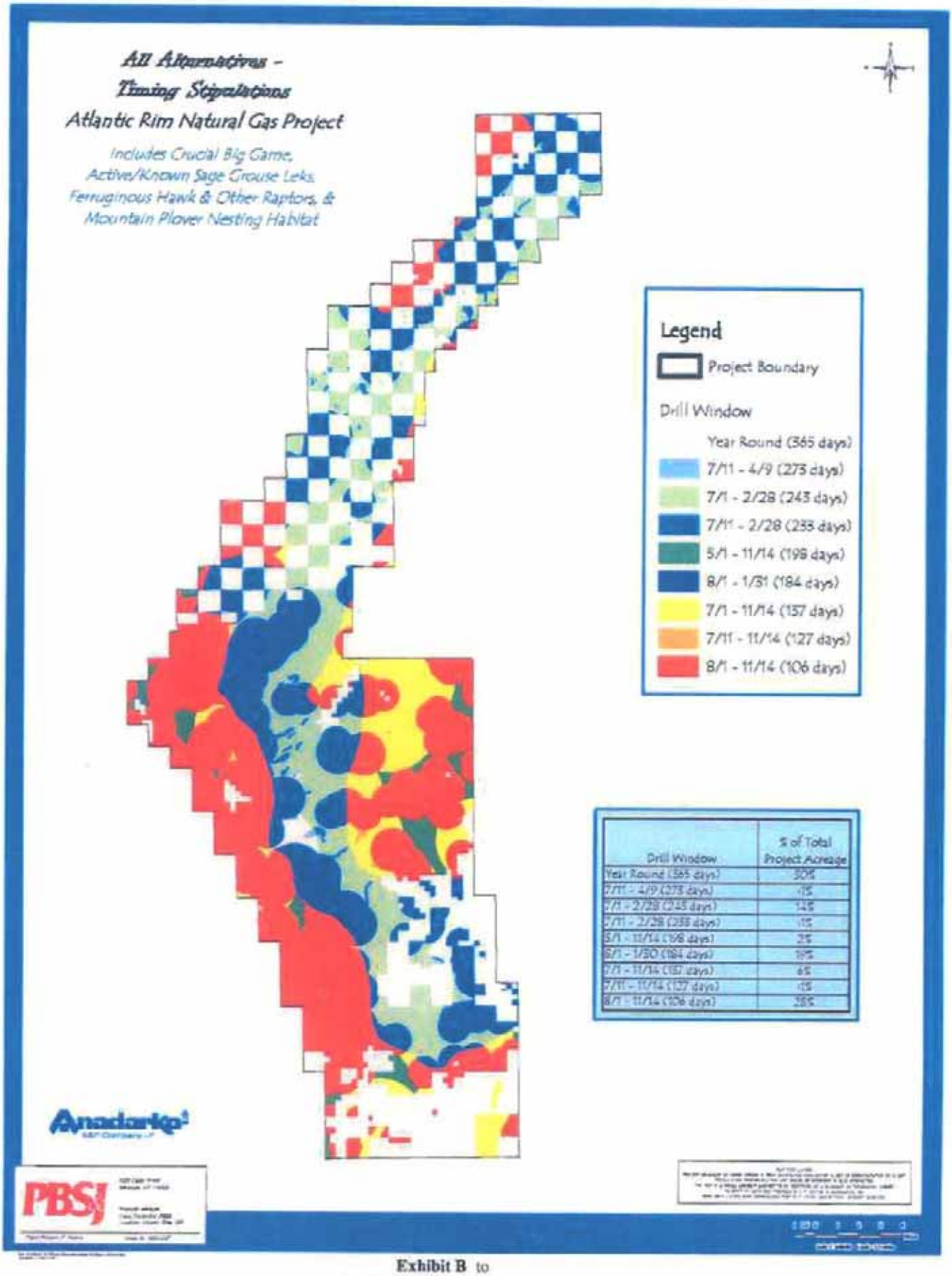
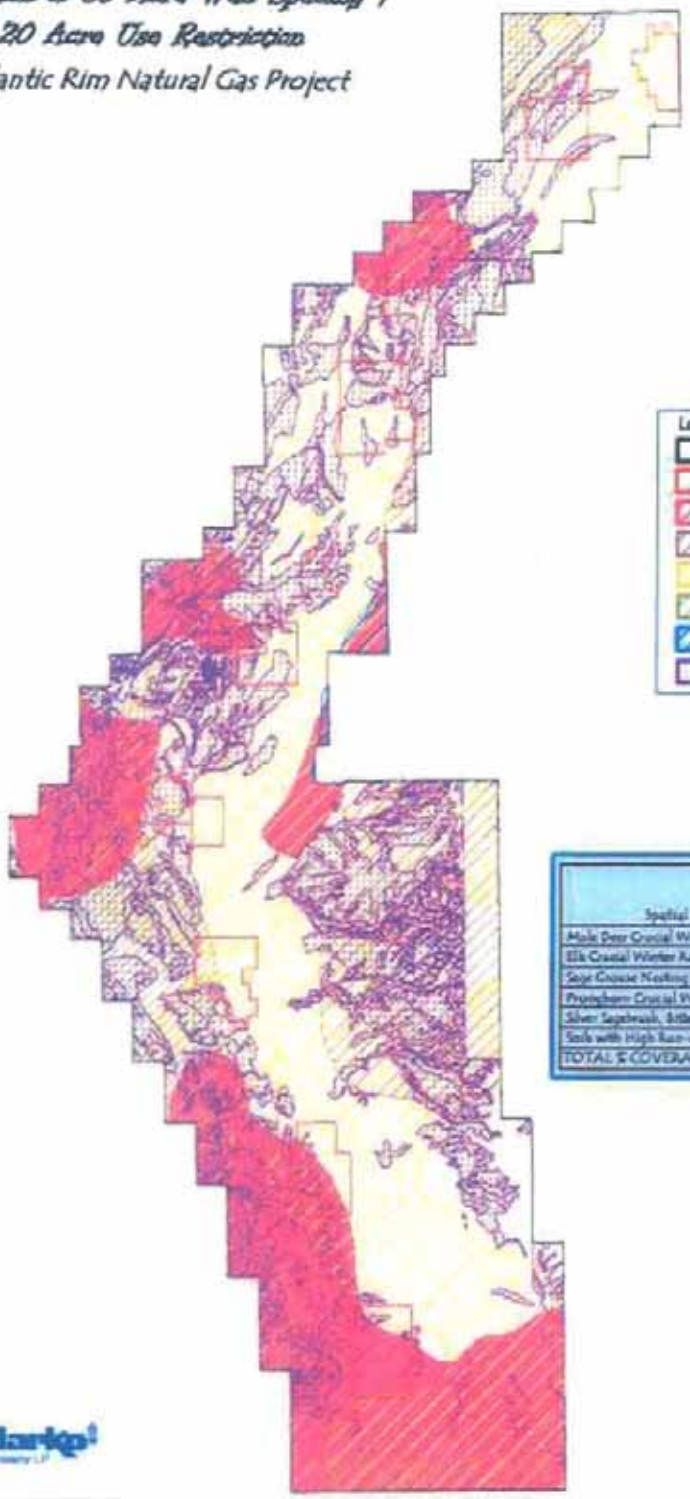


Drill Window	% of Total Project Acreage
Year Round (365 days)	50%
7/11 - 4/9 (275 days)	4%
7/1 - 2/28 (243 days)	14%
7/11 - 2/28 (233 days)	1%
5/1 - 11/14 (198 days)	2%
8/1 - 1/30 (184 days)	19%
7/1 - 11/14 (137 days)	6%
7/11 - 11/14 (127 days)	1%
8/1 - 11/14 (106 days)	3%

Exhibit B to
Anadarko's Comments on
the Draft Atlantic Rim EIS

#6

Alternative C
Elimination of 80 Acre Well Spacing /
20 Acre Use Restriction
Atlantic Rim Natural Gas Project



Legend
- Project Boundary
- POD
- Mule Deer Crucial Winter Habitat
- Elk Crucial Winter Habitat
- Sage Grouse Nesting & Brood Habitat
- Pronghorn Crucial Winter Habitat
- Silver Sagebrush / Bitterbrush
- Soils with High Run-Off Potential

Spatial Limitation	% of Total Project Acreage	Incremental (Overlap) % Coverage
Mule Deer Crucial Winter Range	27%	27%
Elk Crucial Winter Range	15%	14%
Sage Grouse Nesting & Brood Habitat	72%	47%
Pronghorn Crucial Winter Habitat	36%	6%
Silver Sagebrush, Bitterbrush	1%	0%
Soils with High Run-off Potential	39%	1%
TOTAL % COVERAGE		95%

Anadarko
E&P Company LP

PBSJ

Exhibit C to
Anadarko's Comments on
the Draft Atlantic Rim EIS

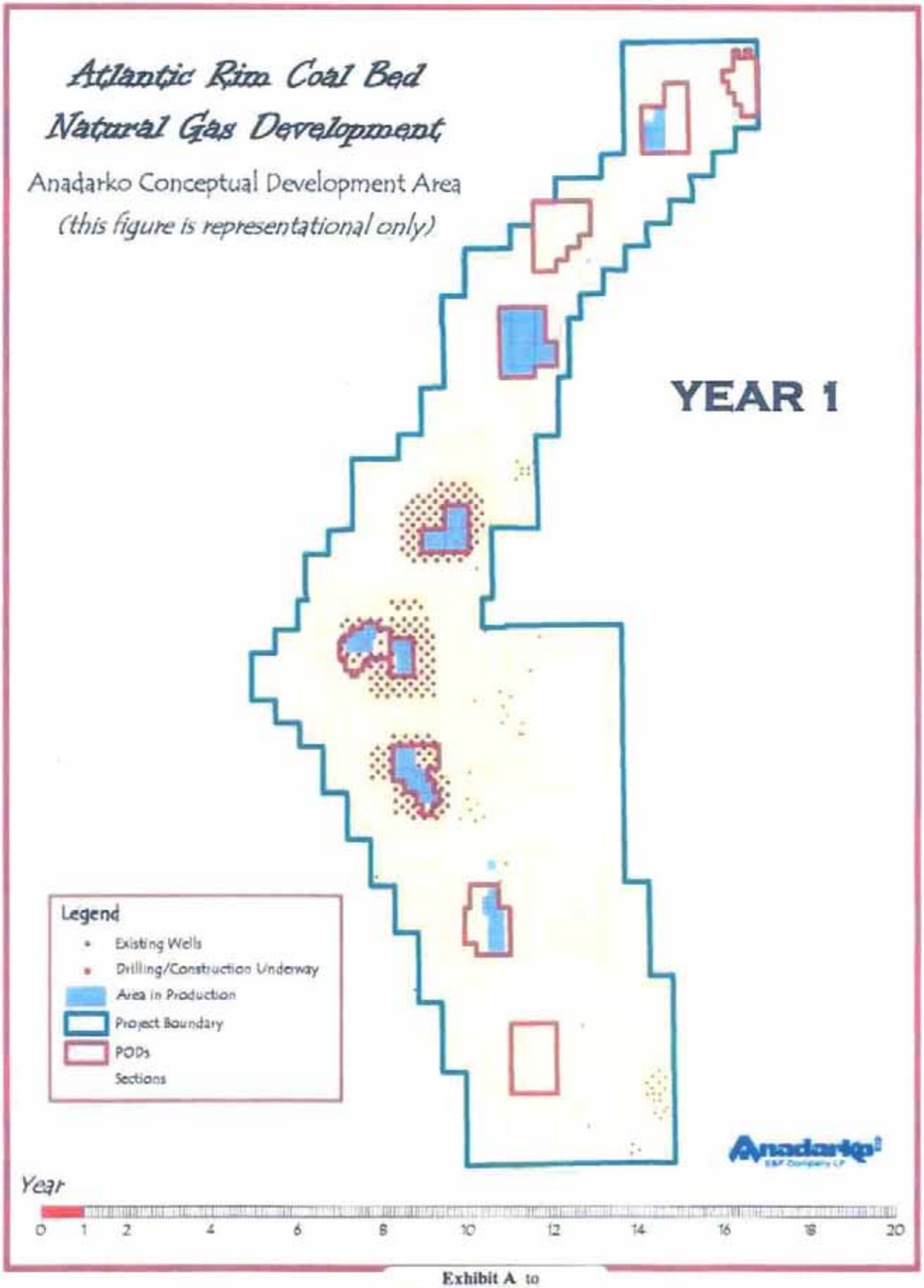
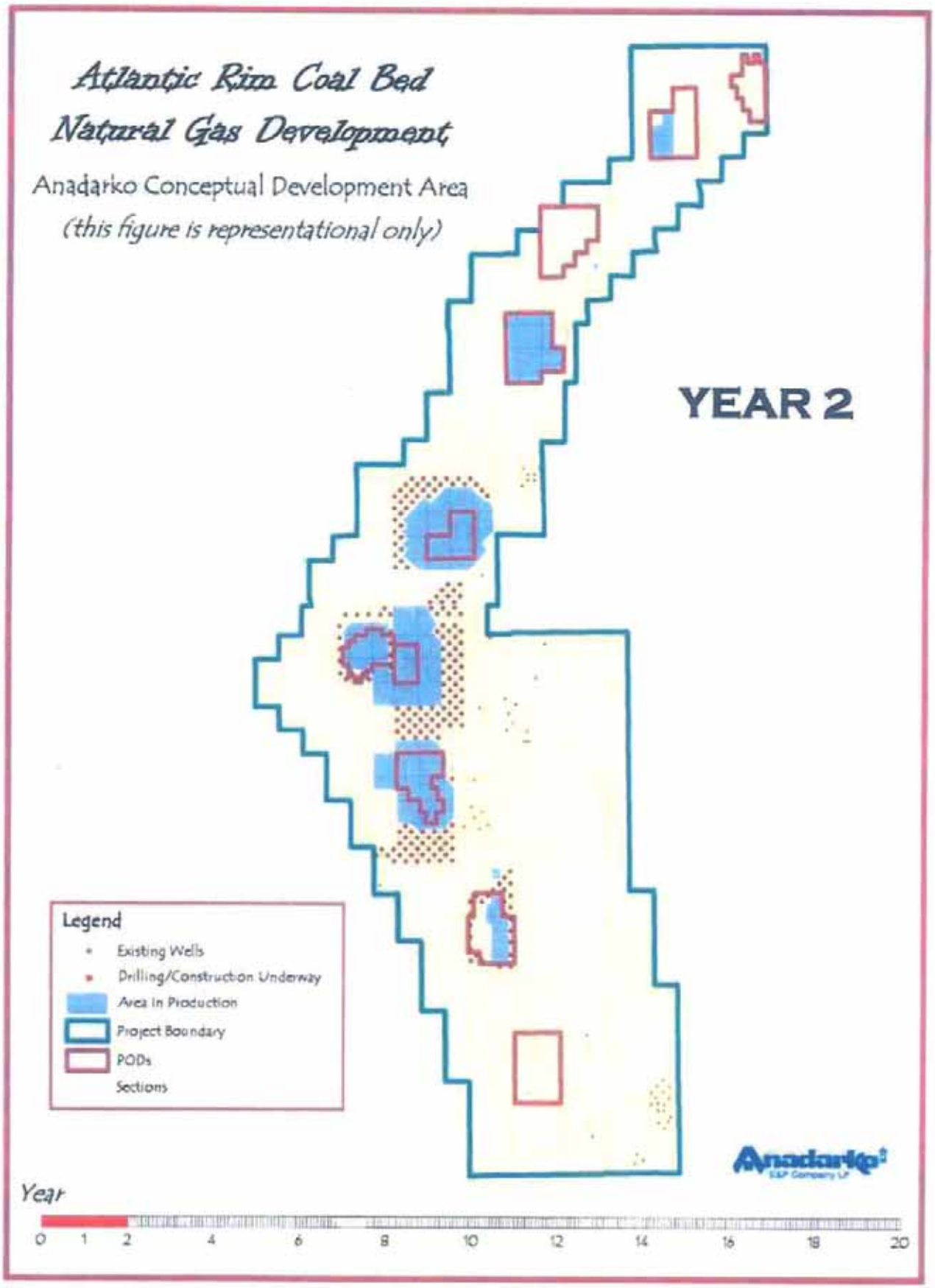


