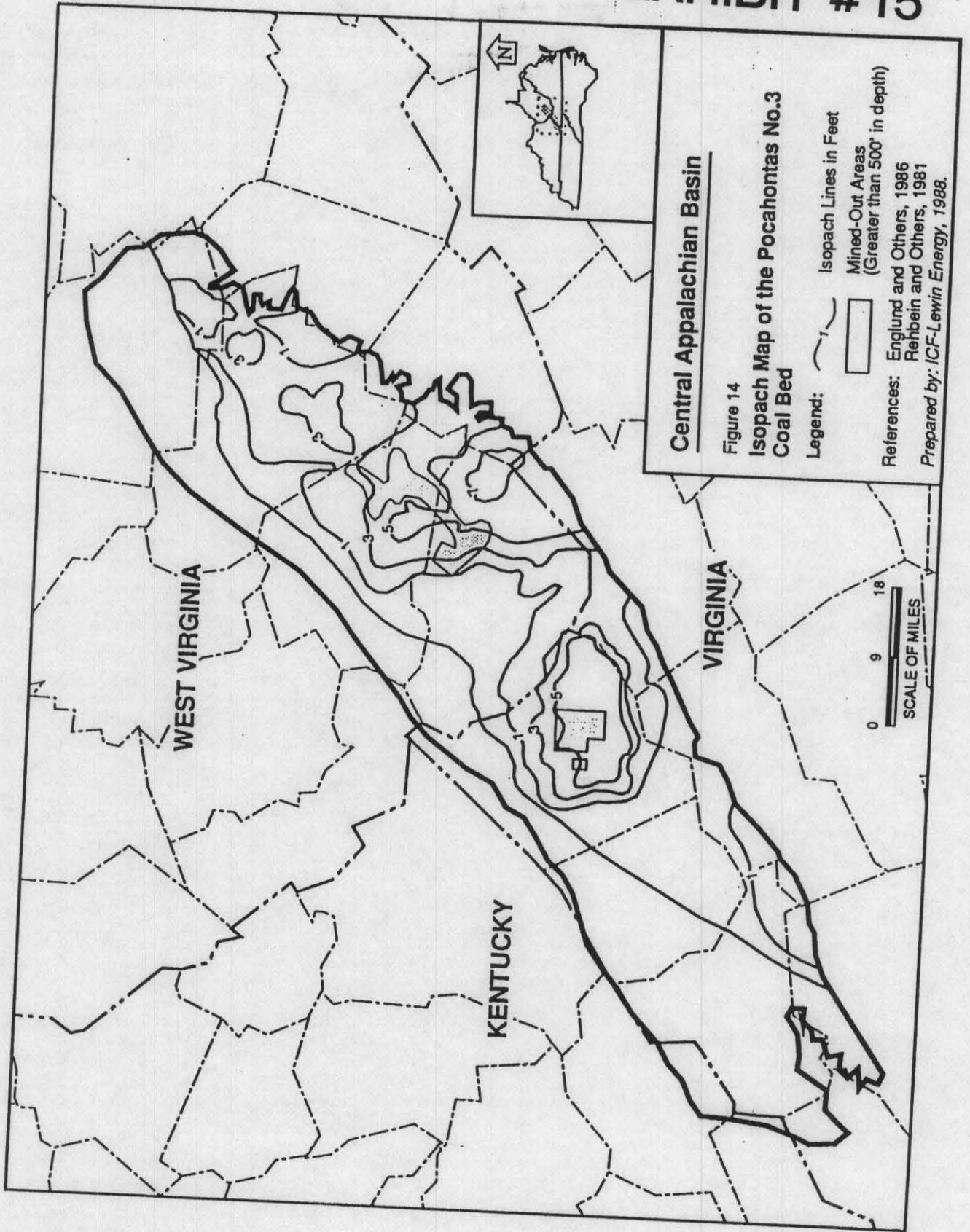


EXHIBIT #15



Central Appalachian Basin

Figure 14
Isopach Map of the Pocahontas No.3
Coal Bed

Legend:  Isopach Lines in Feet
 Mined-Out Areas
(Greater than 500' in depth)

References: England and Others, 1986
Rehbein and Others, 1981
Prepared by: ICF-Lewin Energy, 1988.

VIRGINIA OIL AND GAS CONSERVATION BOARD

SPACING HEARING

OAKWOOD COALBED GAS FIELD

REQUESTED BY OXY USA., INC.

APRIL 10, 1990

BUCHANAN COUNTY BOARD OF SUPERVISOR'S ROOM

GRUNDY, VIRGINIA

BOARD MEMBERS PRESENT

Mr. Benny Wampler, Chairman

Dr. Robert Whisonant

Mr. Jim Bunn

Mr. Chester Starkey

Mr. Tom Fulmer, State Oil & Gas Inspector

Ms. Diane Davis, Secretary

Counsel for Oxy USA, Inc. - Mr. Richard Counts

VIRGINIA OIL AND GAS CONSERVATION BOARD HEARING

April 10, 1990
 Buchanan County Board of Supervisors Room
 Grundy, Virginia

Name	Company	Address
John D. McKinnis	Counts, McKinnis + Scott	P.O. Box 298, Kingsport, TN 37662
James C. Brunon	OXY, USA.	PO Box 2369 Kingsport TN 37662
B Bob Baker	OXY USA	Drawer G, Richlands, VA
Brent Benjamin	Cabot	P O Box 1791 Charleston WV 25326
William E. Copley	Oxy USA	Richland Va.
DONALD W. FRYHOFFER	OXY USA	DRAWER G RICHLANDS, VA
TAM LINCOLN	EDWARDS & HARDING	P.O. BOX 2404 ABINGDON VA 24210
MIKE EDWARDS	EDWARDS & HARDING	BOX 2404 ABINGDON, VA 24210
Glenn Vangolen	OXY USA	Drawer G Richlands, VA 24641
MARTIN E. WIRTH	OXY USA INC.	DRAWER G Richlands, Va 24641
Dennis G. Lewellen	Island Creek	Drawer L Dorchester, Va 24631
Patty Patten	OXY USA	DO Box 300 Tulsa OK 74102
Amanda Patten	OXY USA	Box 300 Tulsa OK 74102
Richard Patten	CM&S	Box 298 Kingsport, Tenn. 37662
Weldon G. Wilcox	OXY	TULSA, OK

Mr. Wampler

Good afternoon ladies and gentlemen, my name is Benny Wampler and I am Assistant Director for Mining for the Virginia Department of Mines, Minerals and Energy. I am going to ask each Board member to introduce themselves.

The following members were present: Dr. Robert Whisonant, Mr. Jim Bunn, Mr. Chester Starkey, Mr. Wampler, Tom Fulmer State Oil & Gas Inspector, Diane Davis Secretary

Mr. Wampler

Thank you. The purpose of the hearing today is to hear arguments and evidence concerning the request of Oxy USA, Incorporated for the establishment of drilling units and spacing for the Oakwood Coalbed Gas Field. We will now ask Mr. Counts to present the evidence to the Board.

Mr. Counts

Thank you Mr. Chairman and members of the Board. Mr. Chairman, as you have indicated, the Board has convened today to hear Oxy's request for the issuance of an Order granting 80 acre spacing to cover the lands involved in this application. Also appearing today on behalf of Oxy USA in addition to the expert witnesses which we will call, I would like to introduce to the Board Ms. Patricia Patton, counsel for Oxy USA, along with John McKinnis with the firm of Counts, McKinnis and Scott. In order to develop some perspective, I would also like to before we get into the hearing pass out some of the exhibits. I think it will help in terms of going through the application. I will be making reference to these, Mr. Chairman, during the course and introducing a number of these as exhibits in the hearing.

Mr. Wampler

Thank you

Mr. Counts

Mr. Chairman and members of the Board, as you are aware the current spacing state wide field rules in Virginia today is based on approximately 19 acre radial spacing. The spacing sought and requested by Oxy today is based on 80 acre spacing. This exhibit which will be introduced during the hearing essentially shows the area sought to be spaced by Oxy which is overlaid by a grid system and the dark lines you see here also entail the Island Creek mine boundaries. This is the entire area sought to be spaced. Essentially right now the western half of this area, all of this area to my left here is currently spaced under an order which the Board issued last year granting 60 acre spacing to Equitable Resources. The area to the east is currently under state wide spacing rules which as I

indicated provide for 19 acre spacing. Mr. Chairman with leave of the Board I would like to go into just briefly to what spacing is for the benefit for the public and what the reasons are why we requested this relief. With your permission I will do that.

Mr. Wampler

Go ahead

Mr. Counts

Essentially the production and development of oil and gas early on was governed strictly by the common law of doctrine of the rule of capture. Under that doctrine if you assume that you have an 80 acre unit and if you further assume that the most efficient and economical way to drain that unit is to locate one well bore in the center of that unit and that one well bore would in fact drain that unit under the rule of capture as a result of the fact that say landowner A owns this unit and they are surrounded by adverse landowners all around as opposed to drilling this well in the center of this unit and maximally drain this unit, the most prudent location to drill this well is going to be on the outer perimeter. The purpose of all conservation laws and schemes throughout the country are for the protection of correlative rights and the prevention of waste. I think we can see here without the benefit of spacing laws and conservation laws that would not be effective. As soon as landowner A drills a well here, landowner B will offset that well as close to landowner A's property line as is possible. We already have two wells where essentially one well would have drained this entire area. As soon as this occurs A will counter by drilling here B to protect will drill here etc. What this results in is two types of waste, economic and physical waste. From an economic standpoint we have drilled a significant number of wells, lets say eight where really one well would have drained this field or this unit of this particular gas. We have physical waste from the standpoint that as opposed to producing this well prudently landowner A is required to produce the gas or produce the oil or the hydrocarbons as quickly as they can get them out of the ground. That will end up leaving a significant amount of hydrocarbons and will not efficiently drain the reservoir. Further graduation of that is that once conservation laws were implemented statewide rules were first enacted, statewide rules are basically are reasonable basis to assume that anywhere within a particular region, particularly within that state that a well will drain a specific number of acres. As I indicated in Virginia, that is based on 19 acre spacing. Coalbed

methane spacing to my knowledge in terms to the wells being drilled throughout the United States basically those goes from some 40 acres to units that are as much as 320 acres in the Fruitland formation in Colorado. As I indicated in Virginia the spacing is now on 19 acre radial basis that is on statewide basis. With regard to the Nora field which covers the western half, the Nora Coalbed Gas Field which covers the western half of the acreage which we have sought to have spaced today that is based on 60 acres and the spacing which Oxy is requesting today is based on 80 acre units. Primarily the purpose of todays hearing is to demonstrate why 80 acre spacing is necessary to govern operations in the area sought to be spaced by Oxy's application. It is necessary from a statewide standpoint to insure that correlative rights and the prevention of waste is protected. I think that you can indicate if you have got an 80 acre unit such as this unit here and you are drilling on statewide rules of a 19 acre radius, the correlative rights of these individuals outside that radius are going to be violated. In addition from the standpoint of the overlap between the area sought to be spaced under this order and the Nora Coalbed Gas Field rules as promulgated by the Board last year that the modification of the overlap of the Nora Coalbed Gas Field is necessary to change with geologic conditions in order to conform to Island Creek's mine boundaries and for the prevention of waste and the protection of correlative rights. Mr. Chairman with that aside I would like to go ahead and call my first witness if there are no questions from the Board. Mr. Starkey.

Mr. Starkey

If you will excuse me but where did you get that 19 acre figure?

Mr. Counts

That is just out of my calculator in terms of trying to take a look at the I think the wells now being drilled statewide spacing is on a 500' radius. That is on a radial basis. I think on a square that would be probably about 23 or 24 acres.

Mr. Starkey

That is for natural gas?

Mr. Counts

Coalbed methane Mr. Starkey. Strictly coalbed methane.

Mr. Wampler

Any other questions of the Board. O.k. proceed.

Mr. Counts

I would like to call as my first witness Mr. Marty Wirth.

Mr. Marty Edward Wirth

Mr. Counts Mr. Wirth who are you employed by and in what capacity?

Mr. Wirth I am employed by Oxy USA, Inc. and I am a coalbed methane project land manager.

Mr. Counts Mr. Wirth have you ever testified before the Virginia Department of Mines, Minerals & Energy?

Mr. Wirth No

Mr. Counts Mr. Wirth would you advise the Board in terms of your background please and your education?

Mr. Wirth I hold a degree in human relations and I have completed numerous professional landman and law educational courses resulting in numerous certified professional landman credits. I am a member of various professional associations and organizations as American Association of Professional Landman, International Right-of-Way Associations and organizations of such.

Mr. Counts Mr. Wirth would you state your work experience with Oxy?

Mr. Wirth I have been employed for almost 13 years with Oxy USA with the majority of my experience being in contract negotiations and lease and surface acquisition, division orders, environmental aspects in the oil and gas industry and negotiations with royalty and surface owners.

Mr. Counts Mr. Chairman I would like to offer Mr. Wirth as an expert witness in this matter.

Mr. Wampler All right

Mr. Counts Mr. Wirth do your responsibilities include the lands involved here and the surrounding area?

Mr. Wirth Yes it does.

Mr. Counts How long have you worked in or been familiar with this area?

Mr. Wirth In the Appalachian area approximately seven years.

Mr. Counts Do your duties involve the lands that are subject to this application?

Mr. Wirth Yes

Mr. Counts Are you familiar with the spacing application and the relief requested?

Mr. Wirth Yes sir

Mr. Counts Is Oxy the owner of the right to drill a well in the lands involved herein so as to produce coalbed methane?

Mr. Wirth Yes sir

Mr. Counts Would you indicate what type of leasehold position that Oxy has acquired.

Mr. Wirth We have acquired numerous oil and gas leases, coalbed methane leases from the various ownership aspect.

Mr. Counts In otherwords, Oxy has a significantly sole position underlying the lands sought to be spaced?

Mr. Wirth Yes sir

Mr. Counts Mr. Wirth what is the boundary of the field Oxy seeks to have spaced?

Mr. Wirth The boundary in the field for this application will be from the north boundary latitude line of 37 degrees, 17 minutes, 30 seconds; the eastern boundary line of longitude line of 81 degrees, 52 minutes, 30 seconds; a southern boundary latitude line of 37 degrees, 07 minutes, 30 seconds and a western boundary line being a longitude line of 82 degrees, 07 minutes, 30 seconds.

Mr. Counts Mr. Wirth would you point that out on the plat that you have prepared.

Mr. Wirth Sure, The exhibit I was referring to was the north boundary line of 37 17 30 here would be your eastern boundary line, southern boundary line and your western boundary line.

Mr. Counts Mr. Wirth was this plat prepared by you or under your direction?

Mr. Wirth Yes sir it was

Mr. Counts How does this plat differ from the one attached as Exhibit A to Oxy's application?

from a lease line and a 1000' between each coalbed methane well).

Mr. Counts Mr. Wirth could you indicate the eastern most boundary of the Nora Coalbed Gas Field?

Mr. Wirth The eastern most boundary will be 82 degrees 00 minutes 00 seconds.

Mr. Counts Thank you sir. Does Oxy request modification of the Board's March 20th, 1989 order such that the drilling units contained in that portion of the Nora Coalbed Gas Field bounded on the north by latitude line 37 degrees 17 minutes 30 seconds on the east by longitude line 82 degrees on the south by latitude line 37 degrees 07 minutes 30 seconds and on the west by longitude line 82 degrees 07 minutes 30 seconds be modified so as to establish in such area 80 acre units?

Mr. Wirth Yes we do.

Mr. Counts Mr. Wirth you also have an exhibit that depicts the overlap between the Nora Coalbed Methane Field and Oxy's proposed field?