Exhibit A to
Anadarko's Comments on
the Draft Atlantic Rim EIS


Atlantic Rim Coal Bed
Natural Gas Development
Anadarko Conceptual Development Area
(this figure is representational only)
YEAR 2
Legend
Existing Wells
Drilling/Construction Underway
Area In Production
Project Boundary
PODs
Sections
Anadarko
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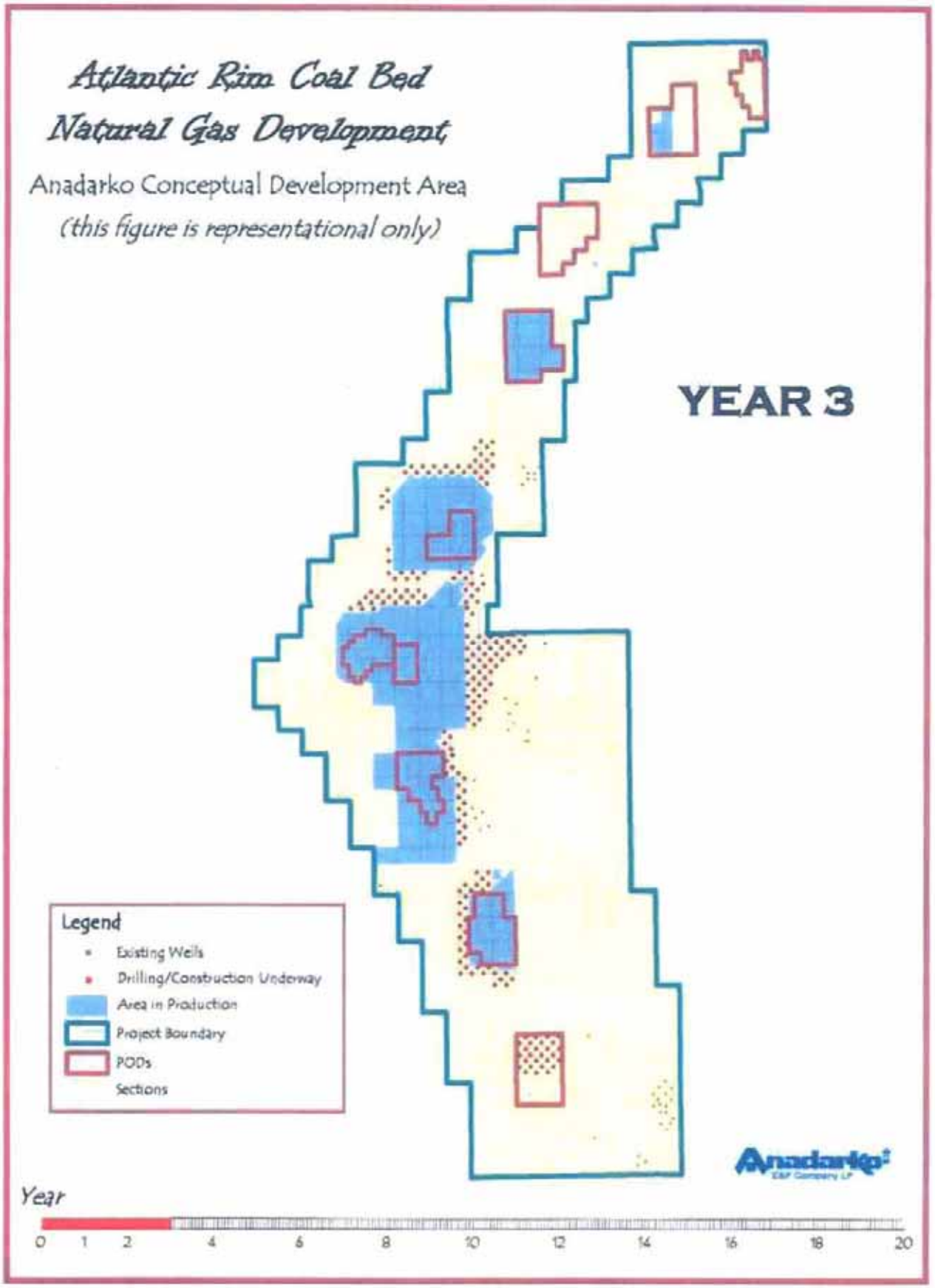
Atlantic Rim Coal Bed
Natural Gas Development
Anadarko Conceptual Development Area
(this figure is representational only)
YEAR 3
Legend
Existing Wells
Drilling/Construction Underway
Area in Production
Project Boundary
PODs
Sections
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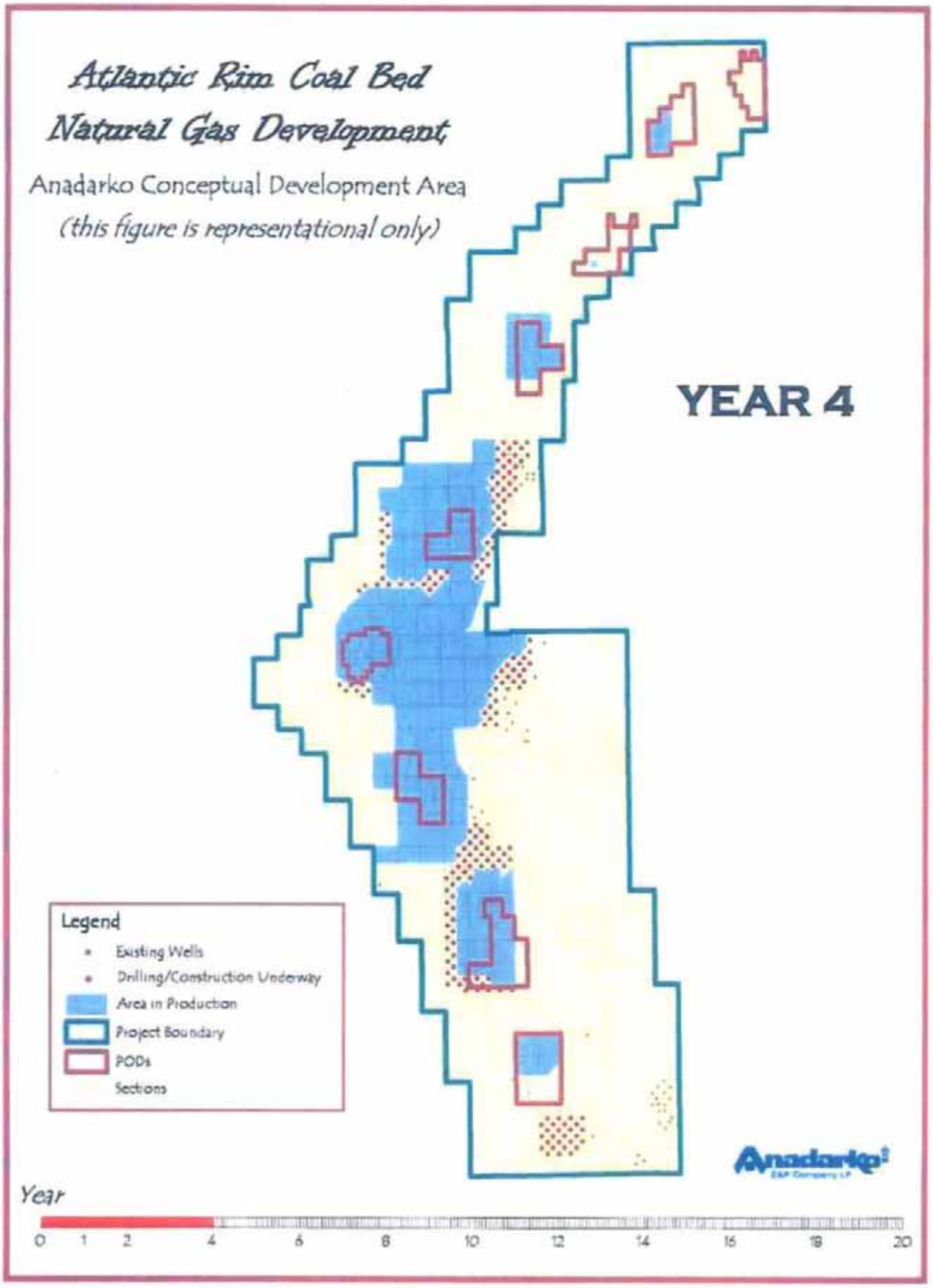
Atlantic Rim Coal Bed
Natural Gas Development
Anadarko Conceptual Development Area
(this figure is representational only)
YEAR 4
Legend
Existing Wells
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Area in Production
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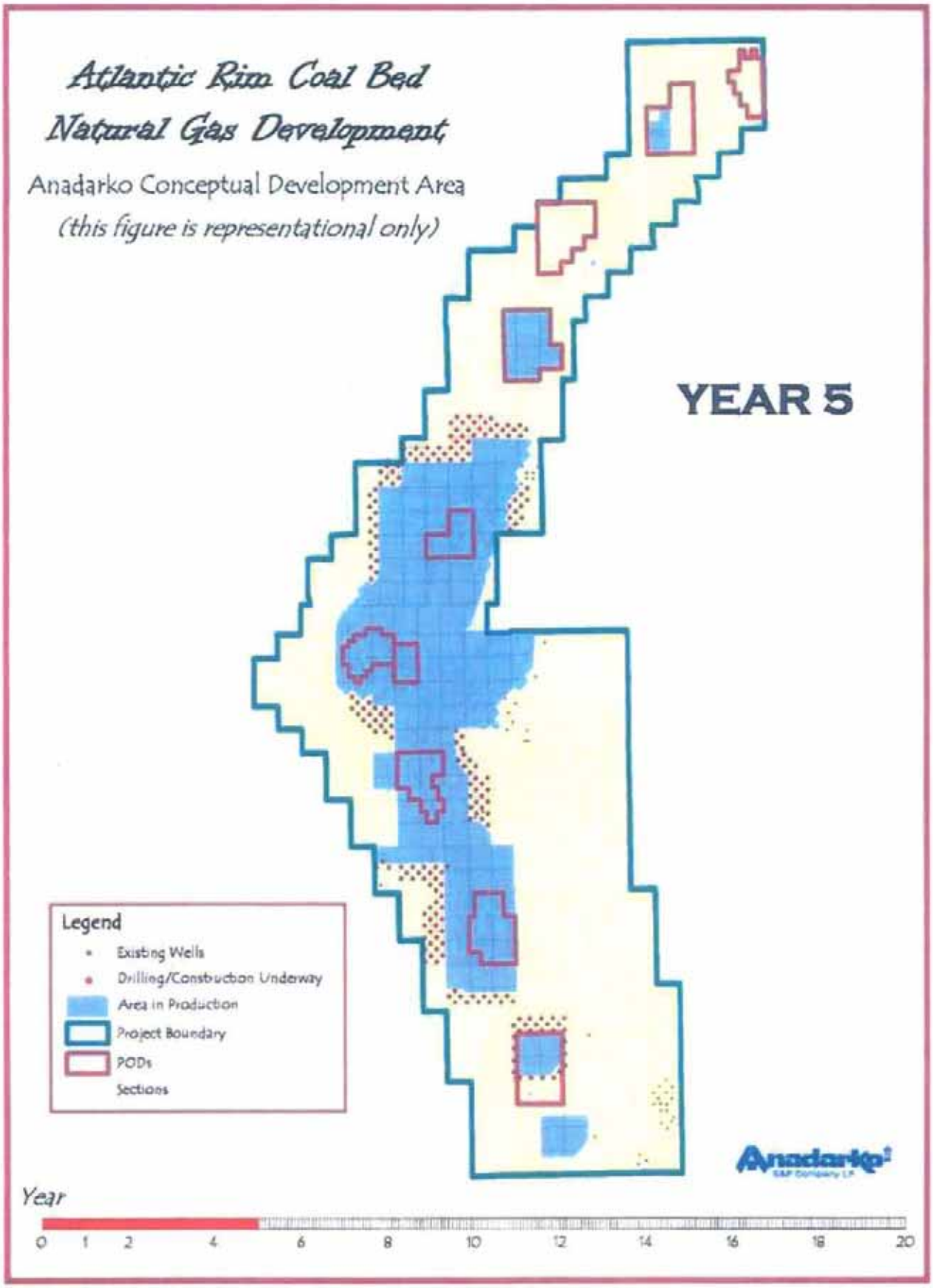
Atlantic Rim Coal Bed
Natural Gas Development
Anadarko Conceptual Development Area
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YEAR 5
Legend
Existing Wells
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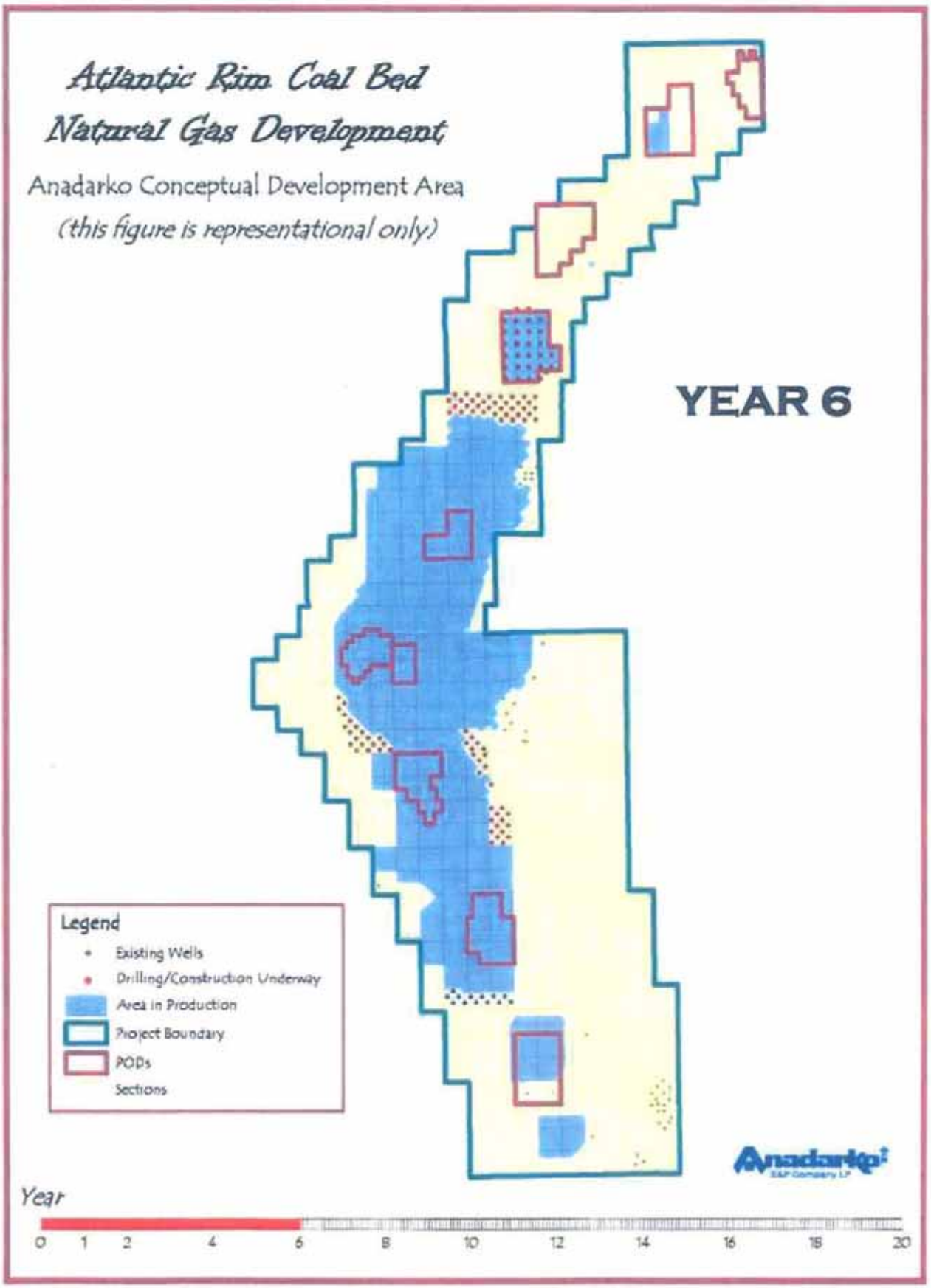
Atlantic Rim Coal Bed
Natural Gas Development
Anadarko Conceptual Development Area
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YEAR 6
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Existing Wells
Drilling/Construction Underway
Area in Production
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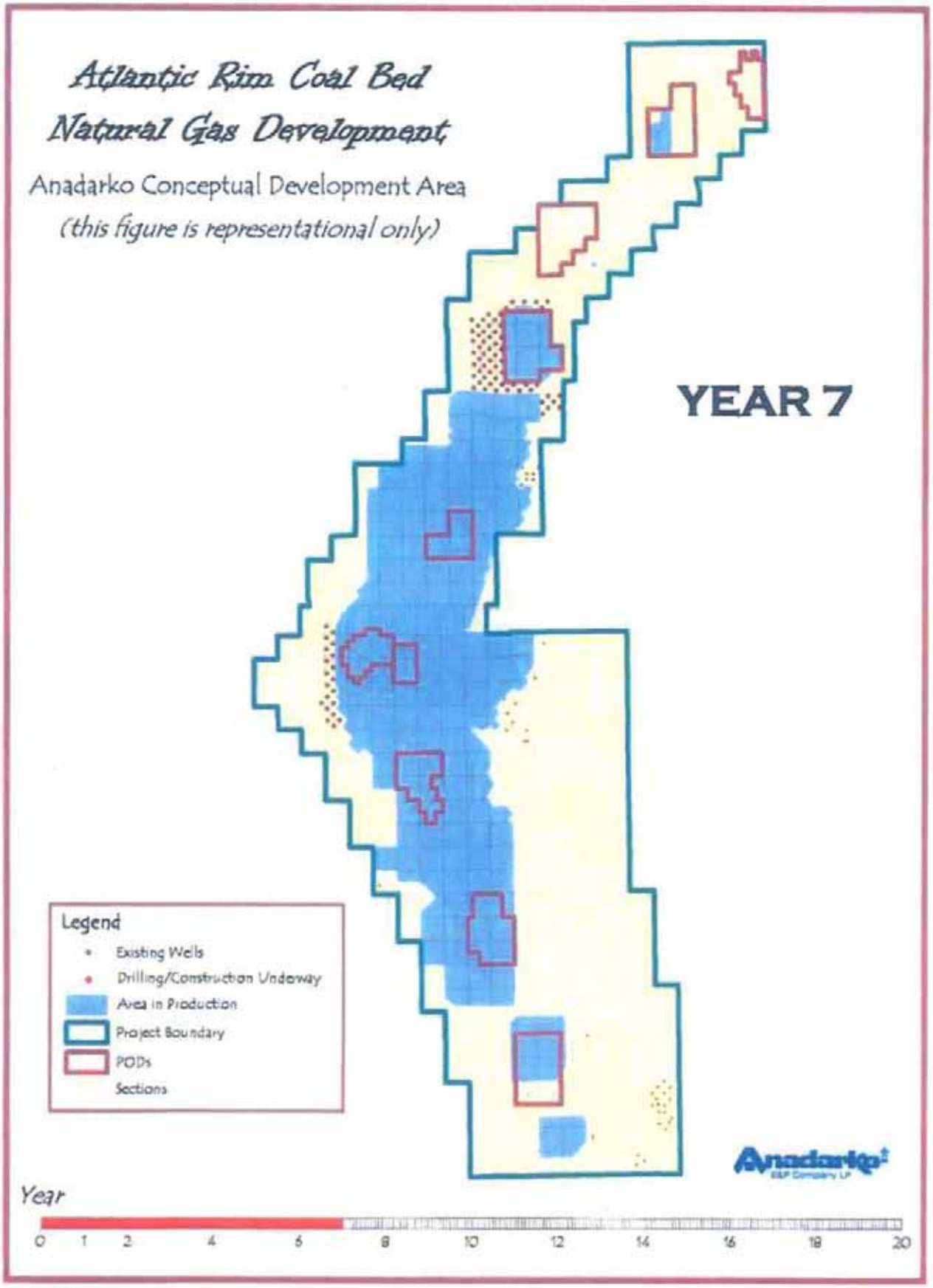
Atlantic Rim Coal Bed
Natural Gas Development
Anadarko Conceptual Development Area
(this figure is representational only)
YEAR 7
Legend
Existing Wells
Drilling/Construction Underway
Area in Production
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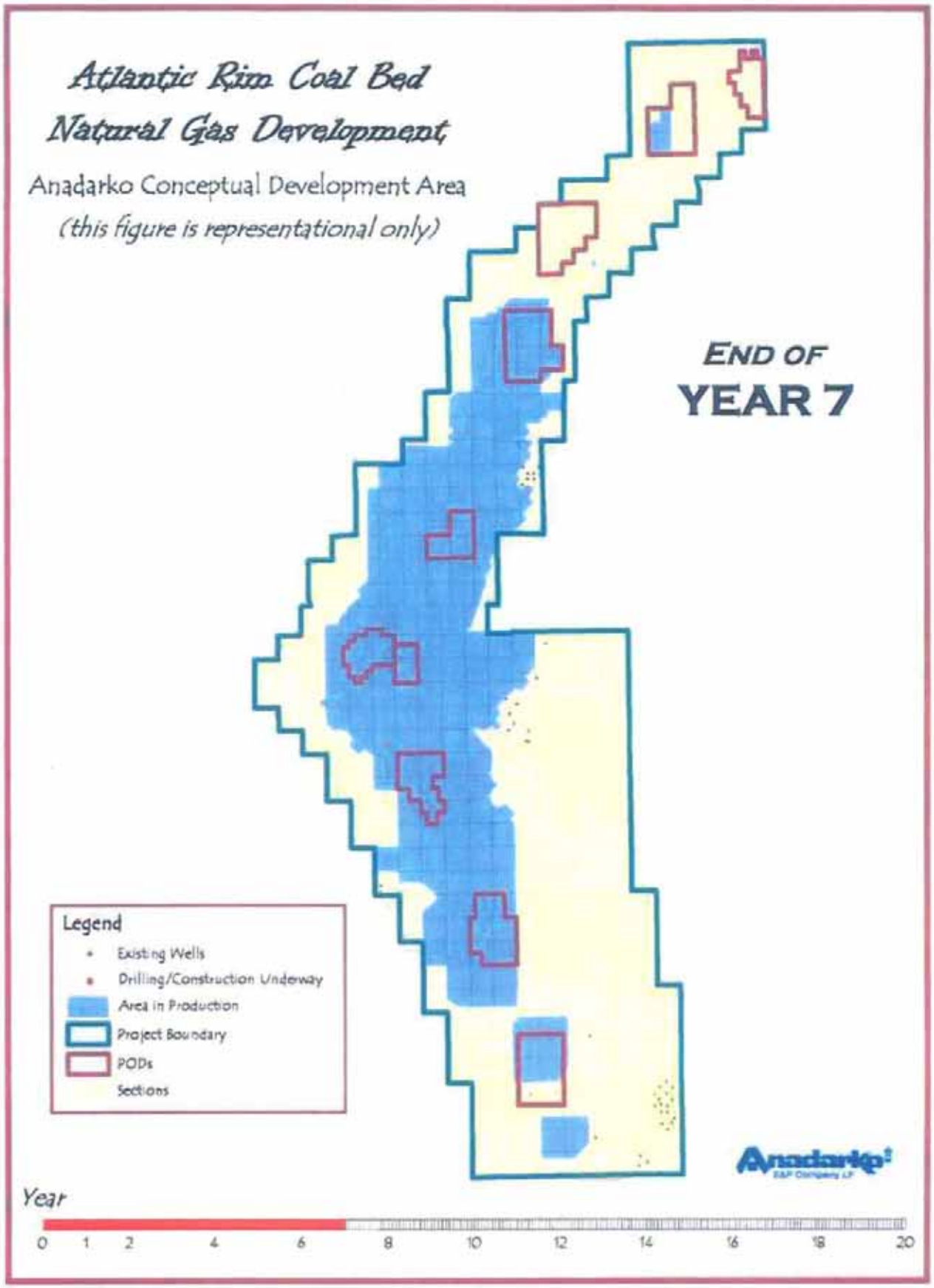
Atlantic Rim Coal Bed
Natural Gas Development
Anadarko Conceptual Development Area
(this figure is representational only)
END OF
YEAR 7
Legend
Existing Wells
Drilling/Construction Underway
Area in Production
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Memorandum