Mr. Wirth Yes

Mr. Counts Would you show that to the Board please sir? Mr. Chairman and members of the Board this exhibit is also on page two of your book.

Mr. Wirth The green outline is the current approximate area of the Nora Coalbed Gas Field, the red is the application which we are here today to discuss.

Mr. Counts Mr. Chairman I would like to offer this plat into evidence as Exhibit Number Two.

Mr. Wampler O.k.. so noted

Mr. Counts Mr. Wirth what name does Oxy propose for the pool underlying this proposed field?

Mr. Wirth What we are going to ask for is the Oakwood Coalbed Gas Field.

Mr. Counts Does Oxy request that this order be effective as of today?

Mr. Wirth Yes we do

Mr. Counts Mr. Chairman I have no further questions of this witness.

Mr. Wampler Any questions from the Board?

Dr. Whisonant I have one. Mr. Wirth you said that Oxy has significant holdings in the proposed new field. What kind of number would that be?

Mr. Wirth We are talking almost 80,000 acres under leasehold interest.

Dr. Whisonant Out of a total of how many?

Mr. Wirth Approximately 85 to 87 thousand is a rough estimate. This is when we say Oxidental Corporation. Between the two companies of Island Creek and Oxy USA.

Dr. Whisonant So Oakwood would be about 86 87 thousand acres total?

Mr. Wirth The total spacing area we are asking for or just the area which Island Creek, a total area of approximately 100,000 acres.

Dr. Whisonant That is this.

Mr. Wirth Yes inside the red, yes sir.

Dr. Whisonant O.k. and of that you have got about?

Mr. Wirth I would say 87 to 85 percent of it. Because some of that acreage Island Creek does not mine on. Therefore we do not have at this time, plans to develop on it.

Dr. Whisonant Is it unleased or does somebody else have it?

Mr. Wirth That is another coal company's concern and I believe I cannot make a statement as to if it is leased or not.

Mr. Counts I would also like to add to Dr. Whisonant that we would be concerned from a spacing application that it is really necessary to show that you are a party in interest to be able to maintain an application for spacing not that you have, we try to indicate that Oxy does have a significant acreage position in here but I would like to point out to the Board to that is going to be the exception as opposed to the rule. That at any time any operator has that high of percentage under lease in a given area you may well go into an area and in fact only have five

percent or ten percent under lease. I am concerned from a precedence standpoint that it not reflect that any operator have a burden of having even a majority of acreage under lease. But Oxy does has, as Mr. Wirth has indicated, a significant amount of acreage under lease in this situation.

Dr. Whisonant Thank you

Mr. Wirth You are welcome

Mr. Bunn Is it Marty?

Mr. Wirth Yes sir

Mr. Bunn O.k. what I would like to know are you the one we are going to address the questions to on this 80 acre spacing?

Mr. Counts Mr. Bunn we will have a geologist and engineer testify with regard to the spacing request with regard to drainage and answer technical questions.

Mr. Bunn That is fine.

Mr. Wampler Any other questions? Thank you Mr. Wirth.

Mr. Counts Mr. Chairman the next witness I would like to call is Mr. Robert Barnes.

Mr. Robert Allen Barnes was sworn in

Mr. Counts Mr. Barnes, who are you employed by and in what capacity?

Mr. Barnes Employed as a drilling specialist by Oxy USA, Incorporated.

Mr. Counts Have you previously testified before the Department of Mines, Minerals & Energy?

Mr. Barnes No sir

Mr. Counts Would you state your education for the Board please sir?

Mr. Barnes I have a degree in accounting from New Mexico State University.

Mr. Counts Would you indicate your work experience?

Mr. Barnes I have been employed by Oxy USA for 11 1/2 years as a drilling specialist in the Rocky Mountain region.

Mr. Counts Would you advise the Board as to your areas of responsibility at Oxy?

Mr. Barnes I was responsible for supervising drilling and completion operations, permitting and production operations in that region.

Mr. Counts Would you list your professional associations.

Mr. Barnes I am a member of the Society of Petroleum Engineers, International Association of Drilling Contractors.

Mr. Counts Mr. Chairman, I would like to offer Mr. Barnes as an expert witness in this matter. Mr. Barnes are you familiar with the well work permit applications filed by Oxy USA with the Inspector's office?

Mr. Barnes Yes sir

Mr. Counts As of this date, how many applications have been filed?

Mr. Barnes Fourteen applications

Mr. Counts Does each of the applications involve lands located in the proposed Oakwood Coalbed Gas Field?

Mr. Barnes Yes sir

Mr. Counts Can you depict the proposed locations of these wells on a map?

Mr. Barnes Yes sir we have a map with the locations plotted on them.

Mr. Counts Would you present that to the Chairman please. Mr. Chairman I would like to offer this plat into evidence as Exhibit Number Three.

Mr. Wampler O.k.

Mr. Counts Mr. Barnes were these permit applications filed based on statewide spacing laws?

Mr. Barnes Yes sir initially.

Mr. Counts Have permits been issued to Oxy for any of these fourteen applications?

Mr. Barnes We received permits for CBMI-2, 3 and 4.

Mr. Counts The other 11 applications are pending?

Mr. Barnes Yes sir

Mr. Counts Does Oxy request that the spacing for these fourteen proposed wells be modified to conform to and be consistent with the spacing requested, the 80 acre spacing requested by Oxy in its application?

Mr. Barnes Oxy has set a period of 90 days effective as of the date of the issuance of the order be allowed to submit new well plats based on 80 acre spacing.

Mr. Counts Is the reason for this to accommodate the proposed wells to the new field rules?

Mr. Barnes Yes sir

Mr. Counts Mr. Barnes are you familiar with the application filed in this case?

Mr. Barnes Yes sir

Mr. Counts What sort of spacing is requested?

Mr. Barnes Oxy is requesting 80 acre square with 300' set back in the unit boundary making the well locations a minimum of 800' between wells.

Mr. Counts Do each of the proposed wells involved in the 14 applications you spoke of conform to the requested spacing?

Mr. Barnes No sir, seven of the proposed 14 are located within the 300' setback area.

Mr. Bunn Hold it what was that now?

Mr. Barnes On the smaller grid there is a block inside a block. The picture frame around the larger block is the setback area. Seven of the wells we have before the Commission are in this setback area.

Mr. Counts That is essentially our request for location exceptions as noted in their application. We will go further into that to Mr. Bunn. Mr. Barnes was it necessary to spot wells at these locations due to topographic considerations, economic constraints and to conform to Island Creek's plan of operations?

Mr. Barnes Yes sir

Mr. Counts Will you identify for the Board the six proposed wells which are located within 300' of the unit

boundary where offsetting ownership is common to the unit where the location exceptions are requested?

Mr. Barnes

We have grid system set up. Letters by numbers. Well number B-29 which has also been permitted under I-9 is in the setback area, the L-24 is also in the setback area, the P-26 which is called the I-8 is in the setback area, the Q-26 which is the I-10 is setback, the V-34 is in the setback area, the X-11 is in the setback area.

Mr. Counts

Mr. Barnes in addition to the six you have just listed for the Board do you also request a location exception for well number 1-5 located in unit X-10?

Mr. Barnes

Yes sir, this would be location right here.

Mr. Counts

Mr. Barnes in terms of trying to attempt to develop a well location for that well what types of consideration did you encounter in terms of locating the well?

Mr. Barnes

We were under pretty steep terrain. We had drainage problems and there are also dwellings in the area. These all played a part in location selection.

Mr. Counts

Did you also have discussion with regard to Island Creek in terms of mining operations in terms of locating this well?

Mr. Barnes

Yes sir

Mr. Counts

I assume that the location conforms with those discussions?

Mr. Barnes

Yes sir we have been approved by Island Creek.

Mr. Counts

Mr. Barnes are the owners of the offsetting units to those units which you have requested location exception, I apologize to the Board I have already gone through that one. Mr. Barnes does Oxy request that the Board grant location exceptions for these seven wells?

Mr. Barnes

Yes sir

Mr. Counts

Mr. Chairman I don't have any further questions of Mr. Barnes.

Mr. Wampler

Any questions from members of the Board?

Mr. Bunn

Yes

Mr. Lewellen

Yes in terms of roof control, I have looked at the hydraulic fracs in other mines at the Jim Walter #4 Mine in the Black Warrior Basin and I have seen some of the fracs in the roof at the Buchanan #1 mine which is adjacent to our VP#6 mine. I have looked at some of the stuff we have done in ventilation holes in our VP#6 mine.

Mr. Counts

Mr. Chairman I would like to offer Mr. Lewellen as an expert witness in this matter.

Mr. Wampler

All right

Mr. Counts

Mr. Lewellen in order for the Board to understand the necessity for coming up with a special set of rules for the production from the various coal seams underlying this field, would you please describe the general geological history and lithology of such coal seams for the area.

Mr. Lewellen

The coal seams that we are interested in are in the coal measures, the upper carboniferous or Pennsylvanian seams and I have a strat column here which I can show you. What you have here is a stratigraphic column of the coal seams, the Pennsylvanian Age coal seams of the Oakwood Coalbed Gas Field. The formations that we are dealing with are the Lee formation and the Pocahontas formation and we are interested in the Pocahontas 9 through Pocahontas 2, the Lower Horsepen, War Creek, Middle and Upper Horsepen, Lower Seaboard, Middle Seaboard, Greasy Creek and Upper Seaboard. Basically we are looking at all the coal seams below the Tiller seam. In terms of economic importance based upon gas content, continuity, lateral continuity of the coal seam and thickness, the most important coal seams are labeled here in group one which are the three and four seams and in group two the War Creek, Lower Horsepen and Pocahontas are particularly important to us and then the group 3. Most of the coal that you see here is a low vol. bituminous although some of the stuff in the upper portion in group 3 probably gets into the mid vol. range. Gas contents will vary between about 230 to 697 to 700 cubic feet per ton. Really the group ones are the most important to us.

Mr. Bunn

What was it now?

Mr. Lewellen

It ranges quite widely from 230 to about 690 700.

Mr. Bunn

Cubic feet

Mr. Lewellen Per ton

Mr. Counts Mr. Lewellen would you indicate generally for the Board how these coal primarily are different from those in Dickenson County where the predominant part of the Nora Coalbed Gas Field spacing is located?

Mr. Lewellen I believe in our case they are probably looking at something higher in the section, perhaps around the Tiller in that interval. Our seams it is a different set of coalseams, we are much deeper in terms of the coal measure section.

Mr. Starkey Excuse me I missed the question.

Mr. Counts I asked Mr. Lewellen if he would indicate for the Board how the difference in the coal from the Dickenson County where primarily the Nora Coalbed Gas Field lies as opposed to Buchanan County where Oxy's request for spacing is.

Mr. Starkey Thank you

Mr. Counts Mr. Chairman I would like to offer this coal strat column chart into evidence as Exhibit Number Four.

Mr. Starkey Let me ask a question here if I may. Do you have a figure on the BTU content of this gas?

Mr. Lewellen Of the methane?

Mr. Starkey Yes

Mr. Lewellen Most of the numbers will range between 960 to 1010 we seem to average around 977 BTU.

Mr. Starkey Does this come out under rock pressure?

Mr. Lewellen No, this is coming out of coal seams and of course it will be under hydrostatic pressure but basically we bring it down to atmospheric pressure or try to get it as low as we can. It is a low pressure reservoir.

Mr. Counts Mr. Lewellen what coal seams are underlying the proposed boundaries of the Oakwood Coalbed Gas Field do you anticipate will be developed. I think you have already indicated that.

Mr. Lewellen We anticipate to develop all the ones I named plus any unnamed seams. There are numerous riders and liters and very thin discontinuous seams in this area as well.

Mr. Counts Do you also have maps depicting cross-sections with regard to the coal.

Mr. Lewellen Yes I do, I have a location map and a cross-section I will show you.

Mr. Starkey Before you leave this, maybe I didn't understand when you went back and answered the question on the range of the cubic feet of methane per ton were you speaking about your drilling area here?

Mr. Lewellen Yes in our area.

Mr. Starkey I thought it didn't sound right, o.k. I understand now.

Mr. Lewellen Before I go into the cross-section, I will first just show you a location map and how this cross-section fits in with the Island Creek properties. This map here shows the seven mine properties at Island Creek, VP#3, 1, Beatrice, 5, 6, 2 and 4. We have four active mines on the west side of the property and then Beatrice 2 and 4 are presently inactive. I have got a scale here. The cross-section is shown here it runs northwest/southeast. The first hole is L-302 on the northwest and on the southeast end it is L-299. Now I will bring up the cross-section here. This cross-section shows the coal seams which we are interested in developing. We will be going down as deep as the Pocahontas #2 which lies about 40' below the 3 seam which is the datum here. The holes you see on the northwest is L-302 and then it just goes on through seven different core holes to L-299 which is on the southeast. You have got a scale here of about 0-5000 for horizontal and 0-200 for vertical. The coal seams you see on this cross-section aren't to scale. I had to thicken them up so that you could see them.

Mr. Counts Mr. Lewellen should all the coal seams below the Tiller be involved in any order resulting from this hearing?

Mr. Lewellen Yes sir

Mr. Counts Mr. Chairman I would like to offer Mr. Lewellen's location map as Exhibit Number Five and the strat cross section as Exhibit Number Six.

Mr. Wampler O.k. it will be so accepted.

Mr. Counts Thank you sir. Mr. Lewellen based on your study is the area described as the Oakwood Coalbed Gas Field wholly underlain by the several coal seams you named?

Mr. Lewellen Yes, the most continuous is the Poca 3, Pocahontas #3, then the other coal seams I had mentioned tend to be more sporadic, come and go.

Mr. Counts Mr. Lewellen we see in the strat chart and the cross-section, would you also with regard to the exhibit one get in terms of perspective for the Board indicate visavis the area sought to be spaced, what the relationships are of these seams and how that impacts the area requested by Oxy.

Mr. Lewellen All right in our program the areas we are most interested in in terms where we have the thickest coal, the most numerous and best gas content lie in this area here in the east and central portion of our properties. Then as you go to the northwest the gas contents, off in this direction, the gas contents tend to get lower. The number of coal seams diminishes and they do get somewhat thinner. The reason this is occurring is most of the section we are looking at is pinching out into the Lee Formation sandstones. Overall this fits pretty well with what our mine planning is and how we can best develop it.

Mr. Counts Mr. Lewellen should the Board's order provide that all coalbed gas wells now or later drilled in this field be declared exploratory wells so as to qualify for the two year period of confidentiality provided for in Virginia Code for all logs, surveys and other reports filed with the Inspector?

Mr. Lewellen Yes sir

Mr. Counts Mr. Lewellen is it your professional opinion that 80 acre spacing is necessary to allow conformity with Island Creek's mine boundaries?

Mr. Lewellen Yes sir

Mr. Counts Does the area sought to be spaced including the overlap essentially conform with Island Creek's mine boundary as depicted on the front cover of the material submitted to the Board?

Mr. Lewellen Yes it does

pinch out. We don't know exactly what the Nora field consists of considering that that data is confidential.

Dr. Whisonant

I am also curious about how deep are these wells? I can't tell from your cross-section relative to say ground surface or sea level or some plane?

Mr. Lewellen

The Pocahontas #3 seam is at sea level roughly in our area. The section will roughly be 1500' to the southeast and it loses about 300' to the northwest. So it will be between 1200 and 1500' of section and that is starting at stream drainage. So three seams at sea level basically.

Dr. Whisonant

Thank you

Mr. Counts

Mr. Lewellen is it essentially your position, to follow up on Dr. Whisonant's question, that the coals basically commencing with the Buchanan County line and running to the west essentially constitute a separate and distinct reservoir.

Mr. Lewellen

Yes sir I think so.

Mr. Counts

That would be due to?

Mr. Lewellen

We are lower in the section stratigraphic section.

Mr. Counts

Relative thickness of coal as well as coals pinching out disappearing?

Mr. Lewellen

Our coal, the three seam is generally about six feet and as we go to the east and northwest these coals will pinch out and get thinner.

Mr. Counts

Thank you Mr. Chairman

Mr. Starkey

On this production per ton, will that vary I assume in different areas?

Mr. Lewellen

It will vary with the rank of the coal. It will vary with the ash content. Generally the higher the rank the more gas. The ash content even though you may have a high rank coal if you have a high ash content you won't have as much gas. If you are too close to the surface and get within three or four hundred feet a lot of that gas will leak off. There are a lot of different variabilities in the gas contents. That is why you see such a wide range. Plus we were taking.

Mr. Starkey

Did you quote a range?

Mr. Lewellen Yes it was between about 230 and 700.

Mr. Starkey In this field.

Mr. Lewellen Yes

Mr. Starkey What about other fields. Do you have experience and knowledge of other fields other ranges you spoke of acreage going up

Mr. Lewellen I would say if you wanted to pick an average number, what I have seen like in the Black Warriors is probably running about 400 cubic feet per ton. Out west I have seen that number to. It seems to be hovering around there between 200, 400 and 600.

Mr. Starkey This was what was the high range, up to 230

Mr. Lewellen Yes, yes

Mr. Starkey What was the low range?

Mr. Lewellen The low range would be around 230 or so.

Mr. Starkey I thought that was the high range?

Mr. Lewellen The higher the number the more gas you have got. So 700 cubic feet per ton is about as high as it gets.

Mr. Starkey Do you expect to get that here?

Mr. Lewellen In places we will. We have gotten samples like that, yes sir.

Mr. Starkey Is there a minimum figure for economic purposes...

Mr. Lewellen We figure looking at what we have got the limited data we have is it is going to average around 400 cubic feet per ton.

Mr. Starkey And that is economical?

Mr. Lewellen Yes sir. Economically there are other factors other than just gas content that come into play. But that is an important factor.

Mr. Starkey I guess I am trying to relate this some way to the 80 acre figure. If it is lower do you want more acreage?

Mr. Lewellen When Weldon comes up he can discuss that with you. He will answer your question better than I can.

Mr. Bunn	In this if you will, did you find that the gas is pretty much in all the seams. It is just that they dissipate faster or that you find it in all seams above drainage as well as below drainage?
Mr. Lewellen	I will find gas in all the below drainage seams once you get below the water table. What happens when you get above drainage, above water table is occasionally you get a little bit of gas but most of it has bled off through just increased permeability of the surrounding strata. But the strata around here is pretty tight so once you get below the ground water table it will keep the gas in it.
Mr. Starkey	Is there any by products of this that you want to capture?
Mr. Lewellen	From the coalbed what you basically get is 96 percent methane, a little bit of Co2 and some inerts. So it is very dry gas and very pure.
Mr. Wampler	O.k. thank you very much.
Mr. Counts	Mr. Chairman I would like to call my next witness Mr. Weldon J. Wilson
Mr. Weldon J. Wilson was sworn in	
Mr. Counts	Mr. Wilson who are you employed by and in what capacity?
Dr. Wilson	I am employed by Oxy USA, Inc. I am an engineering advisor for that firm. I have worked in that capacity for a total of 7 1/2 years.
Mr. Counts	Would you state for the Board please your educational background
Dr. Wilson	I have a PhD in physics from Oklahoma State University. I have attended numerous industry short courses and seminars on reservoir simulation, coalbed methane production, hydraulic fracture simulation.
Mr. Counts	Would you also state for the Board any professional associations.
Dr. Wilson	I am a member of the Society of Petroleum Engineers, the American Physical Society, Society of Industrial and Applied Mathematician, the Society of Exploration Geophysicist.

Mr. Counts	Thank you, Mr. Chairman I would like to offer Mr. Wilson as an expert witness in this case.
Mr. Wampler	O.k.
Mr. Counts	Mr. Wilson does your responsibilities with Oxy USA include the lands involved in this application?
Dr. Wilson	Yes they do.
Mr. Counts	Are you familiar with the geological data available in this area?
Dr. Wilson	Yes
Mr. Counts	Have you made a study of the lands involved here and the surrounding area?
Dr. Wilson	Yes I have
Mr. Counts	Would you discuss with the Board the data used in making those studies.
Dr. Wilson	We used predominantly data taken from literature along with a computer coalbed reservoir simulator that was developed initially by Gas Research Institute. The data was taken from studies funded by the Department of Energy, U. S. Bureau of Mines and the Gas Research Institute. Some background in those the Gas Research Institute was founded back in the 70's to more effectively utilize our gas resources in this country. It takes funding from users and then uses that money to fund fundamental research to all phases of natural gas. The Department of Energy naturally has strategic interest in utilization of gas resources as well as does the Bureau of Mines.
Mr. Counts	Mr. Wilson are you familiar with whether the Gas Research Institute or GRI has been involved in any studies in Virginia?
Dr. Wilson	Yes they have some of which we have been associated with in conjunction with them.
Mr. Counts	Have any of those lands involved lands in Buchanan County Virginia?
Dr. Wilson	Yes they have.
Mr. Counts	Are you aware of any reports that have been prepared by GRI with regards to this data?

Dr. Wilson

Yes

Mr. Counts

Would you indicate for the Board the names of any of those reports?

Dr. Wilson

They have a quarterly report on the coalbed methane. They have regional reports for the Central Appalachian region. They are continually coming out with specialized reports not only of a data collection nature but also of field instrumentation, reservoir computer models that would help utilize the resource.

Mr. Counts

Thank you Mr. Wilson, Mr. Chairman I am going to be using several exhibits now in connection with Mr. Wilson's testimony and for the sake of expediency I would like to go ahead and go through several of those now and have those admitted as exhibits. They are all in the book you have in front of you. Exhibit Number Seven a chart entitled Air Permeability Distribution for Pocahontas Coal Exhibit Number Eight a chart entitled Permeability of Pocahontas Coal vs. Hydrostatic Stress Exhibit Number Nine entitled Pocahontas Coal Capillary Pressure Exhibit Number Ten a chart entitled Pocahontas Coal Water/Gas Relative Permeability Exhibit Number Eleven a chart entitled CBM Spacing Study Langmuir Desorption Isotherm. Thank you Mr. Chairman. Mr. Wilson will you go into a more complete discussion with regard to what these exhibits reveal and indicate to the Board what type of factors you have considered in terms of building your computer model.

Dr. Wilson

Yes, let me go over each one in turn. For convenience we are talking, I have got overhead, these are reproductions of what you have in your booklets. All of these exhibits I will be talking about here they were data taken from the literature, the sources I have previously mentioned. They are publicly available in the scientific and engineering literature. They were used as the basis for the computer modeling study which I will subsequently show. One of the key reservoir parameters that is important in trying to determine a spacing is the permeability. This is a series of tests done on Pocahontas coal from the Beatrice mine that was done at the University of Pittsburgh under the auspice of the Gas Research Institute. This has been published in 1974 in the Society of Petroleum Engineer's Journal. What it shows basically if you look at it is a tremendous variability in the permeability of coal even though these samples may have been taken

only a few feet apart. You will have some that will be over a hundred millidarcies. This would be a very good conductive coal that would transmit its gas through the well bore very effectively. You have the majority of the samples, around the 50 or 60 percent range, that are around the one millidarcy range. That would transmit the gas less effectively to the well bore. It would probably indicate that one would need to stimulate the well in some fashion. The depth at which coal is buried is an important factor on its permeability. One measure of that is what kind of confining stress you do these tests at and that is the two different bar types. You will notice that there is basically good agreement between these two tests because of the very low difference in pressures.

Mr. Wampler

Excuse me before you remove that I would like to take questions as we go so you won't have to pick out the one we are asking questions about. If we ask a question we are going to cover later tell us.

Mr. Bunn

So you are saying about 60 percent of the coal that they fall in the range of .1 to 1...

Dr. Wilson

Of these samples that were taken, roughly 60 percent of them fell within that range.

Mr. Bunn

That is millidarcies.

Dr. Wilson

It is millidarcies.

Dr. Whisonant

Dr. Wilson, those confining pressures, generally is that burial depth the main determinant there. Or something else?

Dr. Wilson

Yes the burial depth and the reservoir pressure that you are working at. These confining pressures, what you should probably keep in mind is it would be the burial depth, the overburden pressure as it is called minus the rock pressure, the full pressure of the fluid that is in there.

Dr. Whisonant

I presume that the 200-400 range is roughly equivalent to what you figure will be the case at Oakwood.

Dr. Wilson

On this series of tests it really isn't. At some portion of the reservoir there may well be that. I have another shot on the next photo that will show you where we expect more....

Dr. Whisonant

O.k.

Dr. Wilson

I think this will probably answer the question better as to where we expect to be.

Mr. Wampler

This is Exhibit Eight you are discussing. It will be helpful to us to number those.

Dr. Wilson

O.k. What this is is a plot of five different samples of again Pocahontas #3 coal. It is actually showing you the relationship between the stress at which you were performing the test, the hydrostatic stress and the permeability of the coal. So one can effectively think of this scale as being tied to the depth at which the coal is buried. Again, you will notice that there is a fair amount of scatter. That occasionally you will get, in this case, one sample out of five it has a permeability that is ten to fifteen times greater than the other samples. I think that is something real that is occurring in the reservoir. That you will see that kind of variations over very small differences in strata probably.

Mr. Counts

Dr. Wilson in considering the permeability or considering maximum spacing what kind of an impact does the permeability have on maximum spacing so as to insure protection of correlative rights.

Dr. Wilson

The higher the permeability, then the larger the spacing that will effectively drain an area. If you have a very low permeability reservoir your wells have to be quite close together to effectively drain it. The range that we would expect, we are in the range of roughly 15,000 to 2,000 feet deep. One psi per foot of overburden. So we are in the 15,000-2,000 psi overburden pressure and our reservoir pressure is about 700. So if you take the difference between those so we are, whatever that is, maybe 800 in that range so basically this data agrees pretty well with the previous data that was done at a range of hydrostatic stress that we are not that interested in and that it falls around one to two with an occasional one being up at 10 or 20 milidarcy. Again this was, I believe this was DOE funding, University of California Berkley published International Journal of Rock Mechanics 1975.

Mr. Wampler

Any questions on Exhibit Eight. I would like to take a ten minute recess please.

Mr. Counts

Mr. Chairman I believe we were getting ready to start with Exhibit Number Nine now.

Dr. Whisonant

Excuse me Mr. Counts let me just inform everyone here that our regular chairman, Mr. Wampler, had to leave. I will taking over if things don't go quite as smoothly as possible please bear with me. But we will do our best. Lets resume the testimony then.

Mr. Counts

Thank you sir. Dr. Wilson I believe we are at Exhibit Nine.

Dr. Wilson

Exhibit Nine, again data is available in the literature for Pocahontas coal Beatrice mine. There is actually two sets of data. One which we call the University of Pittsburgh data I believe this was DOE funded. That is the red curve. The blue is a GRI funded in one of the GRI reports. What this shows is how much pressure it takes to move gas through the pore spaces of the coal. That is a fundamental piece of information that we need to know because we know the pressure in these coal seams is very low. If there is not enough intrinsic reservoir pressure there, then even though the gas may exist there wouldn't be enough pressure to blow it through to overcome the capillary forces and blow it into the well bore when we drill it down.

Mr. Starkey

Dr. Wilson you don't do any forcing any exhilarated as you do in natural gas wells?

Dr. Wilson

We would upon drilling a well you draw that down as much as you can either by pumping water off of the formation or trying to get the wellbore pressure as low as possible. What I am talking about here is the difference in pressure between far out in the reservoir and near to the well bore. That pressure difference is what pulls the gas in towards you. If you don't have, what these curves are showing, if you don't have something at least on the order of 30 or 40 psi, you don't pull the gas toward you.

Mr. Starkey

I guess my question is if you don't have it, you just leave it?

Dr. Wilson

That is right, the gas will not move. What our model that I will show you later actually inputs is this red curve and we have to tabulate it and all those data points are placed into our computer simulator.

Dr. Whisonant

Dr. Wilson, excuse us just a minute, Mr. Fulmer wants to ask a question.

Mr. Fulmer

The GRI data you have plotted on there is that the most recent data?

Dr. Wilson That has vintage of about 1983, 1984 and I cannot tell you if they have updated it since then or not. So it is in that time.

Mr. Fulmer So it is much younger than the University of Pittsburgh is?

Dr. Wilson Neither one of these from a reservoir engineering standpoint is giving us bad information, is telling us something bad from our perspective. These pressures are very low. Typically if you go out in the Rockies and are trying to develop a tight gas reservoir out there they may be up in the 100's so it tells us we shouldn't have a problem in two things. One pulling the gas toward us and also cleaning up any hydraulic fracture fluids that we might have injected into the formation. They shouldn't have a problem of just staying around.

Mr. Bunn What type of liquids or fracing type substances would you be using?

Dr. Wilson We would probably use a range of fluids. There are three different kinds of fracturing fluids that people would use. A nitrogen foam which would be 50 or 60 percent of the water that had been foamed up. They would use just plain water. They would use a viscosified water in which you placed a guar gum gel in it to viscosify it. We would do the least damaging of those. Again we would probably in a development project of this sort there is no doubt we would do some of each kind.

Mr. Counts Dr. Wilson as related to spacing how rapidly you can move the gas through the reservoir is really a function of the permeability and thickness of the coal. Is that not correct?

Dr. Wilson That is correct. The product of the permeability times the net thickness of the coal is directly related to the rate at which we can pull the gas out. The flow rate of any well that might be there.

Mr. Counts Would it be correct to state then the greater the thickness, and increase permeability the greater the production and the increase drainage.

Dr. Wilson That is correct.

Mr. Counts Thank you sir.

Dr. Wilson The next exhibit I believe is Exhibit Ten. I would like to talk about that now. Coalbed methane is

typically produced not only from this data that I am showing you here for the Pocahontas coal but throughout the country. It also has associated water production with it. That is what these the curves of this exhibit attempt to exemplify. Again this was kind of busy but I have shown two different sources of data to give you some feeling for what kind of ranges of reservoir values one might expect even from a particular seam and a particular mine area. The one set of data which I have labeled GRI data that is the triangles or the solid lines is, I am sorry it is the dash lines and triangles is the GRI data and the other set of data which is the solid lines and the dots is the University of Pittsburgh published back in 1974 on the Pocahontas #3 coal seam.

Mr. Bunn

Let me ask. Could you tell me what the scales are there. What is going across the bottom and what is going up and down.

Dr. Wilson

What is being plotted along here is the water saturation as it currently exists. That is something that changes as you look at this plot as you produce the well you produce more and more water so typically one would start out for coalbeds one would start out at high water saturations and as you produce the coal that gas you would also produce water and this water saturation would go in this direction as you produce the well. The vertical scale runs from 0 to 1. It is a relative measure of how well that particular fluid would flow. So for instance, let me just concentrate on one of these curves to give you a feel for it, say the red one. The red one is the relative permeability of water. As we start off the reservoir we would expect it to be very high water saturation. So its relative permeability to water would be very high. That means that only water would flow initially it is high relative permeability of water. As one produces more and more water the amount of water that would actually flow at any given time is decreasing. Its relative permeability is decreasing. At some point you begin to produce gas and that is this solid blue curve. So as I get down and produce the reservoir where I am at an average water saturation of 70% I am flowing partially gas which is the blue curve and partially water although it is easier to flow the water at this point than it is the blue curve which is the gas. As I continue to produce the reservoir my water production drops and my gas production increases. The blue curve.

At some point late in the life we would be producing almost totally gas.

Mr. Bunn

At what point is the well economical to operate?