To: Field Manager, Rawlins Field Office

From: Chief, Reservoir Management Group, Wyoming State Office

Subject: Economic Development of Coalbed Natural Gas, Pertaining to Spacing and Directional Drilling in the Atlantic Rim Natural Gas Development Area

The Reservoir Management Group, Wyoming State Office, has prepared the attached report addressing the economic issues regarding coalbed natural gas well spacing and directional drilling in the Atlantic Rim Coal Bed Natural Gas Development area.

If you have any questions, please call Lee Almasy (307) 261-7628 of this office.

Attachments

cc: Alan Rabinoff (WSO-920) w/report

EUR - Estimated Ultimate Recovery

Reservoir Management Group, Lee Almasy, Petroleum Engineer, June 16, 2005

Economic Development of Coalbed Natural Gas, Pertaining to Spacing and Directional Drilling in the Atlantic Rim Natural Gas Development Area

Summary and Conclusions:

Rawlins Field Office has asked that the Reservoir Management Group (RMG) answer the following questions.

Q1: Can the coalbed natural gas (CBNG) resources in the modified study area be economically developed with 160-acre spacing?

160-acre well spacing for CBNG development in the Atlantic Rim Area (AR Area) is possible only under very special geologic conditions. As a general rule, existing production data suggests that 80-acre well spacing is the best standard well spacing. It is the local geologic setting that must be considered.

Q2: If the project area requires 80-acre spacing, can the project be developed economically utilizing directional drilling techniques?

Directional drilling does not appear to be a viable technical or economic alternative. Directional Drilling would require a severe deviation angle (49 degrees) and this presents both drilling difficulties and operational difficulties. In addition to these difficulties, the range and variation in estimated ultimate recoveries (EUR) in this area would make directional drilling (when considering the extra cost associated with it) an economic burden that would jeopardize many of the proposed wells' economics.

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  - **1. The 'Cumulative Produced Water' Approach:**
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  - **- Localized Assessments (examples) of Vertical Water Influx**

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8) Sun Dog Unit
9) Blue Sky Unit
10) Doty Mountain Unit
11) Brown Cow Unit

Attachments:

No.1 - Atlantic Rim Type Well Log (Federal 1691-16-8,)
No.2 - 'Z-Pinnate' drilling system discussion
No.3 - Diagrams of Directional Well's deviation angles and bottom-hole departure

References:

Discussions

Q1: Can the coalbed natural gas (CBNG) resources in the modified study area be economically developed with 160-acre spacing?

Issues regarding the geology of the target coal seams need to be addressed. Specifically, the Meservede Group of coals in the Atlantic Rim (AR) Area are thin and discontinuous and thus, the probability of 'missing' a coal seam with a well borehole increases with larger well spacings. A well spacing area of 160-acres may be too large and may compromise the full exploitation of the CBNG resources in the AR Area.

A CBNG well has to have the ability to de-water a coal seam. The physical ability of a well to drain an area involves several factors which includes having sufficient permeability in the coal seam to permit the pumping of water from the coal's natural fracture system (de-watering). The de-watering process is responsible for the initiation of the gas desorption process from the coal seam's matrix. The area of gas desorption that is associated with a CBNG well's gas production is the 'drainage area'. The value of the well spacing area should be sized to be equal to the drainage area in order to fully exploit the CBNG resources for the developed area.

The drainage area of the existing wells in the Cow Creek Unit is estimated to be 60 to 112 acres. Drainage areas were estimated using two approaches, the 'Cumulative Produced Water' approach and the 'Gas Content' approach. Both approaches use a generalized mass balance in which broad assumptions regarding reservoir parameters are made. These simple calculations regarding drainage areas do not take into account unexpected water influx sources such as 'vertical water influx' from adjacent over-laying or under-laying formations. The effect of 'vertical water influx' in CBNG production reduces the effective drainage area by limiting and/or reducing the effect of pressure reduction in the coal that the de-watering process creates. There are four wells assessed in this report where we considered localized assessments of 'vertical water influx', two of which show the lack of 'vertical water influx' when 40-acre well spacing is used and two other wells where the presence of 'vertical water influx' appears to be curtailing gas production. Whenever large well spacings (160-acres) are used, the probability of 'vertical water influx' increases. As a result, 80-acre spacing is recommended as a 'standard well spacing' for the AR Area.

Other factors influencing a well's de-watering effort is the well placement in the development area. If a CBNG well is isolated (i.e. not part of a developed CBNG area) or is located on the boundary of a development area (a boundary well), then that well's de-watering effort may never result in a significant gas desorption area. The influx of water from outside the developed area may overwhelm the well's ability to produce the influx of water. This would result in an insufficient pressure reduction in the coal and hence no (or very little) gas desorption would occur. CBNG wells located in the interior portion of a developed area will benefit from the boundary wells interception of the influx water and will have more effective de-watering ability and associated drainage areas. At this time, the AR Area CBNG development is young and without large development areas. Therefore, the existing wells do not benefit from the boundary wells to the extent that CBNG wells in developed areas enjoy

such as CBNG wells in the eastern portion of the Powder River Basin (PRB). Should CBNG well counts in the existing units increase (and thus ratio of boundary wells-to-interior wells decreases), then well spacings of 160-acres might be possible in the interior of unit. But at this time, 80-acre spacing is again recommended as a standard value of well spacing.

Q2: If the project area requires 80-acre spacing, can the project be developed economically utilizing directional drilling techniques?

A directional well for this purpose means a well drilled where the bottom-hole location has been directed to be displaced from the surface location such that there is a horizontal displacement of hundreds (or thousands) of feet and a deviation angle less than 75 degrees. The deviation angle is the angle between the trajectory of a vertical borehole and the directional portion of the borehole (which begins at the kick-off point, from the vertical borehole). Typically deviation angles are less than 30 degrees for directional wells. Directional wells are not the same as horizontal wells. A horizontal well's borehole penetrates a target formation such as to be situated parallel and located within the target formation. Horizontal CBNG wells do have dramatically improved productivity and reserves but the thin and discontinuous nature of the Meseverde Coals when combined with the dramatically higher drilling and completion (D&C) costs of horizontal wells prevent their application in the AR Area doubtful. Directional wells are not advisable because of the higher D&C costs, the lower gas recovery efficiencies (ref.1), and operational difficulties involved with de-watering the well using artificial lift (i.e. high tubing failure rate).

Estimations for original gas in place (OGIP) ranges for a 80-acre tract having a thickness of 20.5 feet (the average coal thickness for a Cow Creek well), having a gas content of 143.5 scf /ton is 0.4098 BCF. Cow Creek wells produce from the Almond Coal of the Meseverde Group of coals. Gas content values for the Almond range from 21 to 266 scf/ton (ref.2)and the 143.5 scf/ton value used here represents an average of this range. If a 70 % 'typical' recovery factor is assumed, then an estimated ultimate recovery (EUR) of 0.2869 BCF is calculated for an 80-acre spacing unit (or tract). This is an average value based upon limited data. It is possible the range of EURs may be from 0.1 to 1.0 BCF.

The economics of AR Area CBNG wells involves D&C costs and infrastructure investments. The CBNG wells in the AR Area cost approximately $900,000 for a directional well. This includes a $700,000 D&C cost and a $200,000 infrastructure cost. The infrastructure costs include the purchase and operation of electrical generation equipment and the costs associated with drilling water disposal/injection wells and associated injection pumps costs. The AR Area infrastructure is not well developed and accounts for extremely high development costs and operating costs when compared with the PRB.

It is estimated that a economic 'break-even' gas recovery for a vertical well is 0.23 BCF and for a directional well is 0.30 BCF. Recall that the estimation for average EURs for an 80-acre tract is 0.2869 BCF so, drilling of directional wells is not economic.

Technical Analysis

1) Geologic Concerns:

Currently, there is CBNG production from the Mesaverde Group of coals (mainly the Almond and Allen Ridge Formations). Structurally, the Mesaverde outcrops on its eastern flank and dips down to the west (8 to18 degrees). The discontinuous nature of these coals would suggest that the probability of a borehole 'missing' a coal seam increases with larger well spacing (e.g. 160 acre spacing). Attachment No.1 is a 'type log' for the AR Area.

2-A) The Ability of a CBNG Well to Dewater a Coal Seam:

The physical ability of an economic CBNG well to drain an area involves several factors. A coal seam must have sufficient permeability to permit the pumping of water from the coal's natural fracture system (de-watering). The de-watering process reduces the pressure in the coal's fractures which initiates gas desorption process from the coal matrix. The rate of de-watering (and resulting drainage area) is constrained by the coal permeability and the degree of 'vertical water influx' from possible adjacent overlying aquifers. The Meseverde coals have good permeability (estimated to be 100 milliDarcies) and good gas content (21 to 295 scf/ton (ref.2)). These coals in general are gas saturated and will thus produce gas from beginning of production and will result in a short (or no) de-watering period for these wells. This will help the operators economically by eliminating the wait for a positive cash flow.

2-B) What is the Drainage Area of the Existing Wells?

Two approaches will be used here to estimate drainage areas. One approach will be based upon the produced cumulative water volume (the 'cumulative produced water' approach) and the other method will use gas contents of the coal and gas EUR (the 'gas content').