Dr. Wilson

That is not easy to answer. From this chart there are certainly lots of coalbed methane gas reservoirs that would be economic to operate realizing that they were going to start off flowing maybe for the first year or two nothing but water. So you could be out here on this part of the curve and produce it backwards and you have to run the specific economics for that case. We are in a very fortunate situation I think in that regard as far as the Pocahontas #3 seam is concerned.

Mr. Bunn

So you are saying you are past the 70% range going in right?

Dr. Wilson

I suspect from our modeling studies, it is very difficult to get hard numbers here, I suspect we are going to start initially in this range right here. Which means we don't have to go through this two year period of flowing water. I think somewhere in between 80 percent and 60 percent is where this coal seam should lie. Which means you will be getting gas production almost immediately.

Mr. Counts

Do you have a question Mr. Chairman?

Dr. Whisonant

Any questions?

Mr. Starkey

I am probably the only one in the room that doesn't know this. Do you have some responsibility for the disposal of that water?

Mr. Counts

Yes, absolutely sir. Those regulations and rules are promulgated by Mr. Fulmer's office.

Mr. Starkey

O.k. thank you.

Mr. Counts

The next will be Exhibit Number Eleven.

Dr. Wilson

The final or the most important variables I haven't shown you everything that is input into the simulator by any means but that as you are more familiar is the desorption isotherm. If one puts, in the case I have done it for a ton of coal, if one puts a ton of coal in a canister and starts pumping in methane under pressure, raising the methane pressure, what one would find is that more and more of that methane would be absorbed onto the surface of the coal. It would proceed as we increased the

gas pressure since the pressure is high we would be able to force more of them onto the surface and reaches a limiting value and in this case this is for Pocahontas coal that limiting value is about 650 standard cubic feet per ton for this particular sample shown here.

Mr. Bunn

But you are saying here in this field that 230 is about a minimum. Right.

Dr. Wilson

What you also have to consider is what the pressure is one will be working at. In our case we are probably at a reservoir pressure of around 700 so one would come up to this curve here and that is going to give something around 500 standard cubic feet per ton for this particular sample.

Mr. Bunn

In this particular area the minimum would be about 700.

Dr. Wilson

Right as presented earlier the minimum I believe he said was 230 and the maximum was about 700. In terms of our simulation study we have actually input this curve. That is a little better than putting in a specific number because then it can pick up how much gas is absorbed into the coal and would subsequently be desorbed into your gas production. Depending on what reservoir pressure you were at at a given time. The way you actually work it of course in a reservoir is that one starts at the initial reservoir pressure and one proceeds in this direction as you decrease the average reservoir pressure by producing the well. The gas then desorbes out of the coal and that is what is actually produced by the gas well.

Mr. Bunn

Tell me this formula here.

Dr. Wilson

This is the formula that is actually used in our model. It is the Langmuir Isotherm model that you maybe see in the literature occasionally. It is characterized by two constants, volume constant and a pressure. These two values here are the ones that were used and it generated this plot. I put that up there because often they just refer to it as Langmuir and no one ever seems to write down the equations. But that is it.

Dr. Whisonant

Questions

Mr. Counts

Dr. Wilson, utilizing the data that you just demonstrated to the Board were you able to project a

model depicting the maximum spacing which could be efficiently drained.

Dr. Wilson

Yes I was.

Mr. Counts

Before we go further into that would you mind explaining to the Board how using one of your exhibits how your data was imputed into your model.

Dr. Wilson

The next exhibit I believe is 12. This is a summary from a typical run that I might make of again there is a lot of data here but let me pick out one. For instance the permeability, in the case that I will be showing you today I used a permeability of two millidarcies. The way that was arrived at was going back to exhibit number 8 one would get into the range in which we were expecting, come up for the hydrostatic stress, come up and we have got in this case five different curves and then would take a weighted average to obtain the two millidarcies.

Mr. Counts

Mr. Chairman I would like to offer into evidence the following exhibits at this time. Exhibit Number Twelve which is entitled Coalbed Methane Spacing Study Reservoir Parameters Assumed, Exhibit Number Thirteen chart entitled Coalbed Methane Spacing Study Cumulative Production, Exhibit Number Fourteen chart entitled Coalbed Methane Spacing Study Recovery Factor. All of these exhibits are also in the folder before you.

Dr. Whisonant

Thank you

Mr. Counts

Dr. Wilson what did your model reveal as to the maximum efficient spacing for the field?

Dr. Wilson

Well, using these assumed parameters that were again taken predominantly from the literature we were able to project, using our computer simulator, these forecasts for the cumulative production from the 320 acre block. What we did was actually run the simulator for a variety of different cases shown here. We assumed in the first case that we had one well in the center of the 320 acre block. That is this bottom curve which shows its cumulative production over a 20 year span production. We then re-ran the simulator with the same reservoir parameters assuming that we 160 acre spacing or two wells in that 320 acre block. That was this next curve and we proceeded again to look at additional wells if we drilled four wells in that 320 acres which is 80 acre spacing, five wells which turns into 64 acres, eight wells which would be 80 acre

spacing, ten wells which is the 32 acres spacing and 16 wells or 20 acre spacing. What we saw upon doing that and just looking at this series of curves is by increasing the number of wells one drills in 320 acres one does not proportionately get the additional gas that one might expect. In fact you reach a point of diminishing returns. As you see these curves are getting clumped closer and closer together even though you may have drilled as many as twelve additional wells between one curve to the other. Another line that we use for our purposes is a cut off line. As you produce these wells the rate is also declining and this cut off line is where it crosses a particular curve indicates where the rate dropped below 25 mcf a day which is what we were using as a minimum economic break.

Mr. Bunn

25

Dr. Wilson

Twenty-five

Mr. Bunn

25 what now

Dr. Wilson

Mcf per day What you see from that is if you are at a very small spacing 20 acres that yes you can produce an amount of gas but economically from those 16 wells you would only produce it during the first four years. So by drilling more wells you accelerate your production. You get more of the production in up front. By drilling fewer wells you extend the economic life of the reservoir. In effect spread out that resource over a longer period of time. I would like to particularly point out that the two curves in question in the overlap area that would be appropriate would be the green one and the blue one. The blue one is the 80 acres spacing. That would be four wells in our 320 acres block that was simulated and the green one is the 64 acre spacing. As you can see there is very little incremental production that is gained by going to the additional well. In fact this difference is something on the order of ten percent. You gain ten percent incremental gas production but your cost have gone up 25% in going from four wells to five wells.

Mr. Bunn

This is what you are showing that after 20 years the well has totally drained. Is that right.

Dr. Wilson

Yes to the point of, right. Actually for some of these it occurs much earlier than that. That 20 year cut off is really only appropriate for the 80

acre. If you look at the 20 acre spacing its life is going to be four or five years.

Mr. Bunn

All right. How can you relate this to the degasification that they are using for the Pocahontas seam now?

Dr. Wilson

I am not familiar really with that degasing scheme. I do know that those are very close to actively mined areas.

Mr. Bunn

That is what I am trying to say. It is hard for me to believe that Occidental would have two companies operating so close as you do and not know how to correlate the degasification wells and the experience you have had from degasing the coal from those wells and not know where it reaches some kind of value to you on your determination of these wells. Where they should be spaced.

Dr. Wilson

Well we certainly have utilized vent hole production data some that was published back in the late 70's as part of GRI studies to verify our computer modeling. So we are able to accurately match the observed vent rates during that GRI program.

Mr. Bunn

I guess it is a fair assumption to ask or to assume, that is a horrible word to use in front of these attorney's here but you are going to drain this acreage before you mine. Is that correct?

Dr. Wilson

I think drain is a relative, it is kind of relative. I go back to the Langmuir isotherm exhibit. One will never get, in this particular case, one will never get no matter how long you wait all of the gas that is in there. You have to make an economic judgement really as to what is the optimum, how long you want to really suck on these wells to desorp the gas from. Again, you reach points of diminishing returns. It is economically based. The economics would be different I believe for degasing a well as opposed where you are trying to economically produce a well.

Mr. Starkey

Dr. Wilson, you may have explained this earlier, but your model is based on these assumptions in exhibit 12. Are these assumptions from your experience and calculations?

Dr. Wilson

Well the assumptions are a combination of several things and there are firm numbers. Very firm numbers and there are some that are softer. Probably the softest ones that I have shown you are

on. Some of the numbers like porosity we assume 4%, that I think is a very firm number, it can't be much off of that. Some of those are log determined values. Again you can go to the literature and pick those up as well. Formation temperature is a pretty firm number. The gas viscosity is a really firm number. Other numbers, for instance I don't see it here, initial reservoir pressure I think that one is a pretty firm number. We can put a gauge down vent holes and determine those. That is how that one was determined.

Mr. Counts

Mr. Starkey for purposes of this model I think it is important to remember that the first commercial production in coalbed methane really occurred in 1982. This is virtually a new untapped resource which we really don't have a lot of data on. There is a lot of studies out there on it. There is of course some production in Virginia but very limited. The vast majority of production is in the Southern Appalachian Basin and in Colorado in the four corners area. So we have really come up with the firmest numbers that we could. But we have just really tried to generate all the empirical data that we could with regard to some of those other numbers.

Mr. Starkey

I guess my thought was triggered by questions of the affiliate company or sister company having experience in this area and whether we used much of that.

Dr. Wilson

We have used some of their data although primarily it has been production related data from the late 70's.

Mr. Counts

From that standpoint also Mr. Starkey I am not aware of any coalbed methane that is being produced commercially within the Commonwealth of Virginia right save and except that in Dickenson County and the Nora field right now. I would have to assume Dr. Wilson that there is some data that you would like to have access to with regard to production that you aren't able to obtain.

Dr. Wilson

That is correct.

Mr. Bunn

Can you tell us what is your spacing on your degas wells on your Island Creek operations?

Dr. Wilson

No I can't.

differently from ordinary gas, natural gas well?

Dr. Wilson I think insofar as it doesn't impact mine safety, that concern would make it special, if it does not impact mine safety I would not assume that it would be any different.

Mr. Starkey What would happen if it impacted mine safety? If it wasn't economical to sell you would just blow it off?

Dr. Wilson Safety should be the overriding concern.

Mr. Starkey It would be another degasification hole?

Mr. Counts Provisions of the Oil and Gas Act and Regulations and Emergency Orders and various other measures provide for the venting of gas for safety purposes. Mr. Bunn with regard to your line of questioning if you would like to break and go back to Mr. Lewellen for a couple of minutes, if you would like to explore that line Mr. Lewellen is with Island Creek, we would be happy to do that.

Mr. Bunn That is the reason that I was trying to ask those questions why he was here. When he said he was with Island Creek and you said hold it. Our first duty of this Board is to preserve the natural resources and use them most efficiently and to explore them as efficiently as we can.

Mr. Counts Absolutely

Mr. Bunn We recognize that we are wasting a natural resource right now but it is for safety purposes. I think anybody in this room can understand that. But I just wanted to know if there is some kind of way that two companies can work together to maximize the recovery of this without stopping a complete mining operation. But to capture as much gas as possible to maximize the use of the natural resource.

Mr. Counts It is my understanding, Mr. Bunn, that Island Creek and Oxy both have every intention of trying to maximize these resources. I could not agree with you more. I think Virginia has lost a tremendous amount of a valuable natural resource as a result of the fact that perhaps, of course as we indicated recently 1982 was the first commercial recovery. It was only through a result of studies such as rendered by the Department of Energy and Gas Research Institute which was finally able to convince operators that this was actually a viable resource that could be captured economically. Quite frankly I have attended conferences very recently

which said the San Juan Basin is terrific, the Black Warrior is somewhat less than terrific and who knows about the Central Appalachian Basin. Who knows about the Northern Appalachian Basin. I think the jury is still out with regard to how economic those operations can be. I think that certainly it is exciting for Virginia that we now have operators here that are going to undertake that and hopefully it will be extremely economic. It will certainly be beneficial to this state if it is.

Mr. Bunn

O.k. to satisfy myself Tom I would like to, we can go ahead and continue, but I would like to talk to Mr. Lewellen.

Mr. Counts

Since we are already on the subject, Mr. Chairman if you don't have any problems, let me go ahead and call Mr. Lewellen he has already been sworn.

Mr. Fulmer

Lets take a break.

Dr. Whisonant

Lets call the meeting back to order.

Mr. Counts

Thank you Mr. Chairman. I believe we were getting ready to go with Exhibit 14 a chart entitled Coalbed Methane Spacing Study Recovery Factor.

Dr. Wilson

Using our coalbed methane reservoir simulator we were able to determine the percent of coalbed methane gas in place that is recovered as a function of the number of wells we have drilled all for a 320 acre study block that we were using. This is a typical kind of chart that is used in the Oil and Gas industry. The think that is different here is we have used a reservoir simulator specifically designed for coalbed methane. We are able to calculate the initial gas in place. We used the simulator to see how much of that is produced over the economic life of the wells. That determines the total gas that is recovered. We have been able to calculate a percentage. Then that is plotted versus the number of wells that were drilled in that block to obtain that total gas recovered from the 320 acres. As you see if you only drill one well in the block or a 320 acre spacing, one only would recover about 22 or 23 percent according to our simulation study. If one drills an additional well, one does not double the percentage in place recovered. But one still recovers a substantial portion up around 37 or 38 percent. As one progresses and drills more wells you can recover more and more of the resource that is available there. What is typically done in the oil and gas industry is try to get as far up on

this knee of the curve as is economically possible. In this case the bend occurs around the 80 acre spacing. To go to 20 acre spacing one still only recovers 65% of the gas in place, 80 acre spacing I believe that number was actually 56% of the initial gas in place. So even we have drilled to go to 20 acre spacing we have drilled what 12 more wells we incrementally get very little in addition. Particular ones to point out again in going from 80 acre spacing to 64 acre spacing, the reason I have used 64 throughout is that is an even number of wells in a 320 acre block. The incremental is only a little over 1% of the initial gas in place.

Mr. Counts

Dr. Wilson I would like to confirm for the benefit of the Board that this spacing study model is based upon the model that you put together with regard to Buchanan County, Virginia. This is not a generic number picked out that will be applicable to any particular area based upon the assumed data in your model. Correct?

Dr. Wilson

That is correct. It is based on the unique reservoir characteristics that we believe exist in this area.

Mr. Counts

And specifically for the Oakwood Coalbed Gas Field?

Dr. Wilson

That is correct.

Dr. Whisonant

Questions? I have got one. I keep wanting to return to this issue of how fundamentally different Oakwood and Nora are. It looks like we are headed toward two coalbed methane fields with different spacing rules. So my question would concern the last few exhibits. I am assuming that if you had Nora numbers up here the curves would look different. The sixty acre spacing is still more applicable?

Mr. Counts

If I can interrupt for just one moment. I think what we will probably will end up seeing in Virginia as well as a number of other states, are the fact that depending upon reservoir characteristics which certainly Dr. Wilson can testify to. You are going to find a lot of the same formations, even the same seams, will be spaced differently in different areas. Depending upon the thickness, depending upon the permeability etc. For instance there has been a recent request in Alabama to expand spacing which was initially established at 40 acres to 160 acres. Now that is fine that you finally get around to expanding the spacing on that but what happens in a

situation like that is that the correlative rights of those parties who are around those 40 acre squares when they were initially drilled, those correlative rights were violated. They don't have redress now. But we are basically saying here is it is our opinion that the Oakwood Coalbed Gas field represents essentially a separate distinct reservoir from that of the Nora field. Dr. Wilson.

Dr. Wilson

In my opinion I am not privy to the reservoir numbers for that field, but it would have to be studied as a unique case in much the same way as we have done here. It could very well give the 60 acre spacing. Each reservoir has to be considered as a unique reservoir with its properties determining what the optimum value would be. It is not uncommon in oil and gas parts of the country to even have different strata on different spacing. That may be only 20 or 30 feet apart. One might be 640 because of the gas zone and below it or above it might be an oil zone that might be 20 or 40 acre spacing.

Dr. Whisonant

Thank you I thought that is what you had been saying several times. I just wanted to be crystal clear on the record. It will show up as two different spacing rules for adjacent fields.

Mr. Counts

Absolutely

Dr. Whisonant

In fact one previously overlaps the other.

Mr. Counts

As you are aware there are other areas in Virginia, for instance the Richmond basin, Pulaski and Craig counties. We may end up with several different spacing field rules depending upon the reservoir characteristics of each area.

Dr. Whisonant

Thank you.

Mr. Starkey

Dr. Wilson, Mr. Counts said something I would like to pursue. You answered a question I asked awhile ago and I thought you said that once you have a methane well gas in you either put it into production or blow it off. Is that a pretty fair statement?

Dr. Wilson

Or you can keep it shut in. You keep the well capped. Certainly that would be a third option. Generally one would probably either vent or put it into production.

Mr. Starkey I don't know enough about drilling to pick that up so you clarified that for me. That answers my question.

Mr. Counts Dr. Wilson are you familiar with the application filed in this case?

Dr. Wilson Yes I am

Mr. Counts Would you please briefly for the Board summarize the purpose of the application.

Dr. Wilson Yes we seek to get the what we call the Oakwood Coalbed Gas Field, the gas seams associated with that as you have seen as a reservoir producing coal seam gas. In addition we would like the Board to recognize the spacing for this field that would most effectively and efficiently utilize and produce this resource.

Mr. Counts Dr. Wilson the most effective spacing to utilize this resource is also not only in the best interest of Oxy USA but also in the correlative rights of the underlying owners. Am I not correct?

Dr. Wilson That is correct.

Mr. Counts Dr. Wilson are there existing permitted wells in the lands involved which are completed in and producing from coal seams covered in this matter?

Dr. Wilson No

Mr. Counts Have you made a study of other similar coalbed methane gas development in other areas.

Dr. Wilson We have made studies of the Black Warrior Basin area, the San Juan Basin and a few smaller areas although none to the detail that we have presented here.

Mr. Counts How has the development of these areas compare with Oxy's plan of development?

Dr. Wilson They are similar in that they have a water production. All coalbed methane that I am aware of has to a greater or lesser degree a water production phase and they do produce associated water. They are similar in that they all produce gas as the predominant mechanism that is desorbed gas from the coal.

Mr. Counts Does Oxy plan to commingle production from various coal seams through the same bore hole?

Dr. Wilson Yes, we plan to commingle the zones.

Mr. Counts In your opinion is production from such commingled coalbed methane wells from the various coal seams the most efficient and economical way to produce such gas?

Dr. Wilson Yes it is.

Mr. Counts Would you explain to the Board why that is true?

Dr. Wilson There are really only a few reasons, technical reason. And economically it would just not be feasible to produce the gas economically without commingling the zones. Technically there is no reason that one would want to not commingle them.

Mr. Counts Do you also recommend that the special field rules provide for venting as necessary for mine safety and for the testing of wells?

Dr. Wilson Yes I do.

Mr. Counts Do you recommend that a minimum distance of 300' from the unit boundary be maintained for all wells drilled except those requiring location exceptions?

Dr. Wilson Yes

Mr. Counts Do you further recommend a minimum distance between coalbed wells of 800'?

Dr. Wilson Yes I do

Mr. Counts In your opinion Dr. Wilson how large a tract in the Oakwood Coalbed Gas field producing from one or more of these coal seams effectively and efficiently drain?

Dr. Wilson As I showed in my previous exhibits I believe all our evidence indicates that 80 acres is the most appropriate spacing that would efficiently and effectively produce the gas from these seams.

Mr. Counts As Dr. Whisonant has indicated, why should the Board's March 20, 1989 order with regard to the Nora Coalbed Methane Field be modified from 60 to 80 acre units in the overlap which we have discussed?

Dr. Wilson

I think that there are three reasons: the first is I believe it is a different reservoir. We have seen from our geologic testimony and Mr. Lewellen the coal seams that are giving us the predominant gas production mechanisms will not exist in that area. They pinch out. In addition the second reason would be that we believe that we have higher quality reservoir. In general we have some of the highest gas content coal in the country I believe. The third reason is that such a plan would conform with Island Creek's mining operations.

Mr. Counts

Based on your discussion of the gas content of the coal would you discuss with the Board the GRI report which is listed as Exhibit 15 in the brochure and I would also like to ask the Board to accept this as Exhibit Number 15.

Dr. Whisonant

We accept

Mr. Counts

To show you why we believe we are in the highest quality part of the gas reservoir, our area of interest is essentially this blocked area. This that we have plotted here is an isopac map showing the thicknesses of the Pocahontas coal. As we have said earlier the dominant thing, reservoir parameter is the permeability times the thickness. We are in some of the thicker seams. The highest quality gas content. In general better quality gas, better quality reservoir I should say. As you get away from this area the seams are pinching out and the thicknesses are getting smaller.

Mr. Counts

I would also like to point out for the Board, if I may, I know that all of you on the Board know your geography in terms of Southwest Virginia. But to bring into perspective of the Nora field into play. We are looking here at Dickenson County (am I correct, I believe that is correct) and this is the area the extent of the Nora Coalbed Gas Field. You see as you go into Buchanan County the GRI report is indicating the increased thicknesses with regard to the isopac map here. This essentially is the dividing line in terms of the Oakwood Coalbed Gas Field that we requested. We requested that this part of the field be increased to 80 acre spacing with the eastern part of the field also being increased from the statewide spacing to the 80 acre spacing. So I think there is a very direct correlation to our point with regard to our fact that we are essentially dealing with a separate distinct reservoir once you get on over into Buchanan County.

Mr. Counts Dr. Wilson, Mr. Barnes has testified that location exceptions are requested for some seven wells. Have you reviewed these locations and is it your opinion that the correlative rights of the owners will be protected through these exceptions?

Dr. Wilson Yes I have reviewed and it is my opinion they will.

Mr. Counts Does Oxy request that the order resulting from this hearing find that the vertical limits of this field comprise all coal seams below the Tiller seam?

Dr. Wilson Yes it does.

Mr. Counts In your opinion will the granting of the application foster, encourage and promote the safe and efficient exploration for and development, production and utilization and conservation of coalbed methane from the seams underlying the lands involved in the application?

Dr. Wilson Yes

Mr. Counts In your opinion will the granting of the application be in the best interest of conservation, prevention of waste and protection of correlative rights?

Dr. Wilson Yes it is. In terms of conservation the increased spacing as we have indicated is the most efficient and effective way to economically produce this gas. In addition, the coal would be degased so that subsequent planned mining activity in the area would have the benefits of increased safety in their operations.

Mr. Counts Thank you Dr. Wilson. Mr. Chairman I have no further questions of this witness.

Dr. Whisonant Any questions from the Board. Mr. Counts I have one. Would you and or your witnesses, please express clearly again the need for confidentiality concerning this endeavor. The issue came up earlier and I am not sure we are quite clear as to why this must be so treated.

Mr. Counts Certainly. The Virginia Oil and Gas Act requires that an in order to obtain confidentiality an operator must so request. Coalbed methane is a new resource which is being just now being explored in Virginia. With regard to for instance if we were looking at the eastern part of the state and developing a major reservoir there there is a tremendous amount of testing from both a geologic

and engineering standpoint and a geophysical standpoint that have to be done. There has to be some incentive to the operator to be able to perform all these tests, to drill core holes, to evaluate the reservoirs etc. Being able to protect the information, I think is given throughout the conservation schemes of most all states, that protection of this information has found to be justifiable in terms of furthering the interest of the Conservation Board and essentially that is what we are requesting here. This is a new resource. There is new technologies being developed everyday. The request for holding this information confidential, if I am not mistaken Tom, I believe that is for a maximum period of two years. Which the legislature has granted in order to be able to say that o.k. the operator is entitled to some consideration with regard to confidentiality but there should also be a compelling public interest with regard to not having that period extend into infinity. So what we have requested here is two year confidentiality with regard to the testing results of these wells.

Dr. Whisonant

Thank you Mr. Counts. Any other questions?

Mr. Counts

Thank you sir. Are you ready for closing remarks Mr. Chairman?

Dr. Whisonant

Please

Mr. Counts

I think we have shown that existing statewide rules clearly are inadequate for the development of coalbed methane underlying the proposed Oakwood Coalbed Gas Field as indicated by the evidence presented today. Adherence to statewide rules will result in drainage significantly outside the boundary established by statewide spacing and, therefore, will not protect the correlative rights of those individuals outside the approximate 18 acre radial units or 23 acre square units created under statewide rules. With respect to the request for modification of the Nora Coalbed Gas Field we have put on evidence that the Oakwood Coalbed Gas Field involves essentially a separate distinct reservoir with one or more coal seams present and secondly greater thickness of seams. Hopefully our evidence has indicated that and supported that. Also it is illustrated by evidence outside that preparation by Oxy including the GRI report which we just reviewed. In addition to the evidence put on by Oxy USA to that effect, this also supported by numerous industry publications including the Gas Research

Institute Report. In addition, our evidence has shown that the Oakwood Coalbed Gas Field is a better quality reservoir with more seams present. More gas per cubic feet and also the fact that it conforms with Island Creek's areas of operation. In this application Oxy is concerned with being required to drill more wells than are necessary to develop the field. That is why we need the maximum efficient spacing available and that is why we have requested the 80 acre spacing. If we had to drill more wells then hopefully as I have shown on my diagram that would result in economic and physical waste. For the owner, less than maximum efficient spacing will also result in drainage and waste. I think it is important to recognize in Virginia that spacing is prospective and that for instance some states do require that a number of wells be drilled in a given area before spacing will be allowed. As you have indicated your concern this order, other orders may well in fact be modified in the future. What I think is extremely important to realize though from the Board's standpoint and the Board is charged with the protection of correlative rights and prevention of waste. If we look at an 80 acre unit and we assume that one will maximally drain an 80 acre unit but if we consider the fact for some reason as I indicated the spacing in Virginia is prospective. So we don't have all the data we would like to have. We can't confirm for certain that it is 79 acres, 80, 81 etc. but from the Board's standpoint I think it is extremely important that we not space the area too small. If the area gets spaced too small there is no relief available for the correlative rights of those parties that have been impacted. There reservoir outside this area if that is spacing statewide or other, has been drained and there is no relief, no recourse available to them. What is important to the Board in terms of the Board considering any request for spacing as flip back to the other paper and go back to the same untidy unit, is the fact that relief is available to the extent that later on the Board were to find that it had spaced to large of an area. Now this is from the standpoint of increased density which I think will be most appropriate in Virginia in all likelihood. That opposed to one well in this particular area you would be able to drill two wells or the Board could come in and despace the area and for instance lay down 40 units or stand up 40 units. What is important to realize is that the maximum, the maximum efficient spacing should be established for this field for the protection of correlative rights. In the event that spacing proves ends up proving it

is larger than is necessary, there is recourse and the correlative rights of these individuals end up being protected. In the event, however, that the Board were to space the area too small there is no recourse and the correlative rights are violated. On behalf of Oxy USA I respectfully request that the 80 acre spacing and the additional relief requested by Oxy in this matter be granted. I would like to thank very much the members of the Board and also you Mr. Chairman for your time.

Dr. Whisonant

Thank you Mr. Counts. Is there anyone else present here today that wishes to be heard before the Board on this matter. If so please come forward and identify yourself.

Rand Sterling

Mr. Chairman, my name is Rand Sterling I am a staff attorney with Equitable Resources in Kingsport we have just several brief comments if we may. First we would request that we be given an opportunity to provide you with written comments and we would suggest possibly a two week period. We did not receive actual notice of this hearing. We heard of this hearing, there was constructive notice by publication but we did not have a full and complete opportunity to review the application. Furthermore there are materials that have been submitted today that we would like to be able to review. We obviously have not brought with us our engineers or geologists. This is an order or this request or application does have the effect of modifying an existing order. We feel that due process would be best served if in the future for all interested parties and operators that actual notice be provided. Furthermore we would request that if we could if the application is in public record if we could take a copy of that with us or that could be provided so that our engineers and geologists could have an opportunity to review that.

Mr. Counts

They are a matter of public record with regard to the package as submitted.

Mr. Sterling

So we may be able to obtain a copy of that so that we can take that back with us and review it with our group.

Mr. Counts

In terms of the major exhibits we don't have any additional copies.

Mr. Fulmer

We can provide it in fact George Mason already has a copy of it.

Mr. Sterling Oh he does? I wasn't aware of it.

Mr. Fulmer We will supply you with another copy. There isn't any problem with that.

Mr. Sterling If at all possible we would appreciate having the opportunity of having the two week period to review the application so that our people can have an opportunity to review that and make written comments at that time. Thank you for your time.

Dr. Whisonant Questions, thank you. Anyone else. Would you please come forward and identify yourself.

Mr. Edwards Yes sir, my name is Michael Edwards I am president of Edwards & Harding Petroleum Company. My comments are similar to those of Mr. Sterling of EREX in that the area of the proposed spacing order here affects part of the area that our company has under lease. As matter of fact it affects part of the area that the Board has created units that our company is operator of and we would also like to request a similar period to review and comment on the order. Thank you.

Dr. Whisonant Thank you Mr. Edwards. Questions? Anyone else. Thank you everyone this hearing is closed.

Mr. Fulmer Wait, let me ask a couple of technical questions here to just clarify up a few things just for the record Rick. Noting the date of the application was dated the 7th we received. I know at that time the emergency legislation wasn't passed but it was signed on the fourth. So technically I am asking some questions. The relief sought is under 45.1-357.37

Mr. Counts That is correct.

Mr. Fulmer That is correct, you want to amend your application sir?

Mr. Counts Yes sir, so amended.

Mr. Fulmer For your spacing are you asking relief under 45.1-357.2 dealing with statewide spacing?

Mr. Counts Mr. Fulmer with regard to 357.2 obviously that is the statewide spacing for coalbed methane development. That is obviously applicable to statewide rules and also 45.1-301. We are asking that we receive this relief even considering the statewide rules, save and except from statewide. We

want something over and above the statewide spacing for these units.

Mr. Fulmer

Am I correct in seeing in your application you mention in section three page five of the application, minimum distance between vertically drilled coalbed methane degasification wells. Do you mean gob wells or vertical vent holes, that nature?

Mr. Counts

I will have to ask for some technical expertise on that. Mr. Fulmer I am advised that will be essentially anything but gob wells.

Mr. Fulmer

Anything but gob wells.

Mr. Counts

Yes sir

Mr. Fulmer

Like I said I am just trying to get this on for the record to make sure we get all of this correct. For your gob wells, when they go on production will that be 80 acre units? Or will you want less?

Mr. Counts

At the present time the request for relief we have made addresses only the vertically drilled wells. We are not at this time addressing gob wells.

Dr. Whisonant

Thank you Mr. Fulmer. Other questions, then the hearing is closed. Thank you very much.

Mr. Counts

Thank you Mr. chairman and members of the Board.

EXHIBIT LISTING OF OXY USA, INC.