2-B.1) The 'Cumulative Produced Water' Approach:

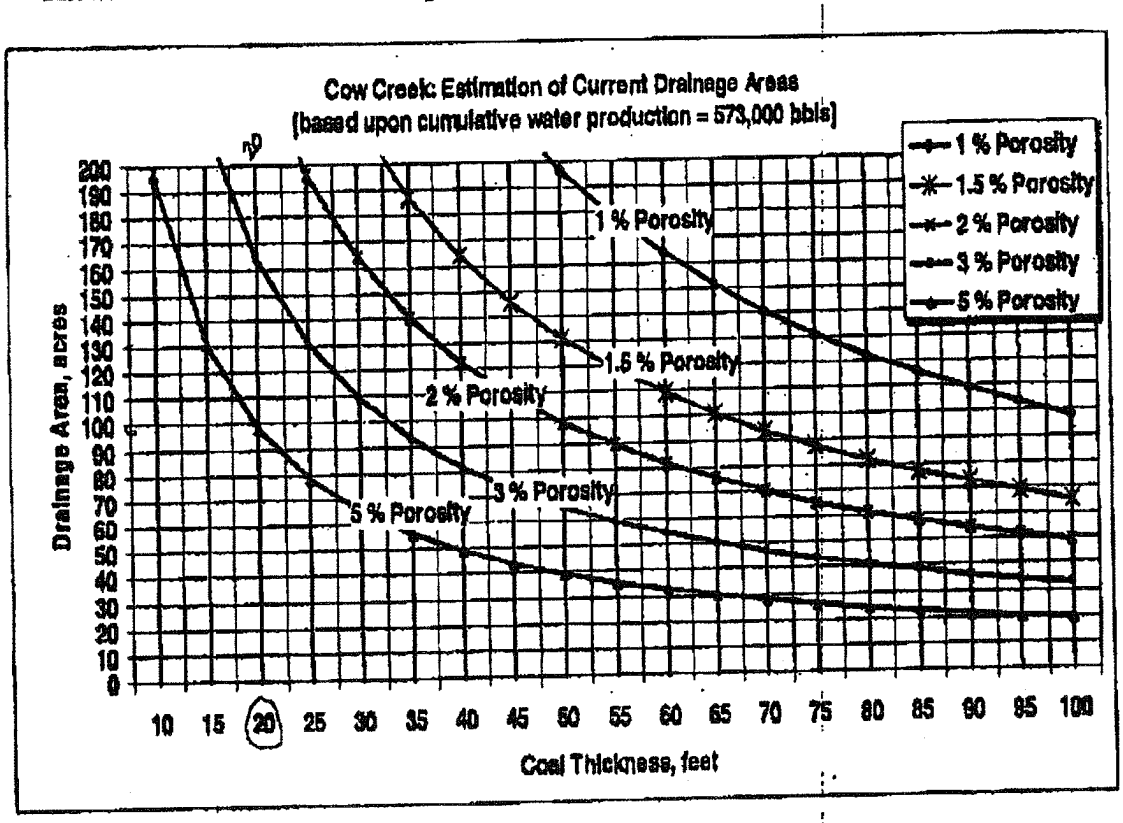
In the 'cumulative produced water' approach it is assumed that the pore volume is represented by the volume of the coal's natural fracture cleat system. This pore volume is assumed to be 100% saturated with water and 75% of this water will be produced by the CBNG well. The 75% water recovery factor assumes that there will be some irreducible water saturation. The following equation will be solved for area (A), the area which is required to hold the produced amount of water for a given coal thickness and porosity.

$$Wp = 7758 \times A \times H \times \text{Porosity} \times 0.75, \quad \text{(75 \% of the initial water in place is produced)}$$

where: Wp = cumulative water production, bbls
A = area, acres
H = coal thickness, feet
Porosity = coal porosity (= cleat volume / bulk volume)

Reservoir Management Group, Lee Almasy, Petroleum Engineer, June 16, 2005

The following chart is a graph of estimated current drainage areas as a function of coal thicknesses for various coal porosities (and assumes a cumulative produced water of 573,000 barrels of water which is the average cumulative produced water for a Cow Creek Unit well.



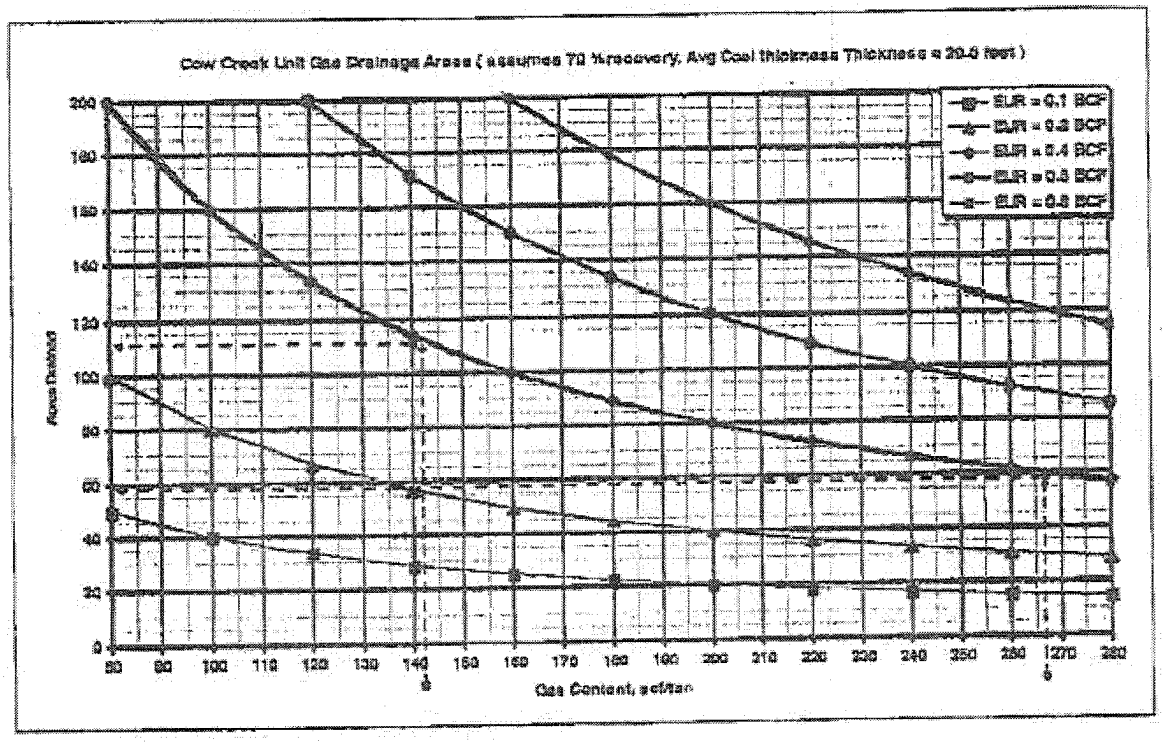
The porosity of the Mesaverde coals is not known. Typically CBM porosities range from 0.1 to 2.0 %. For the Powder River Basin (PRB) coals, estimations for coal porosity values range from 1 % to 5 %. The average perforated thickness for wells in the Cow Creek Unit is 20.5 feet. To get an idea what the drainage are might be for a average Cow Creek Unit well, using this graph and porosity values of 1 % to 5 %, a net coal thickness of 20.5 feet and a cumulative 573,000 bbls, then a range of 'average' drainage area estimates is calculated to be from 99 to 492 acres. Although, these drainage areas are quite large, we must consider other factors. They do not represent the final drainage areas for the AR area. This approach uses the 'cumulative produced water' to calculate the drainage area.

If reservoir simulation models were constructed and 'history matches' were to suggest higher porosity values (i.e. > 2 %), then this would indicate that a portion of the produced water may be coming from other sources (e.g. 'vertical water influx'). Porosity values of the Mesaverde coals need to be determined using pressure transient testing and reservoir simulation in order to improve the accuracy of these estimates.

2-B.2) The 'Gas Content Approach':

For estimations of an average Cow Creek Unit well's drainage areas based upon the 'gas content approach, we use the following equation and the results are in the following graph.

EUR = 0.70 x area x Thickness x 1,741 tons coal/acre-ft x Gas Content scf/ton



This approach calculates the drainage area based upon 'gas content' of the coal, net coal thickness, and a recovery factor. Limited core samples have been gathered for Cow Creek Unit wells and the gas content ranges from 21 to 266 scf/ton for the Almond Coal (all wells in the Cow Creek Unit are producing from only the Almond Coal). Using the above graph, drainage areas of 60 acre is estimated (assuming a gas content of 266 scf/ ton) or 112 acres (assuming a gas content of 143.5 scf/ton which is the average of the gas content range for the core sample from the Almond Coal).

The Original-Gas-In-Place (OGIP) for a 40-acre tract having a thickness of 20.5 feet and a gas content of 143.5 scf /ton is 0.2049 BCF and 0.3797 BCF if a gas content of 266 scf/ton is assumed. Using the optimistic estimate of OGIP (0.3797 BCF) and multiplying it by 0.7 (a 'typical' recovery factor) then an optimistic gas reserve of 0.2659 BCF is calculated for a 40-acre tract. The average EUR for a Cow Creek Unit well has been estimated to be 0.4 BCF. Clearly the average range of drainage areas for the Cow Creek Unit shows that more than 40-acres is being drained.

In comparing the drainage areas calculated using the 'cumulative produced water' and 'gas content' approaches, there is a significant difference. From a cylindrical void point of view, the 'gas content' approach's estimation of the gas drainage area is probably more accurate (112 acres). The cylinder void method yields drainage areas that are conservative. This approach assumes the gas content in the gas drained area is at an abandonment 'gas content' value then abruptly jumps up to the initial gas content, at the boundary between the drained and un-drained gas region.

The 112 acre drainage area value would be a conservative estimate from a real reservoir point of view. If the drainage area value of 112 acres is our best interpretation and this value is compared with the drainage area calculated from the 'cumulative produced water' approach (which has a value in excess of 200 acres when a coal porosity of 1.5 % is assumed), then it is safe to say that there is a significant portion of the cumulative (83%) produced water originating from outside the 40-acre well spacing area. It is plausible that 160-acre spacing could be implemented if the local geology permitted (i.e. if there is no 'vertical water influx' from adjacent overlying aquifers). Without this kind of specific localized geologic knowledge, it is suggested here that the 80-acre well spacing is a standard well spacing.

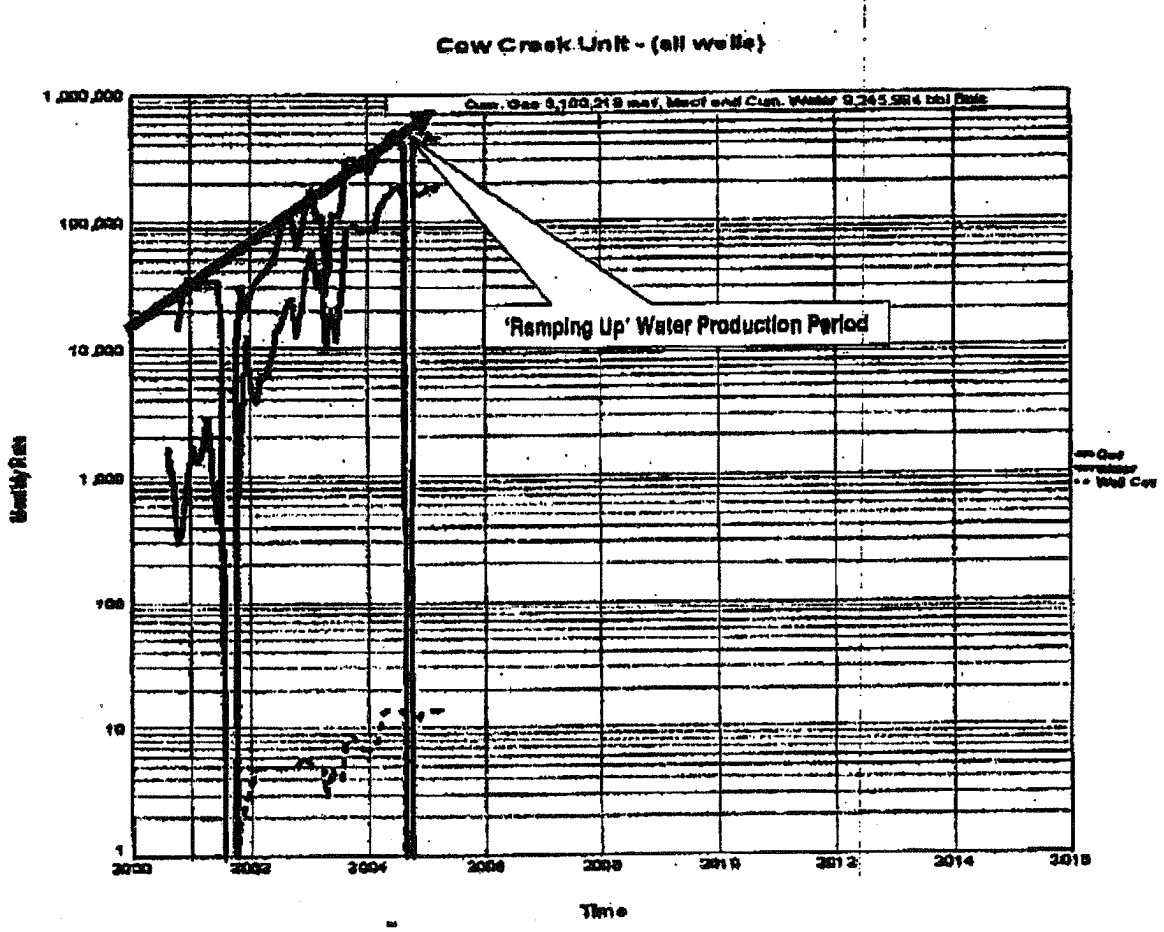
2-C) The Role of 'Vertical Water Influx' in Reducing Drainage Areas

Vertical water influx has been a limiting factor in some of the well spacing of CBNG wells in the PRB and has resulted in well spacing as low as 40-acres. If the total water influx is greater than a de-watering CBNG well's water production rate, then the diffusion of gas from the coal's matrix will not occur and gas production will cease.

'Vertical water influx' may be inferred from the rate-time production histories of water and gas (ref.3). In a well that is not experiencing vertical water influx, the water production rate should decline and the gas production rate should be increasing 'ramping up'. The production histories on the following three graphs are not mature. There is no gas production rate decline history to conclude (or exclude) the possibility that vertical water influx is occurring at this time, on a 'unit wide basis'. There are a few well histories where it may be possible to quantify the existence of localized vertical water influx and they will be discussed later in this report.

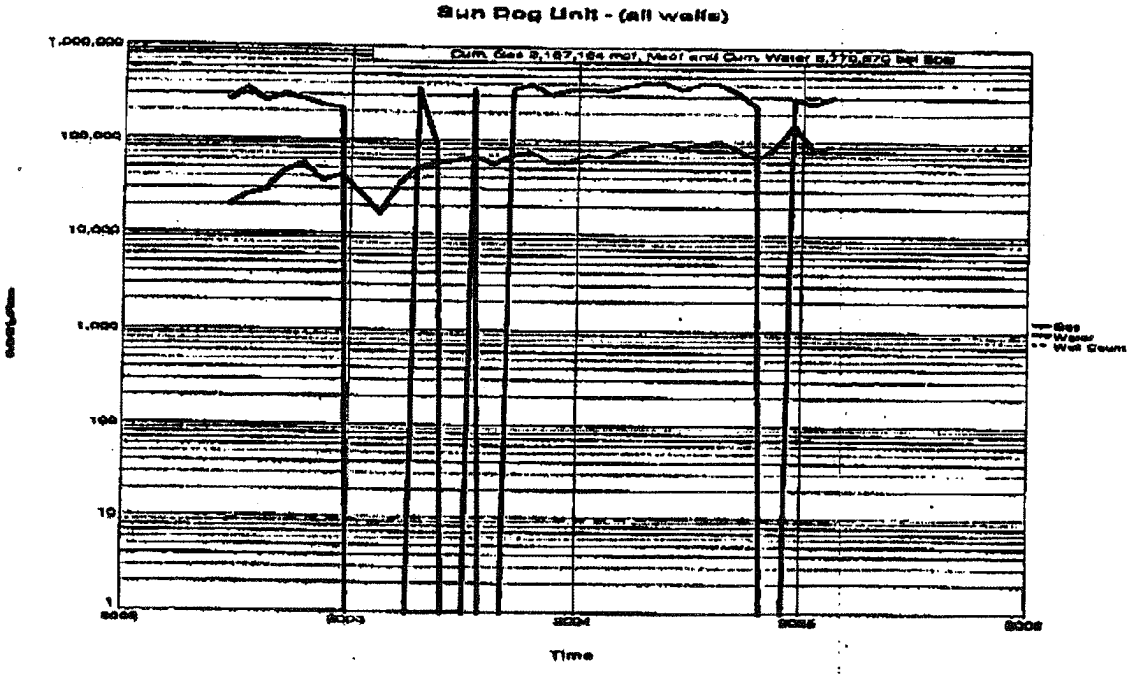
Reservoir Management Group, Lee Almasy, Petroleum Engineer, June 16, 2005

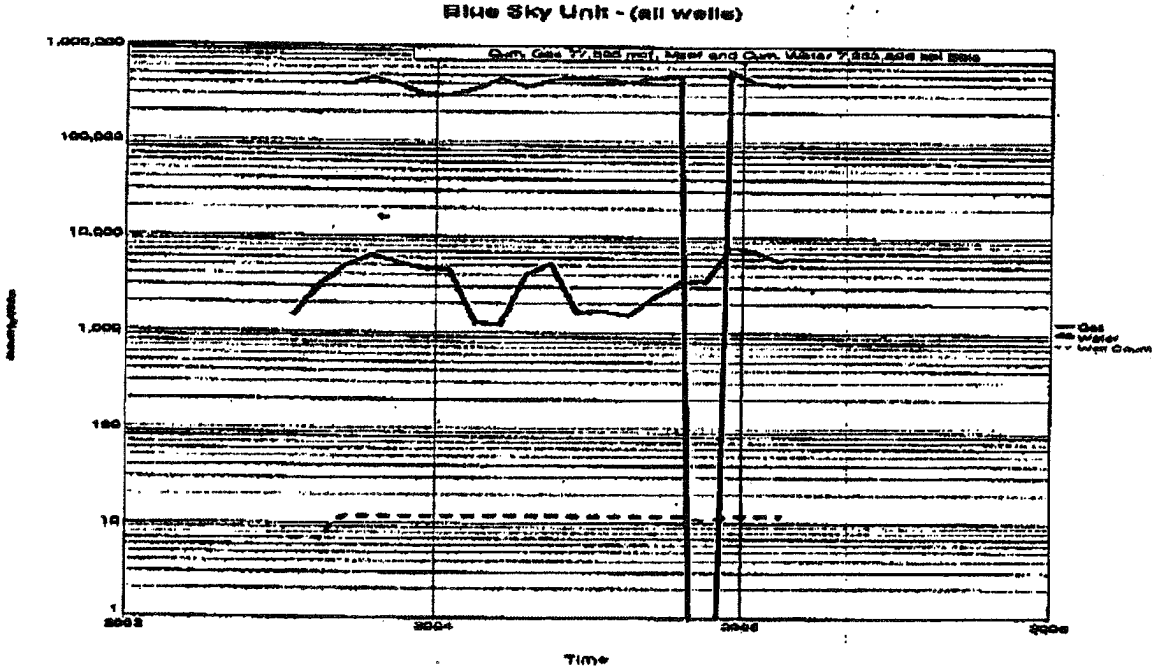
The following graph indicates the production in the Cow Creek Unit is still young and is 'ramping up'.



Reservoir Management Group, Lee Almasy, Petroleum Engineer, June 16, 2005

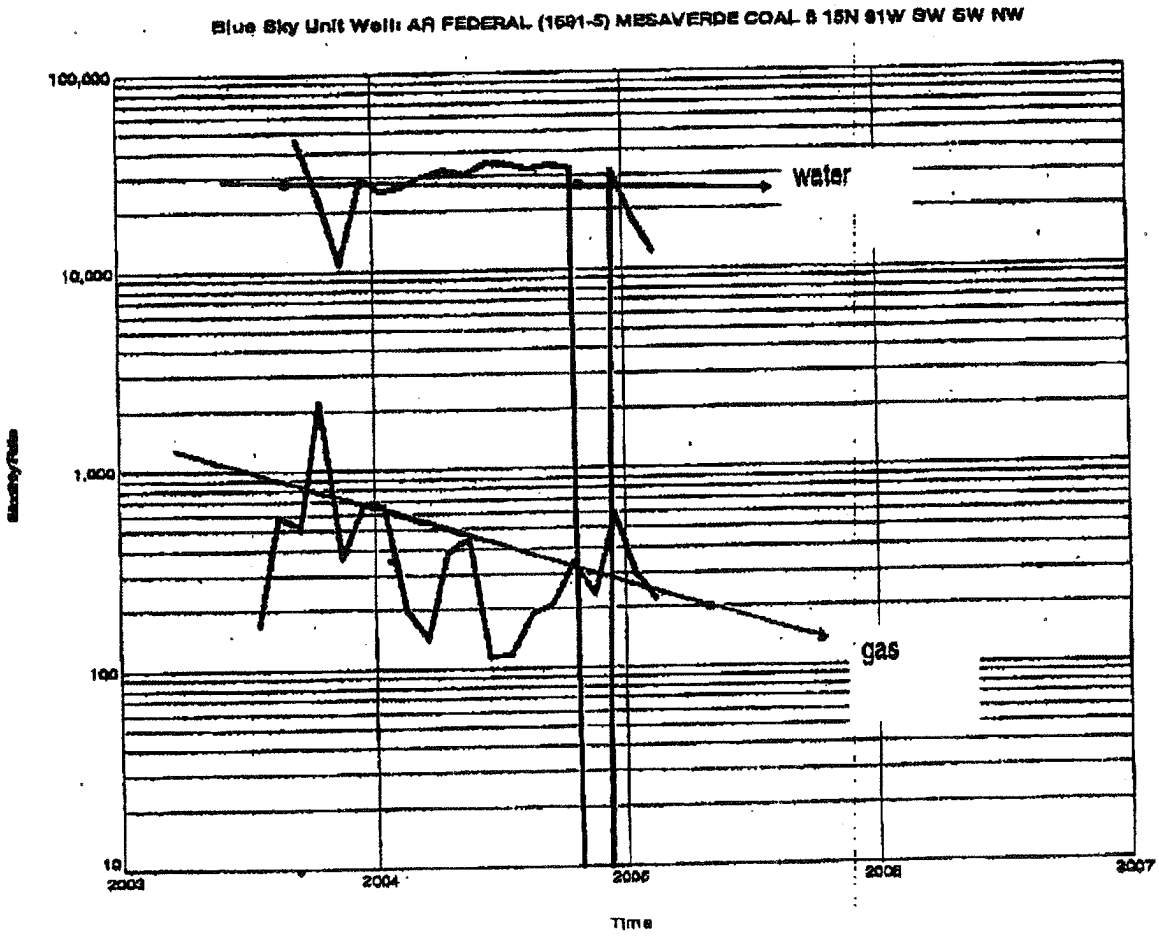
Production in the Sun Dog and Blue Sky Units and is also 'ramping up' (following two graphs).

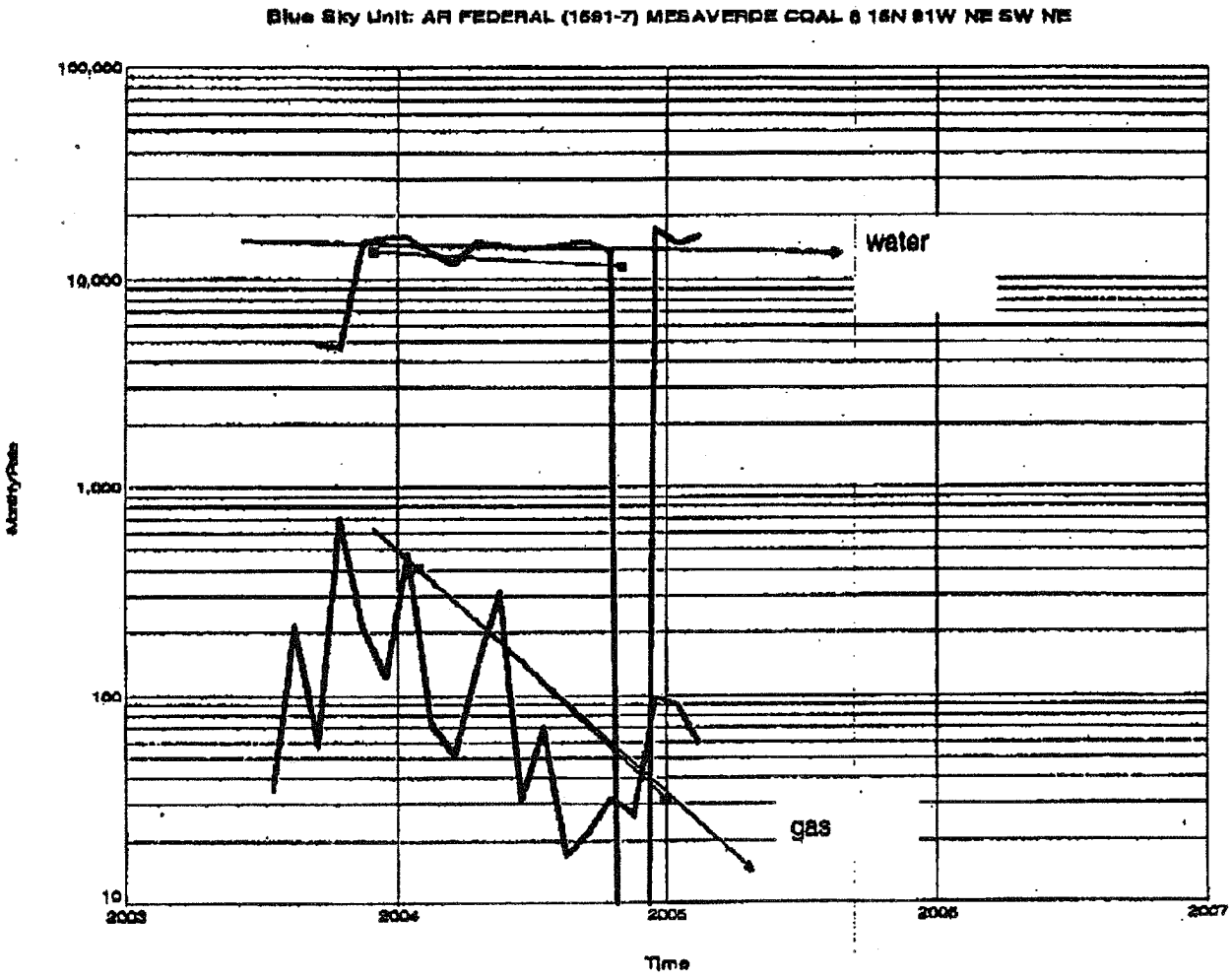




2-C.1) Localized Assessments of Vertical Water Influx:

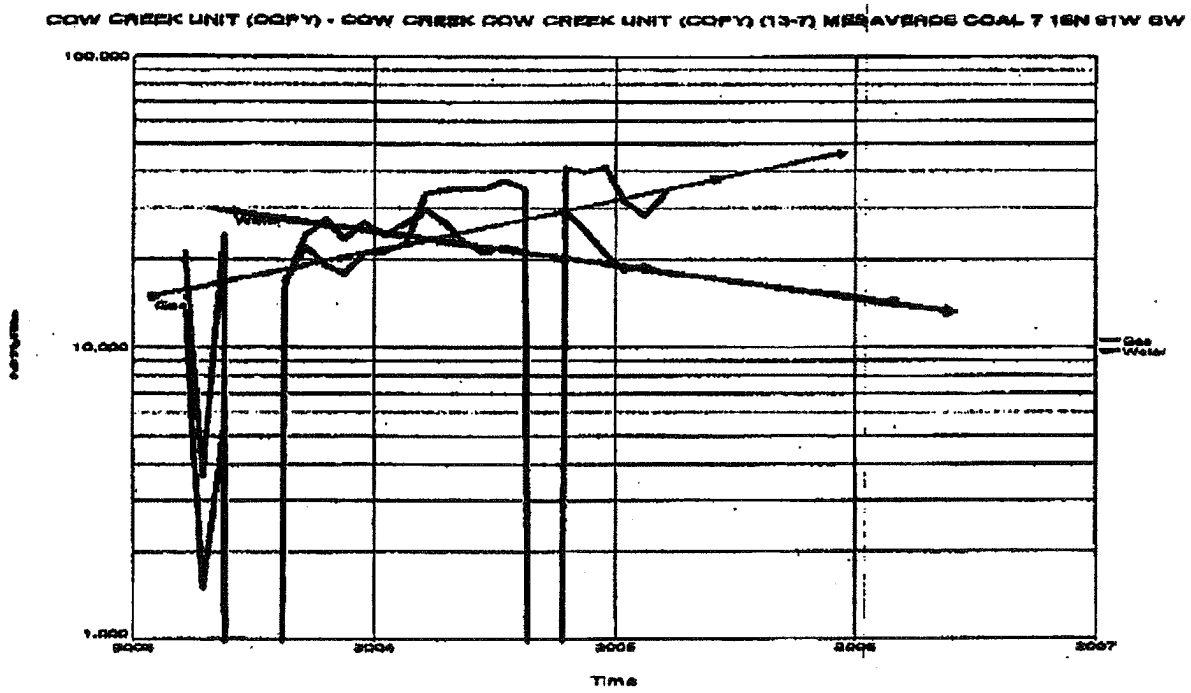
Of the individual wells production histories, the following production histories for two wells in the Blue Sky Unit were selected because they show some signs of vertical water influx (declining gas rates, steady water production and low peak gas rate, (ref. 3)). The current well spacing for this unit is 80-acre. CBNG recovery from the Blue Sky Unit recovery may be influenced by 'vertical water influx' in which case recovery will be significantly reduced. This statement assumes that the initial gas content for the individual wells was good (e.g.143.5 scf/ton or greater). Switching to 40–acre spacing in this particular unit would increase gas recovery. The following two graphs suggest the possibility of 'vertical water influx' for two Blue Sky Unit wells.

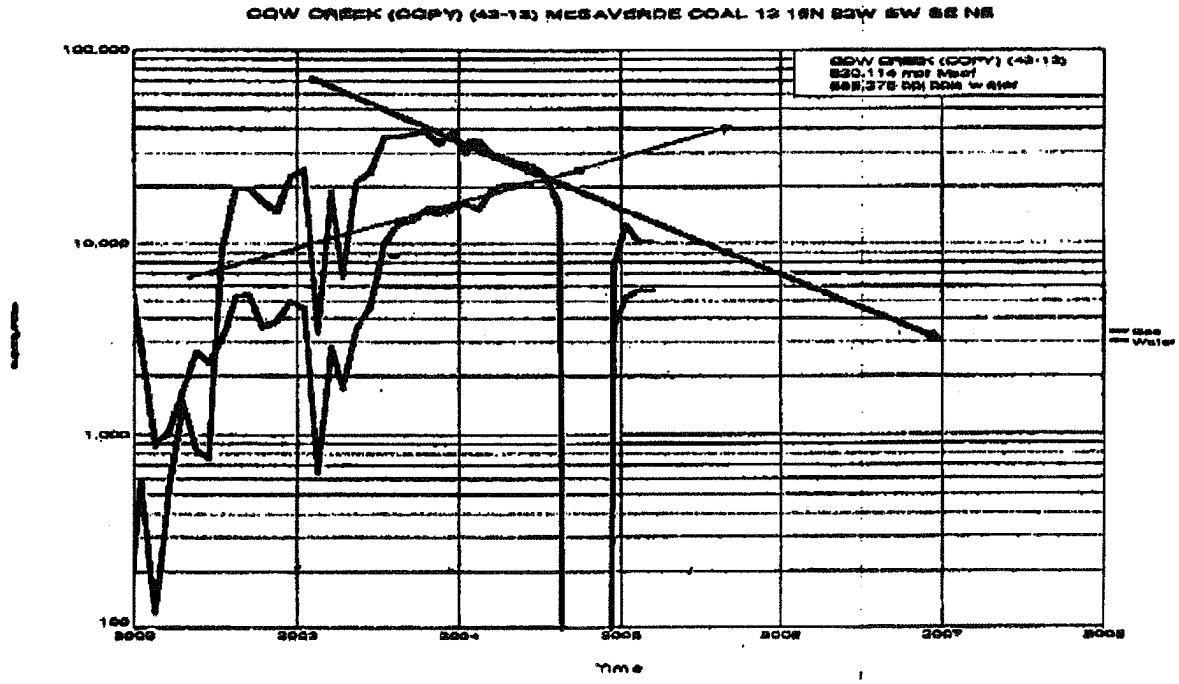




In comparison, the following two production history graphs for two Cow Creek Unit wells suggest that there is little or no 'vertical water influx' occurring (gas production is increasing and the water production is decreasing with time, (ref. 3)). This unit is spaced at 40-acres.

Reservoir Management Group, Lee Almasy, Petroleum Engineer, June 16, 2005





The majority of the Cow Creek Unit wells are still producing water (at rates in excess 1,000 bpd) and hence the 'current average' drainage area will continue to grow. Permeability in the Almond and Allen Ridge coals appear to be high and thus will permit coal seam de-watering at rates in excess of 1000 bpd.

3) The Role of Well Locations in the Dewatering:

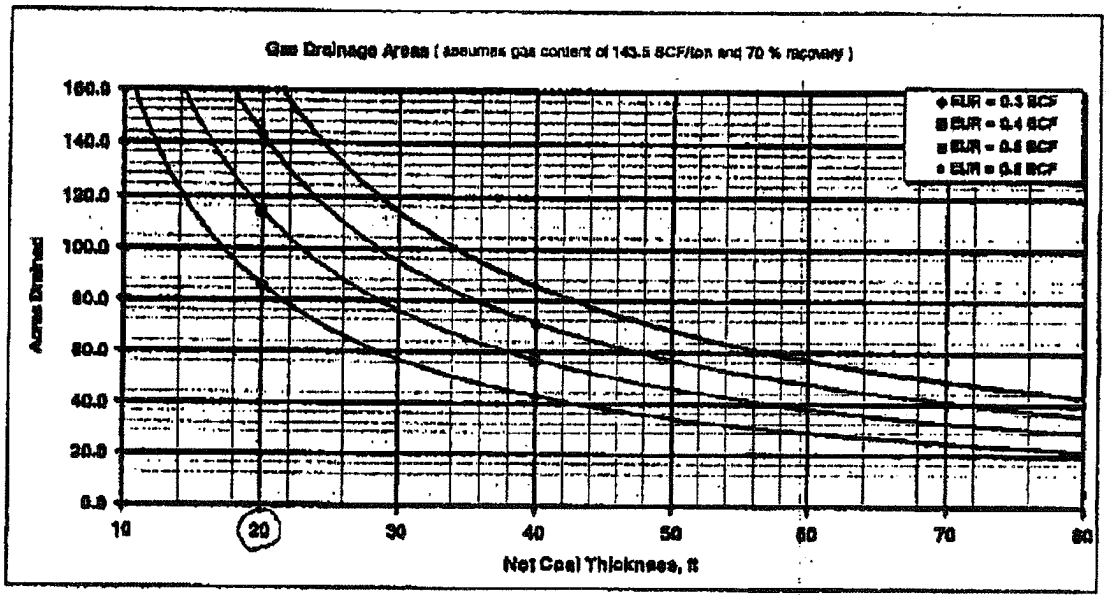
The 'drainage area' estimations are simple volumetric calculations and do not include the effects of any 'vertical water influx' (if any) or the geologic effect of well locations. The location of a well within CBNG development affects its ability to produce gas. If a CBNG well were located within the inner boundary of a developed area and vertical water influx was not occurring, then the simple volumetric approach used here would apply. If a well were located on the 'boundary' of a developed area (i.e. a 'boundary well'), then the water influx from outside the developed area would likely continue and the efficacy of the 'de-watering' of the 'boundary well' would be reduced significantly. If 'vertical water influx' is not a problem, then 160-acre spacing is plausible. Local geology must be evaluated for the presence of over-laying aquifers. The key issues associated with well spacing is the ability of a well to de-water the coal seam and EUR values.

4) CBNG Well Types:

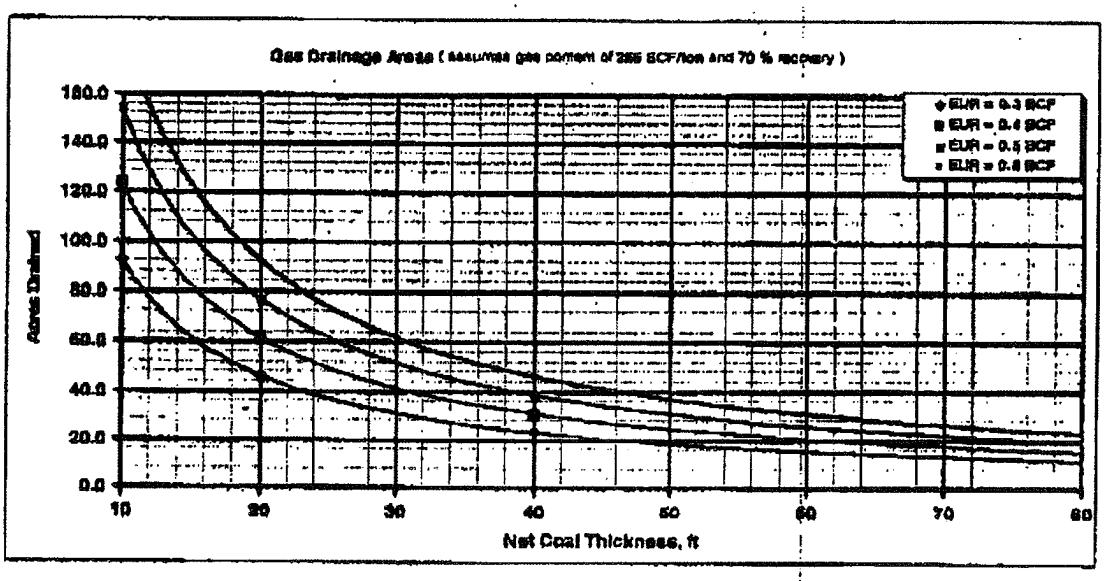
An economic analysis was conducted which assumed that two wells are drilled per 160 acres, one well vertical and one well directionally, both situated on the same drill pad. Directional wells in CBNG plays have historically (in the San Juan Basin) been shown to have lower productions rates and recoveries when compared to conventional vertical wells (ref.1). A directional well for this purpose means a well drilled where the bottom-hole location has been directed to be displaced from the surface location such that there is a horizontal displacement of hundreds (or thousands) of feet and a deviation angle less than 75 degrees. The deviation angle is the angle between the trajectory of a vertical borehole and the directional portion of the borehole (which begins at the kick-off point, from the vertical borehole). Typically deviation angles are less than 30 degrees for directional wells. Horizontal wells are not the same as directional wells. Unlike directional wells, a horizontal well's borehole penetrates a target formation such as to be situated parallel and located within the target formation. Horizontal CBNG wells do have dramatically improved productivity and reserves (ref.1), but is still a young technology. The drilling costs associated with horizontal wells are four times the cost of a vertical well. There is an environmentally favored drilling development plan called 'Z-Pinnate'. 'Z-Pinnate' system consists of drilling a central vertical well with a system of multiple lateral horizontal boreholes drilled from it (Attachment No.2). 'Z-Pinnate' system may drain as much as 1,200 acres from one central vertical borehole. At this point in time, the 'Z-Pinnate' system would not be considered to be an alternative.