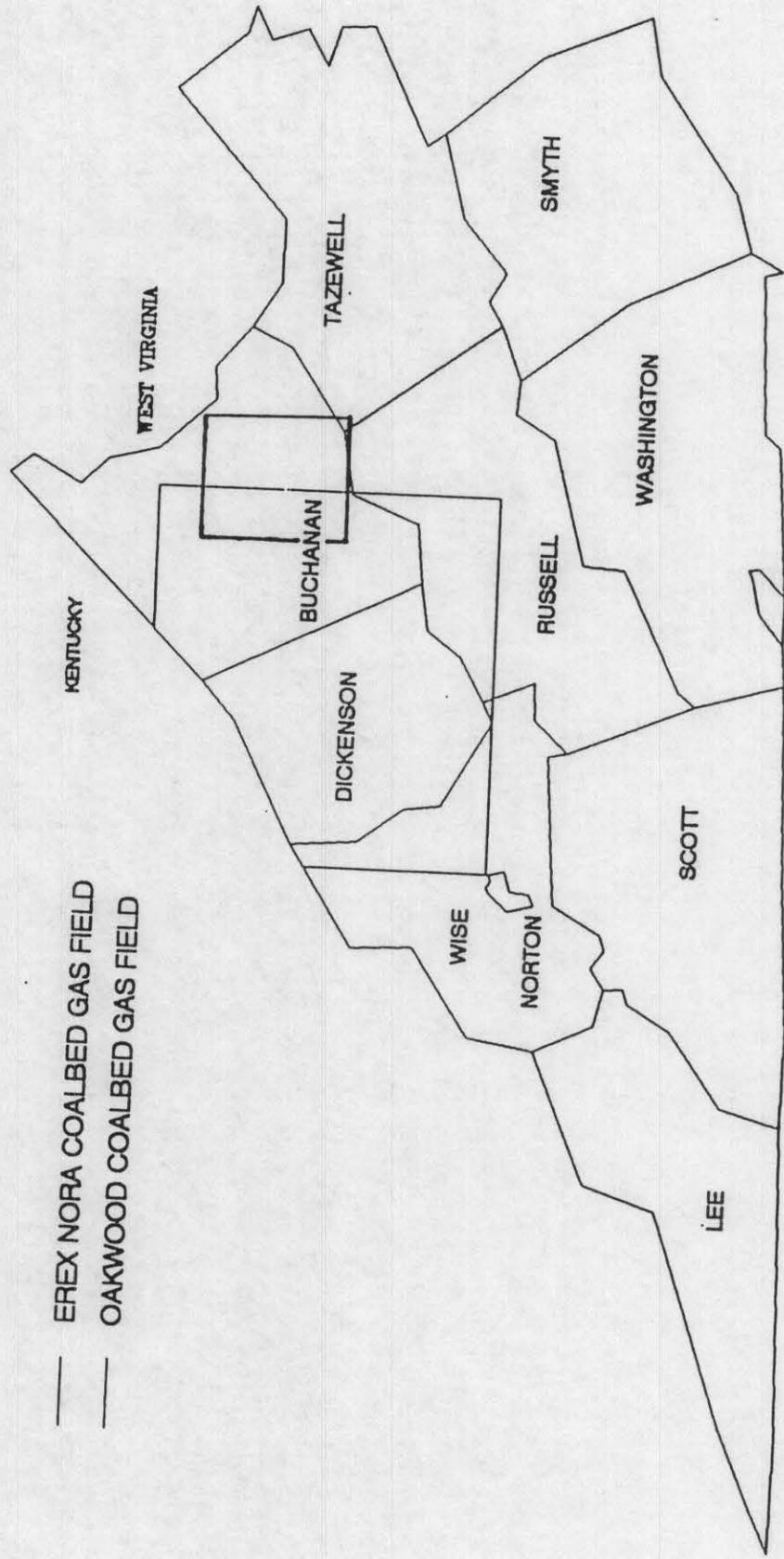
1. Grid Map
2. Approximate Extent of Field Overlap and Relationship
3. Plat
4. Stratigraphic Column of The Pennsylvanian Age Coal Seams, Oakwood Coalbed Gas Field
5. Location Map of the NW-SE Cross Section of the Tiller To Pocahontas #2 Horizon
6. Stratigraphic Cross Section of the Tiller To Poca. #2 Horizon, Drawn by Lewellen
7. Air Permeability Distribution For Pocahontas Coal
8. Permeability of Pocahontas Coal vs. Hydrostatic Stress
9. Pocahontas Coal Capillary Pressure
10. Pocahontas Coal Water/Gas Relative Permeability
11. CBM Spacing Study Langmuir Desorption Isotherm
12. CBM Study Reservoir Parameters Assumed
13. CBM Spacing Study Cumulative Production
14. CBM Spacing Study Recovery Factor
15. Isopach Map of the Pocahontas No. 3 Coal Bed

EXHIBIT #1

PLAT PREPARED BY OXY USA

ON FILE IN THE DIVISION OF GAS AND OIL
230 CHARWOOD DRIVE
ABINGDON, VIRGINIA

APPROXIMATE EXTENT OF FIELD OVERLAP AND RELATIONSHIP



- EREX NORA COALBED GAS FIELD
- - - OAKWOOD COALBED GAS FIELD

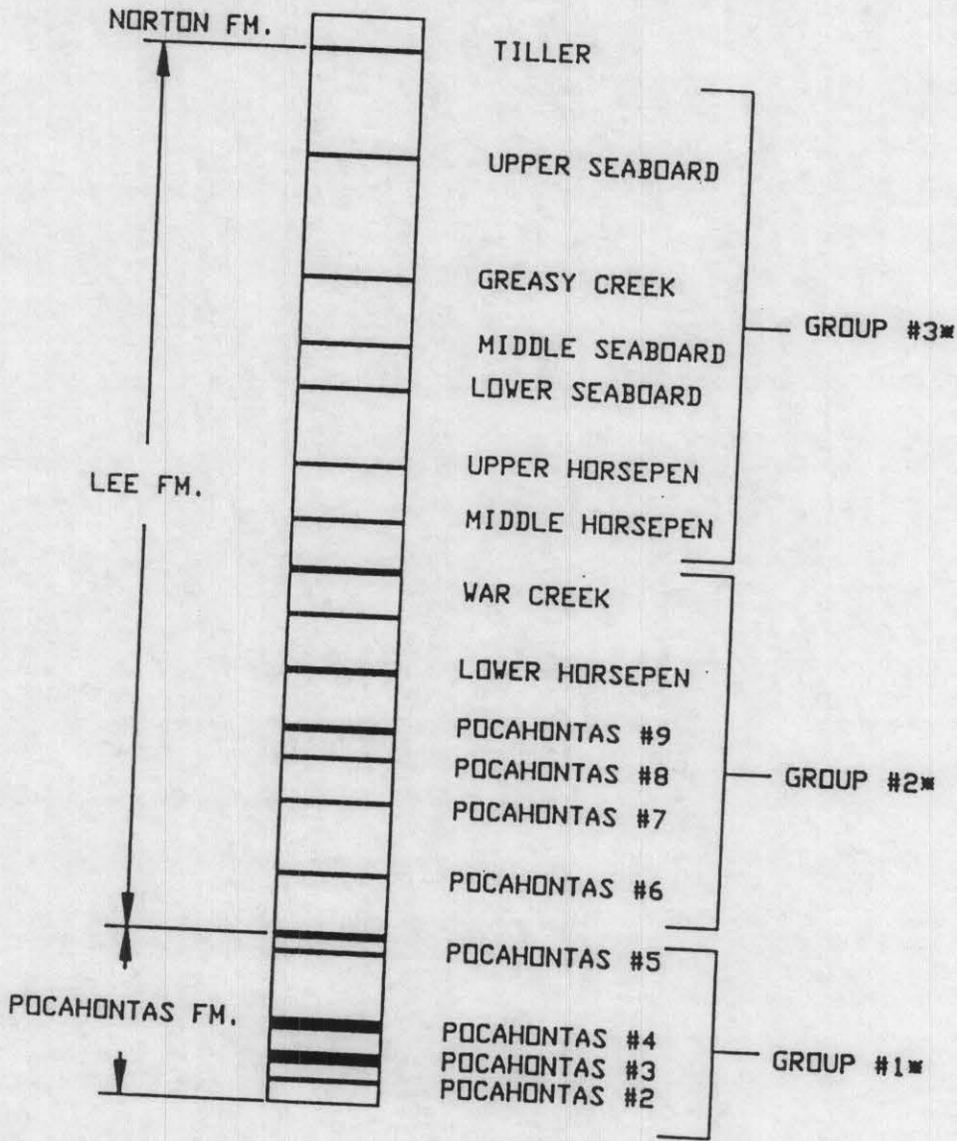
EXHIBIT #3

PLAT PREPARED BY OXY USA

ON FILE IN THE DIVISION OF GAS AND OIL
230 CHARWOOD DRIVE
ABINGDON, VIRGINIA

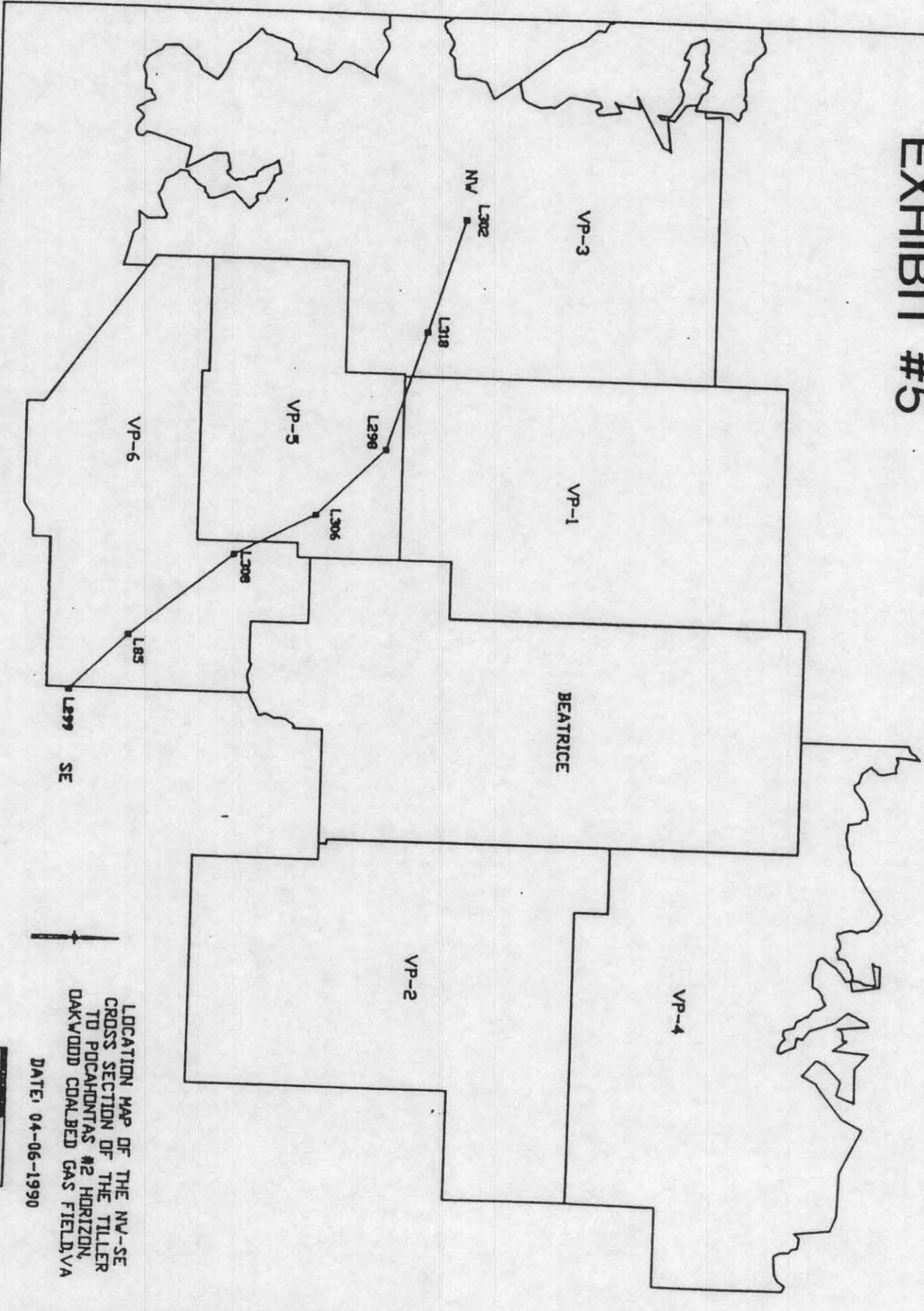
EXHIBIT #4

STRATIGRAPHIC COLUMN OF THE PENNSYLVANIAN AGE COAL SEAMS, OAKWOOD COALBED GAS FIELD, VA.



* seams are grouped in the order of importance based on thickness and continuity.

EXHIBIT #5



LOCATION MAP OF THE NV-SE
CROSS SECTION OF THE TILLER
TO POCAHONTAS #2 HORIZON,
DAKWOOD COALBED GAS FIELD, VA

DATE: 04-06-1990



NORTON FH.

LEE FH.

S.E.

POCAHONTAS FH.

TILLER HORIZON

UPPER SEABOARD

GREASY CREEK

MIDDLE SEABOARD

LOWER SEABOARD

UPPER HORSEPEN

MIDDLE HORSEPEN

WAR CREEK

LOWER HORSEPEN

POCAHONTAS #9

POCAHONTAS #8

POCAHONTAS #7

POCAHONTAS #6

POCAHONTAS #5

POCAHONTAS #4

POCAHONTAS #3

POCAHONTAS #2

L-299

L-85

L-308

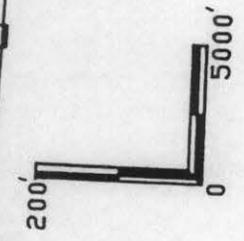
L-306

L-298

L-318

L-302

N.W.

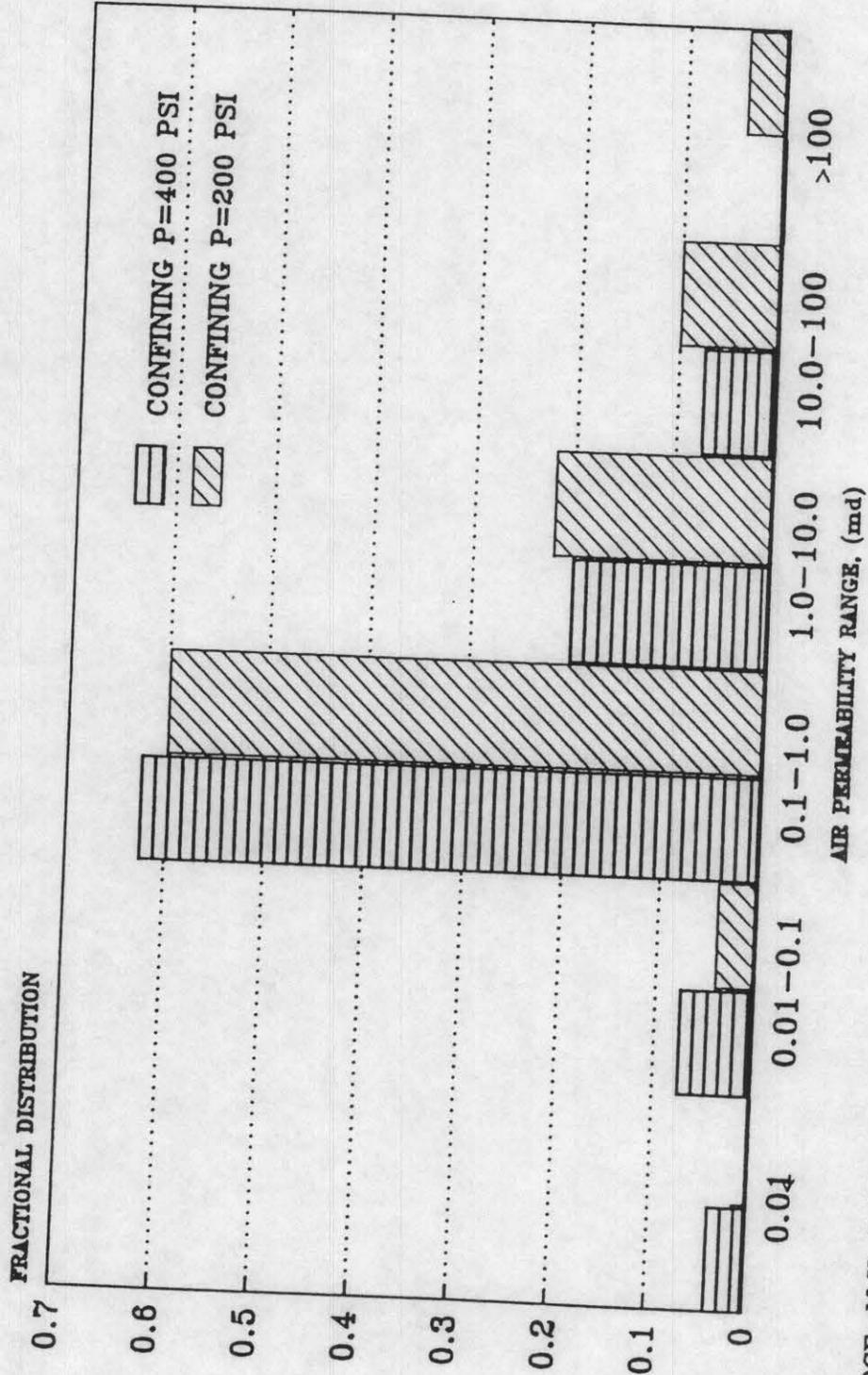


DATUM: BASE OF THE POCA. #3 SEAM
 COAL SEAM THICKNESS NOT TO SCALE

STRATIGRAPHIC CROSS SECTION OF THE
 TILLER TO POCA. #2 HORIZON,
 DAKWOOD COALBED GAS FIELD, VA.
 DATE: 10-06-1990
 DRAWN BY: D. LEVELLEN

EXHIBIT #6

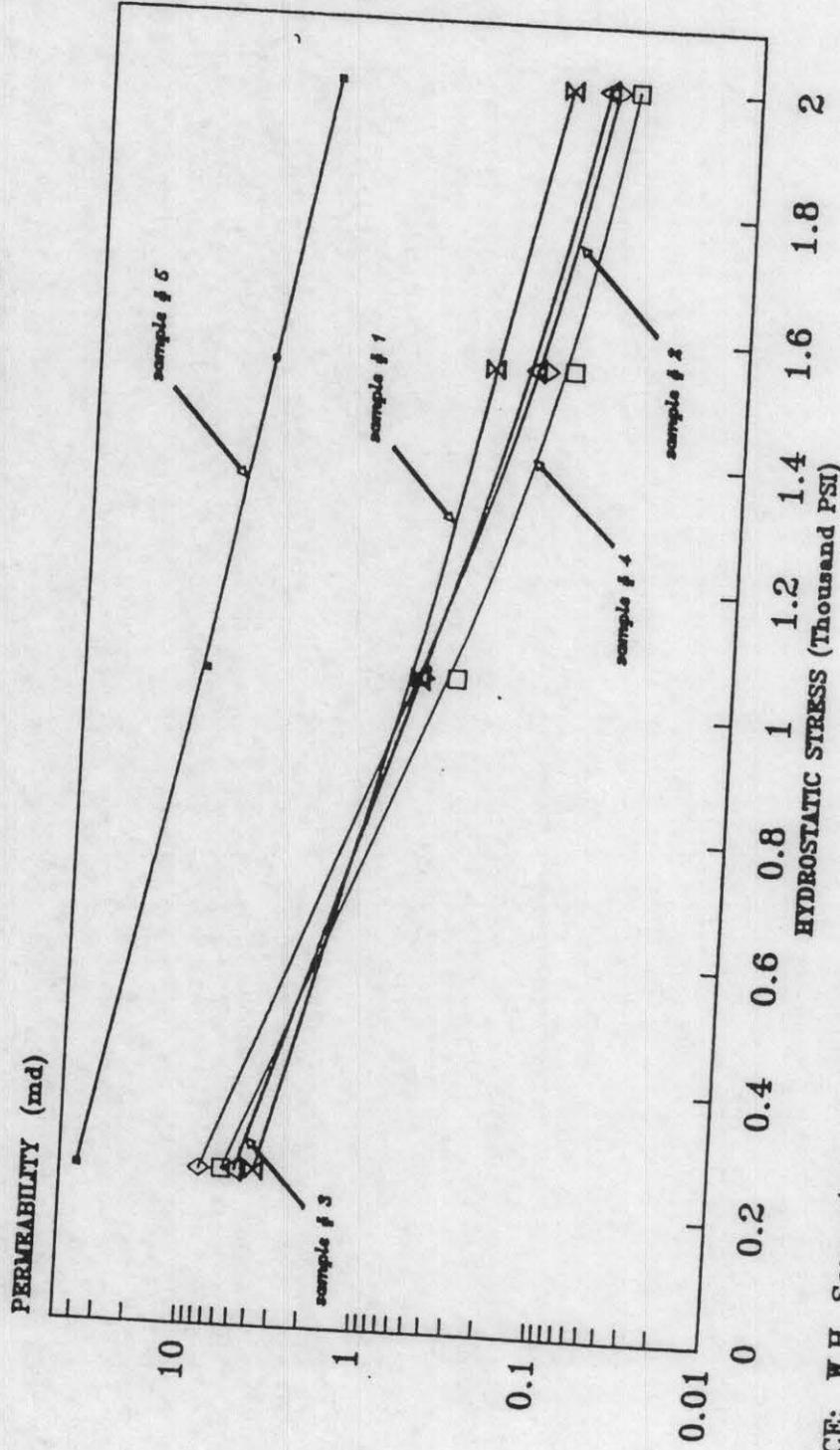
AIR PERMEABILITY DISTRIBUTION FOR POCAHONTAS COAL



SOURCE: M.K. Dabbous, et al.
SPEJ (Dec. 1974) p. 563f.

EXHIBIT #7

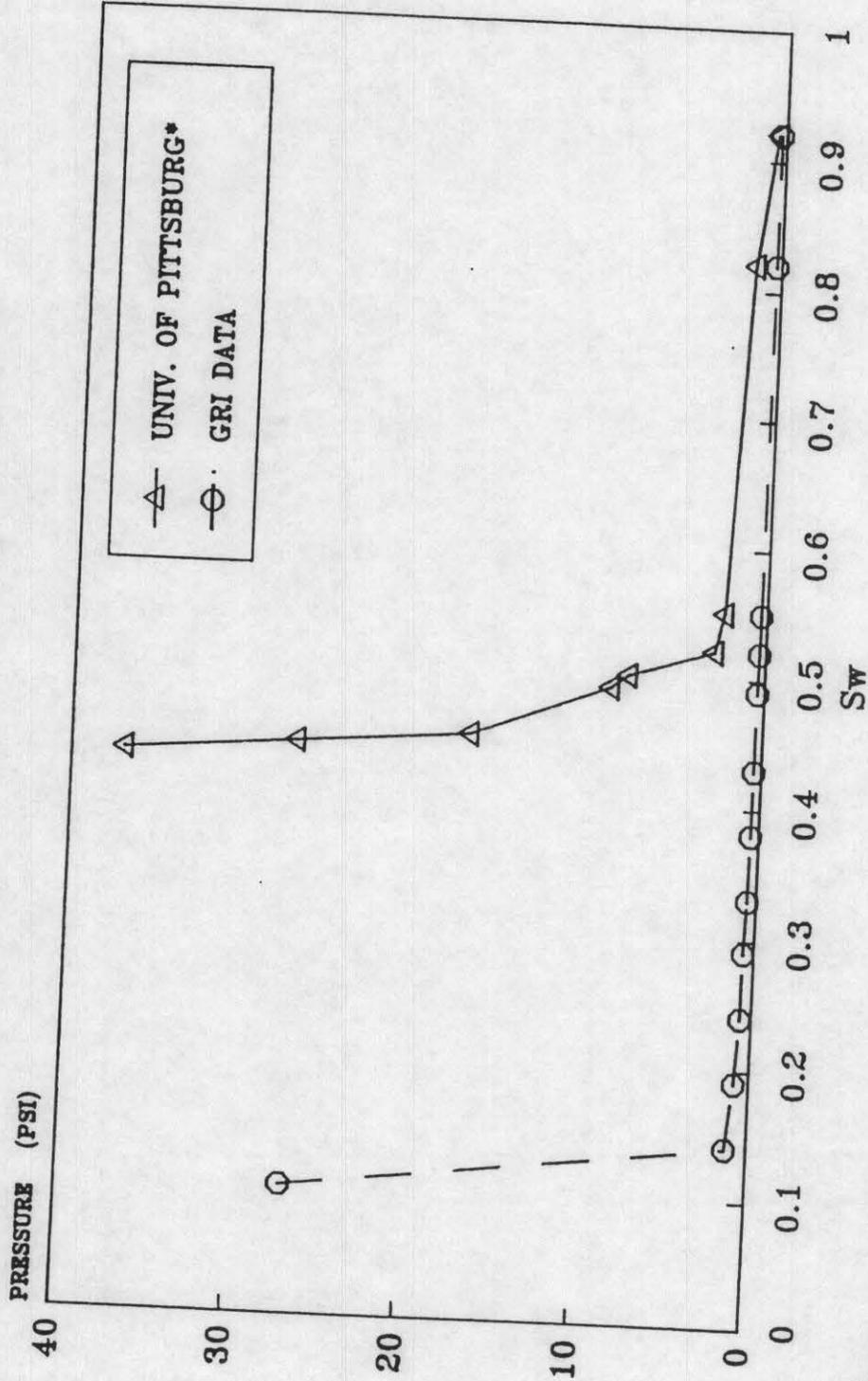
PERMEABILITY OF POCAHONTAS COAL VS HYDROSTATIC STRESS



SOURCE: W.H. Somerton, et al., Int. J.
Rock Mech. 12 pp. 129-145 (1975)

EXHIBIT #8

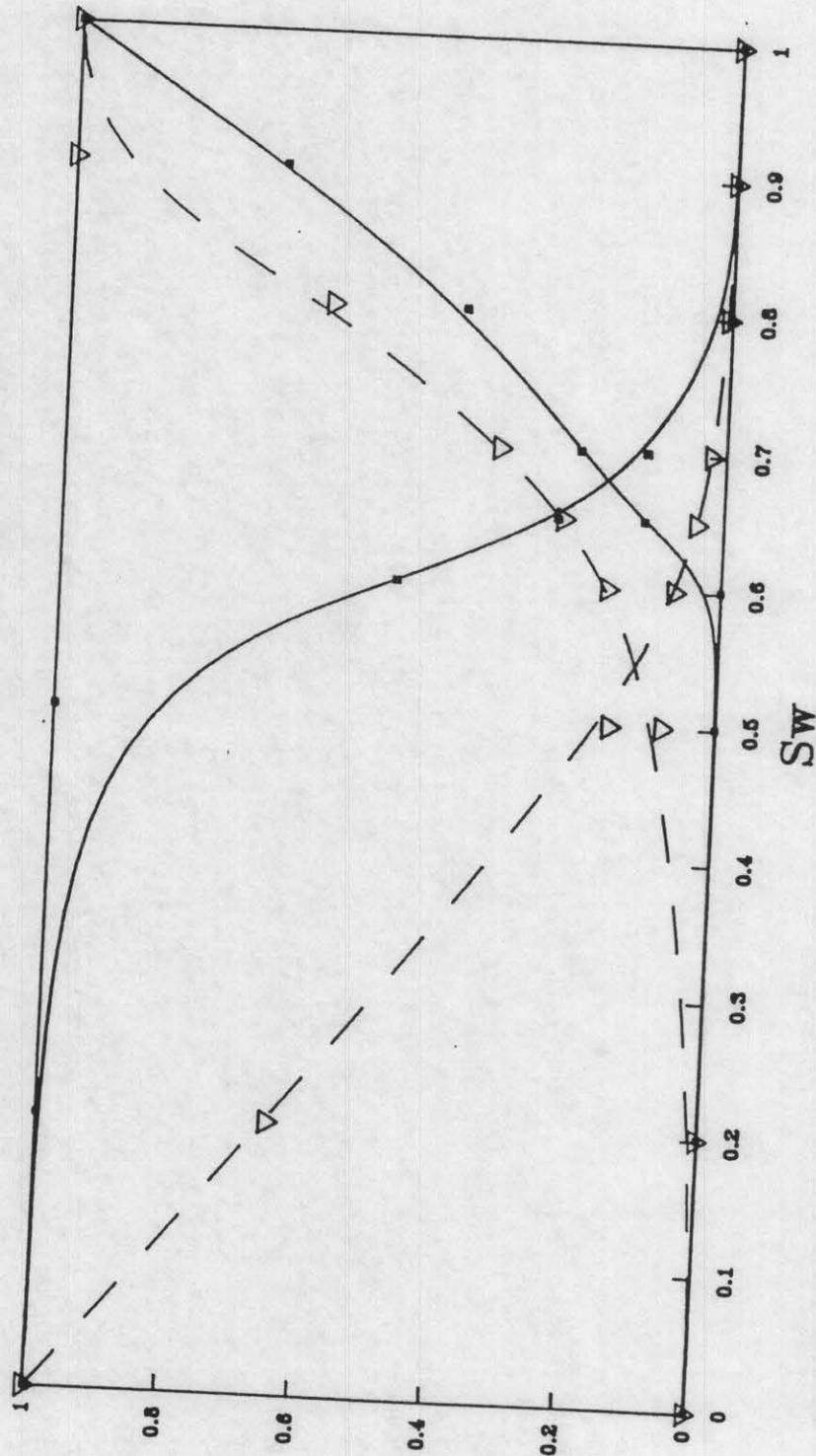
POCAHONTAS COAL CAPILLARY PRESSURE



*SOURCE: M.K. Dabbous, et al. SPEJ
(Oct. 1976) p. 261f

EXHIBIT #9

POCAHONTAS COAL WATER/GAS RELATIVE PERMEABILITY



*SOURCE: A.A. Reznite, et al. SPEJ
(Dec. 1974) p. 556f.

EXHIBIT #10

CBM SPACING STUDY LANGMUIR DESORPTION ISOTHERM

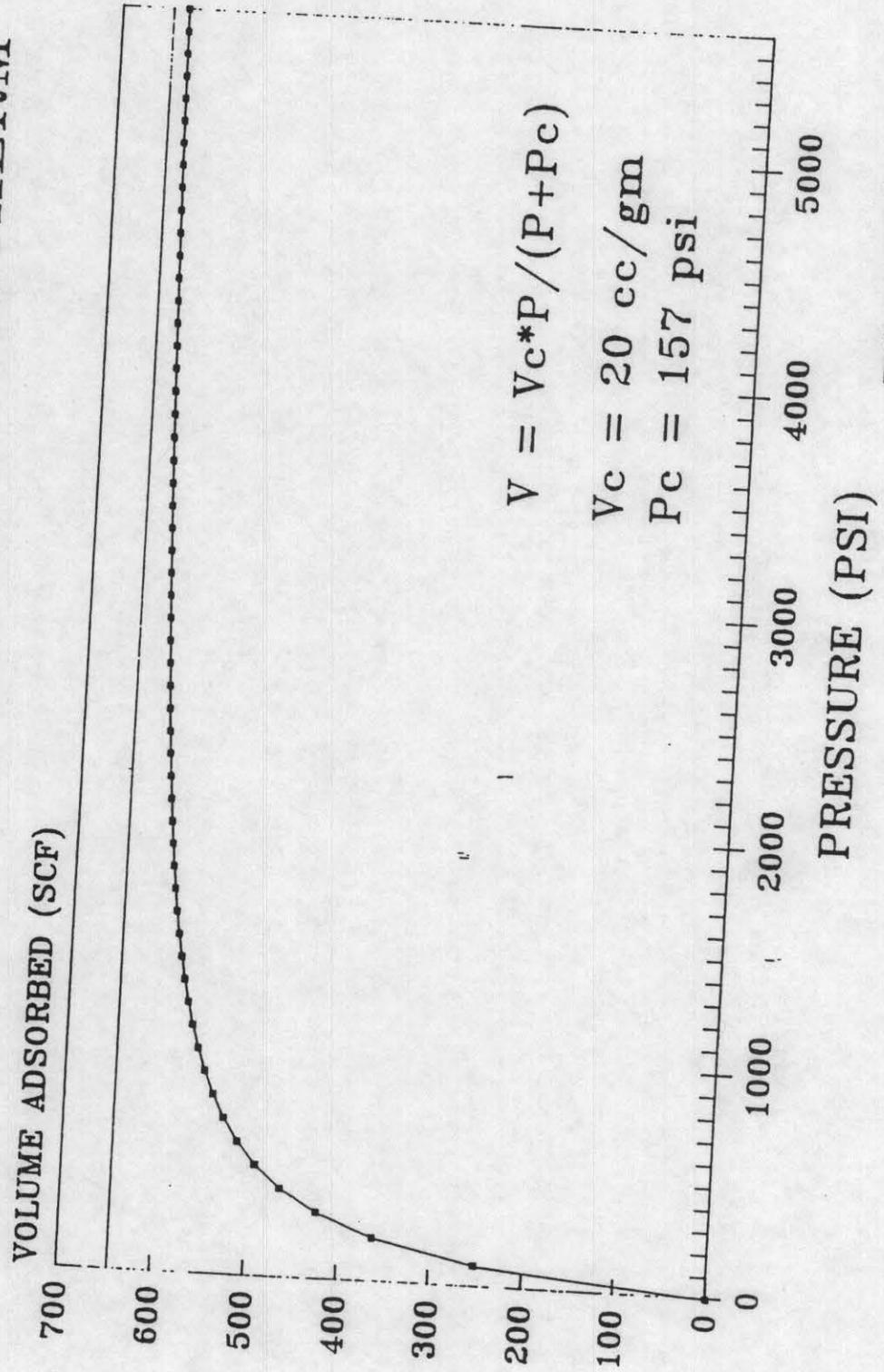


EXHIBIT #11

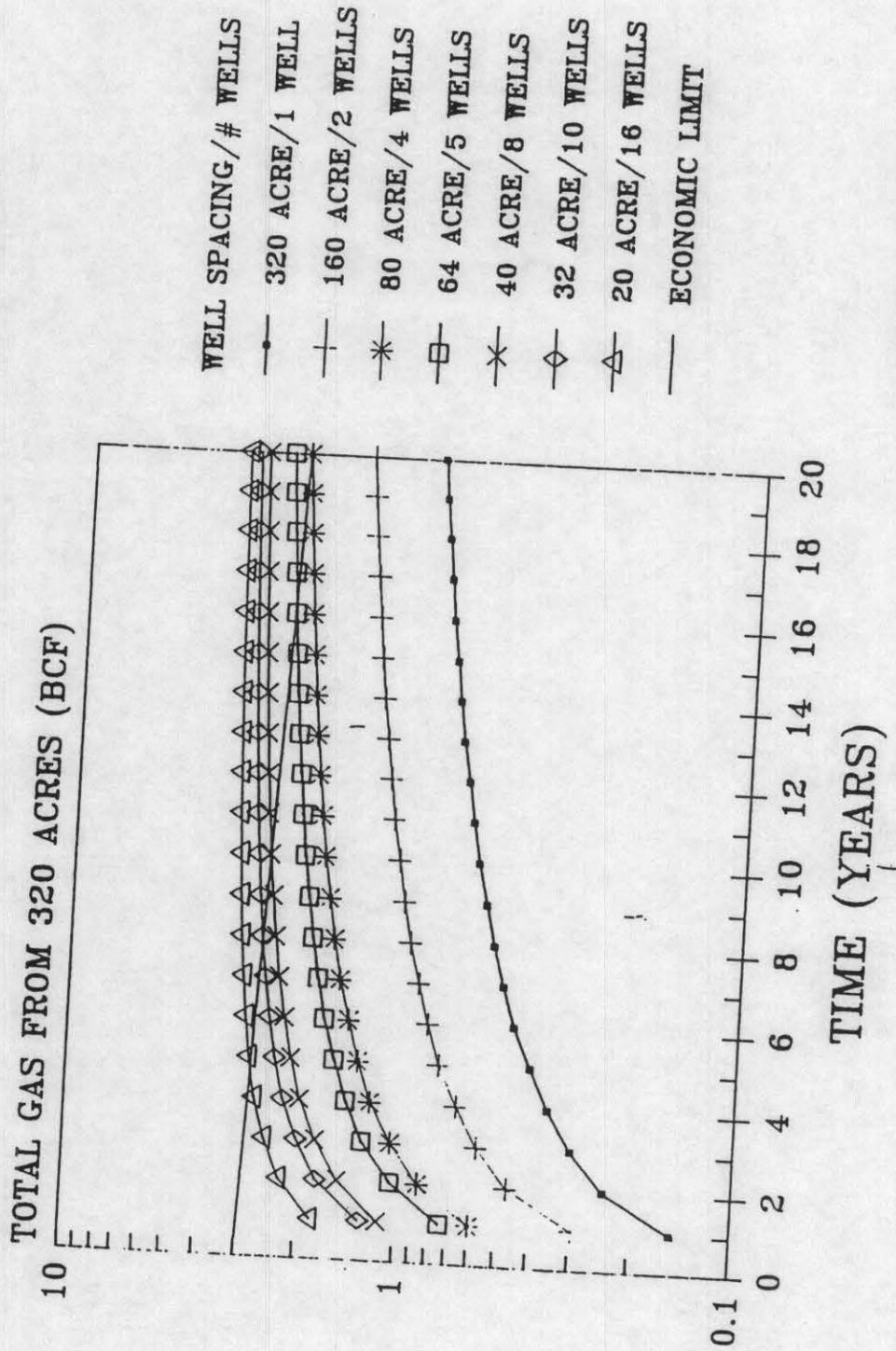
CBM SPACING STUDY

RESERVOIR PARAMETERS ASSUMED

AVERAGE RESERVOIR DEPTH, FT	2000
NET RESERVOIR THICKNESS, FT	13
ABSOLUTE PERMEABILITY, MD	2
POROSITY, %	4
INITIAL RESERVOIR PRESSURE, PSI	673
INITIAL WATER SATURATION, %	70
FORMATION TEMPERATURE, DEG F	75
FORMATION COMPRESS., 1/PSI	0.000017
DESORPTION VOLUME CONST., CC/GM	20.2
DESORPTION PRESS. CONST., PSI	157
DESORPTION TIME CONSTANT, DAYS	0.231
NATURAL FRACTURE SPACING, IN	0.25
MATRIX PERMEABILITY, MD	0.0
MATRIX POROSITY, %	2.4
STORATIVITY RATIO, FRACTION	0.62
COAL DENSITY, CC/GM	1.36
DIFFUSIVITY COEFF., SQ FT/DAY	20.4
WATER COMPRESSIBILITY, 1/PSI	0.000003
WATER FORM. VOL. FACTOR, CF/SCF	1.0
GAS VISCOSITY, CP	0.01
GAS GRAVITY, FRACTION	0.60

EXHIBIT #12

CBM SPACING STUDY CUMULATIVE PRODUCTION



CBM SPACING STUDY RECOVERY FACTOR

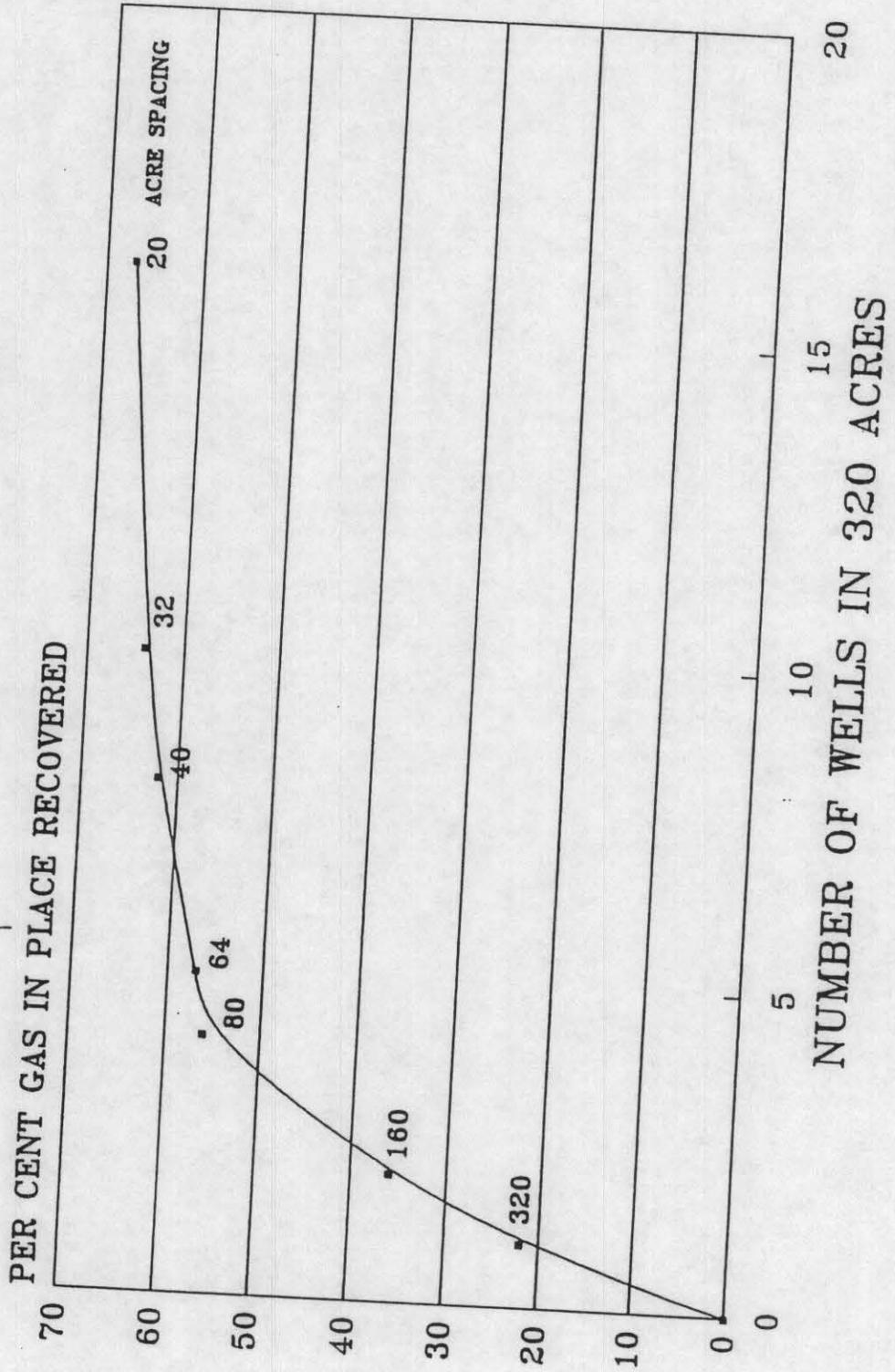
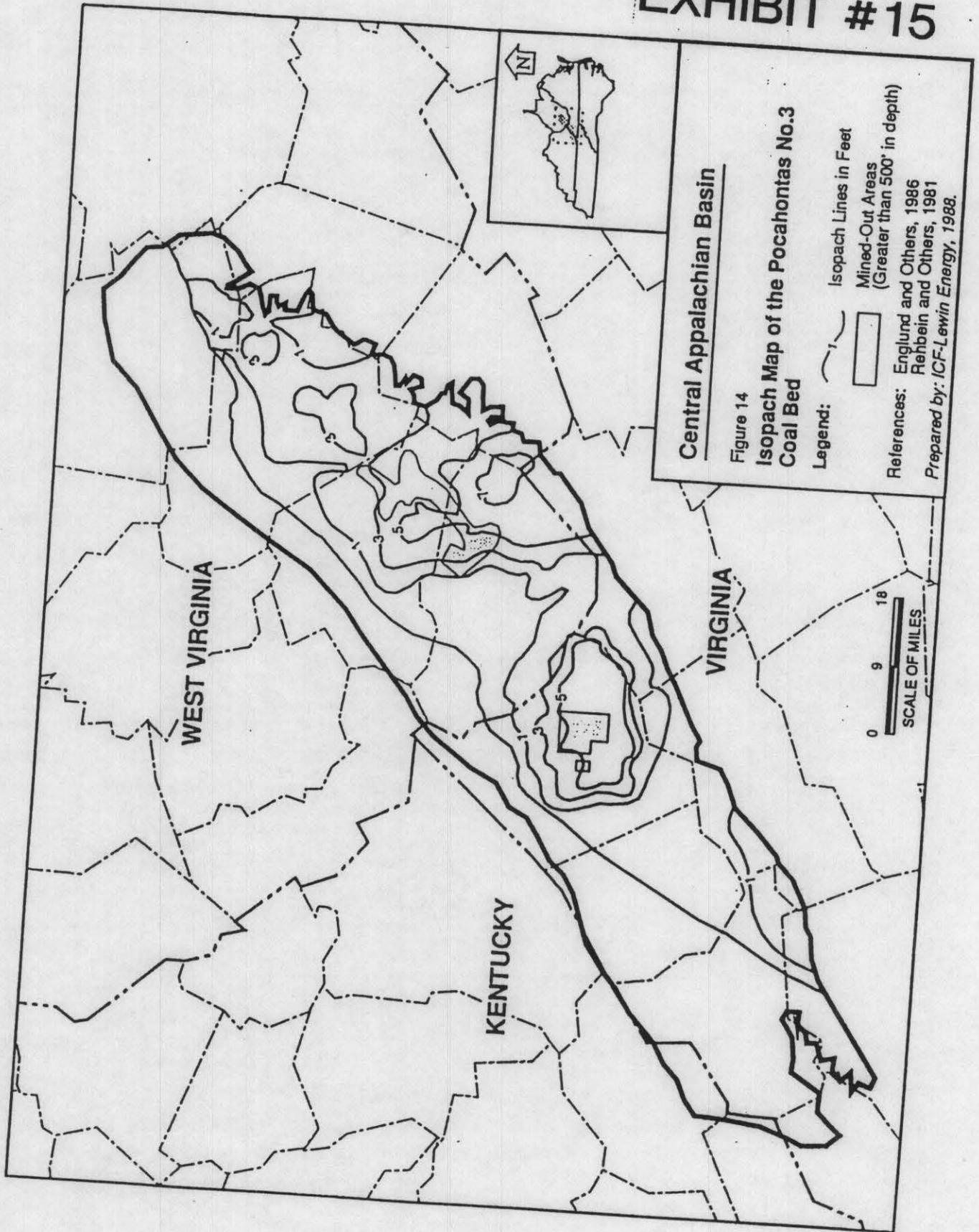


EXHIBIT #14

EXHIBIT #15



Central Appalachian Basin

Figure 14
Isopach Map of the Pocahontas No. 3
Coal Bed

Legend:  Isopach Lines in Feet
 Mined-Out Areas
(Greater than 500' in depth)

References: Englund and Others, 1986
Rehbein and Others, 1981
Prepared by: ICF-Lewin Energy, 1988.