5) Original Gas In Place (OGIP):

The following is a graph of volumetric estimates of OGIP for an average gas content of 143.5scf/ton and various coal thicknesses. Coal thicknesses and gas contents will vary. The following graph may be used to estimate gas drainage areas for various thicknesses.



The following is a graph of volumetric estimates of OGIP for a gas content of 266 scf/ton (upper limit) and various coal thicknesses.



6) The Economics of CBNG Wells in the Atlantic Rim:

6-A) Drill and completion costs for a 1,600 foot directional CBNG well

According to Double Eagle Petroleum, the typical cost to drill and complete a 1,600 foot vertical CBNG well in the Cow Creek Unit is approximately $450,000. Addition cost to directionally drill adds approximately $250,000 to the D&C costs. As a result the D&C costs for a directional well is $700,000. In addition, these wells require compression, electrical generation equipment, and re-injection of the produced water. This adds at least an additional $200,000 per well and brings the total cost for a vertical well (including production equipment) is $650,000. The total estimated drill and completion costs for a 1,600 foot directional CBNG well including production equipment is $900,000. The infrastructure costs include the purchase and operation of electrical generation equipment and the D&C costs associated with water disposal/injection and associated injection pumps. The AR Area infrastructure is not well developed and this results in extremely high development costs and operating costs.

6-B) Viability of Directional Wells in the AR Area

An extreme departure angle of 49 degrees would be required for a 1,600 feet deep borehole to obtain a 1,866 feet horizontal departure (figures in Attachment No.3) for a well to be drilled to an offset 80-acre tract. CBNG development in this area is relatively young (development beginning in 2001). To date, there have been no CBNG wells drilled directionally in the AR Area.

There are several issues regarding the viability of directional wells in this area. One issue is the deviation angle. The CBNG wells need to utilize artificial lift to produce the water. The use of rod pumping units is required. Submersible pumps and other artificial lift methods can not be used because problem of coal fines. Highly deviated boreholes can not utilize rod pumping because the there would be a high rate of tubing failure associated caused by the rods rubbing against the tubing. Operators in the San Juan Basin report drilling difficulties when the deviation angle exceeds 30 to 35 degrees (ref.1).

Studies of directional CBNG wells in the San Juan Basin (ref. 1) suggest that directional wells have lower productivity and EURs than conventional vertical CBNG wells located in adjacent leases.

The Meseverde coals in this area are thin and discontinuous and thus higher well densities (i.e.80-acre well spacing) will be required. The Meseverde coals' depths range from 1,000 to 3,000 feet and the distance between these thin coals is considerable (hundreds of feet) and thus it may necessary to perform multiple completions.

6-C) Cash flows for Vertical and Directional Wells:

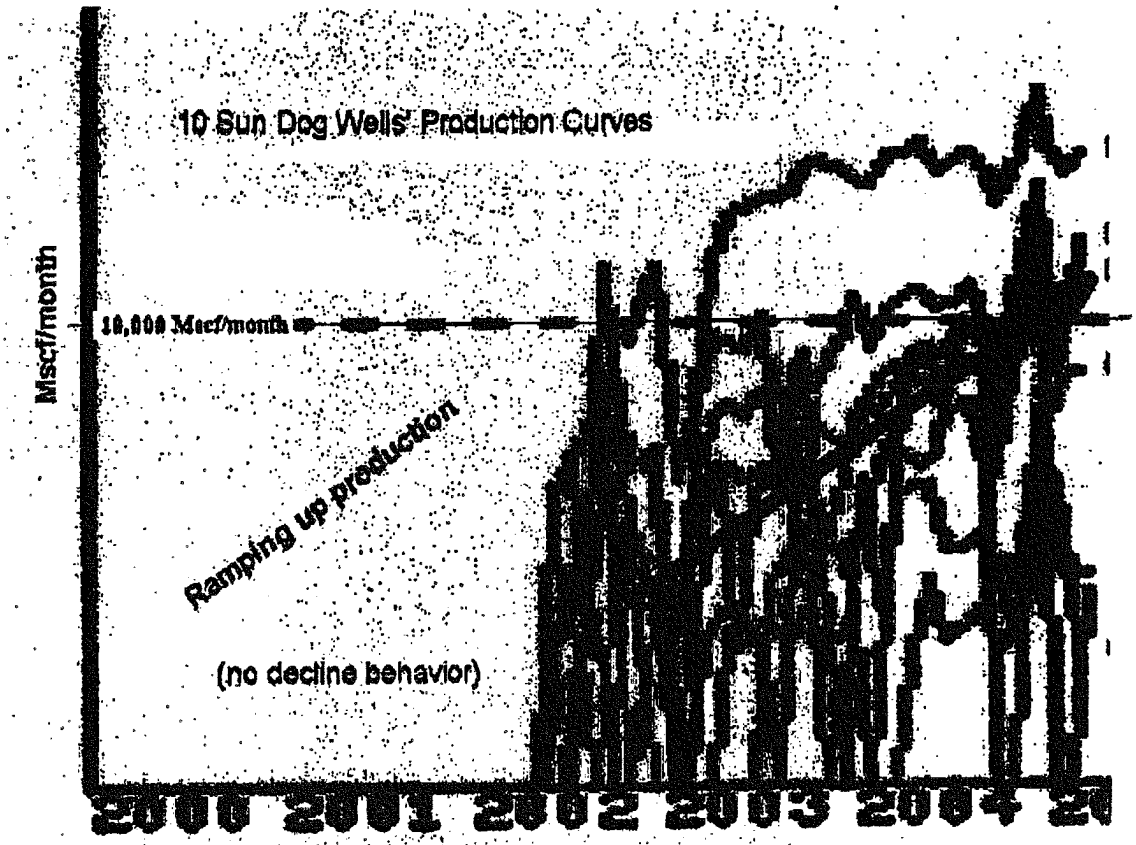
In order to get an idea of the economic viability of future CBNG wells economic analyses were conducted and estimates of 'break-even' EURs were calculated. In these analyses a 1,600 foot deep well was assumed and a drill and completion costs of $650,000 (for a vertical well) and $900,000 (for a directional well). It was estimated that an economic 'break-even' gas recovery volume is 0.23 BCF for a vertical well and 0.30 BCF for a directional well. The average EUR of all AR Area CBNG wells is about 0.250 BCF (for the 36 wells where EURs are estimations are possible). Drilling of directional wells does not appear to be profitable. It is not likely that directional wells in the AR Area would be viable as a result of the extra drilling expenses, drilling difficulties, and severe operational difficulties associated with rod pumping a highly deviated CBNG well.

Background of Existing Units:

The Atlantic Rim Coal Bed Methane development area is located in southwest Wyoming and is approximately 5 miles wide (R89W to R92W) and is 50 miles long (T13N to T20N, north-south). Currently, there is CBNG production from the Almond and Allen Ridge Formations of the Mesaverde group of coals.

Atlantic Rim CBNG development is relatively young, with gas production beginning in the year 2001. Of the producing units in the AR Area, only the Cow Creek and Sun Dog Units have enough production history for the purpose of estimating economic viability. These units' production histories were used for assessing the potential average estimated ultimate recovery (EUR) for an Atlantic Rim CBNG well. There are not any well defined production rate-time decline curves available for the Cow Creek or Sun Dog Units. The majority of these wells are in the ramp-up stage of production. The following figure illustrates the 'ramp up' gas production rate trends in the Sun Dog Unit utilizes all the individual well gas production curves.

Reservoir Management Group, Lee Almasy, Petroleum Engineer, June 16, 2005



Production data for the Sun Dog and Cow Creek units were gathered and rough estimates of EURs were made and used in our analysis. Both the Sun Dog and Cow Creek units have good average values for EUR and current cumulative gas production.

7) **Cow Creek Unit** is located T16N, R91-92W and targets the Almond Formation which has a depth range of 1,180 to 1,800 feet (average well depth 1,301 feet). There are 14 producing wells. CBNG is being developed on 40-acre spacing. This unit is located on a localized structural trap and hence the EURs in of these wells may be optimistic if used as a metric for estimating an average EUR for a typical Atlantic Rim CBNG well. The following table summarizes the production for an average well in the Cow Creek Unit.

Cow Creek Unit					
Wells in Averages	Average Date of 1st Production	Avgerage EUR, Mscf	Avg Cumulative Gas, Mscf	Avg Days Producing	Average Cumulative Water, Bbls
14	1/2/2003	412,051	184,503	875	573,026

The following table summarizes individual well productions for Cow Creek Unit.

Cow Creek								
API Number	1st Prod Date	T	R	S	EUR, Mscf	Cum Gas, Mscf	Days Producing	Cum Water, Bbls
49007223960000	4/1/2004	16	92	1	35,166	20,227	421	151,839
49007223680000	4/1/2004	16	92	12	36,220	22,824	421	138,866
49007223970000	4/1/2004	16	92	12	147,751	44,615	421	220,386
49007219200000	1/1/2002	16	92	12	184,072	136,112	1242	849,934
49007050940001	8/1/2000	16	92	12	205,620	91,385	1760	1,580,681
49007219210000	11/1/2001	16	92	12	254,171	193,318	1303	468,696
49007223230000	11/1/2002	16	91	7	316,339	142,519	938	558,357
49007221570000	4/1/2004	16	91	7	360,981	85,465	421	164,431
49007219190000	12/1/2001	16	92	12	423,187	308,670	1273	667,794
49007223950000	4/1/2004	16	92	12	485,826	99,360	421	257,358
49007223310000	8/1/2003	16	91	6	501,506	207,832	665	911,357
49007219180000	2/1/2002	16	92	12	610,632	263,936	1211	547,399
49007223320000	11/1/2002	16	91	7	1,100,045	475,198	938	1,071,791
49007221560000	3/1/2003	16	91	7	1,107,201	491,588	818	433,487

8) Sun Dog Unit is located in T16N, R91W and targets the Almond and some Allen Ridge Formations which have a depth range of 800 to 1,000 feet. This unit has 10 producing wells and the cumulative production is 1.726 BCF and 7.49 millions barrels of water since production began in 2003. The estimated ultimate recovery (EUR) for these 10 wells is 0.389 BCF per well. Both water and gas production began at the same time which suggests these coals are saturated with gas. CBNG is being developed on 40-acre spacing. The following table summarizes the production for an average well in the Sun Dog Unit.

Sun Dog Unit					
Wells in Averages	Average Date of 1st Production	Average EUR, Mscf	AvgCumulative Gas, Mscf	Avg Days Producing	Average Cumulative Water, bbls
10	6/4/2002	389,474	189,650	1088	807,742

The following table summarizes individual well productions for Sun Dog Unit.

Sun Dog Unit								
API Number	1st Prod Date	T	R	S	EUR, Mscf	Cum Gas, Mscf	Days Producing	Cum Water, Bbls
49007219350000	6/1/2002	16	91	8	116,026	57,860	1091	545,034
49007221920000	6/1/2002	16	91	17	151,001	115,555	1091	1,597,412
49007219370000	6/1/2002	16	91	8	161,205	91,982	1091	425,870
49007221910000	6/1/2002	16	91	17	253,354	163,300	1091	829,073
49007221930000	6/1/2002	16	91	17	382,034	201,097	1091	922,960
49007221890000	6/1/2002	16	91	17	385,507	215,255	1091	973,253
49007221880000	6/1/2002	16	91	17	400,923	178,184	1091	415,267
49007219360000	7/1/2002	16	91	8	437,653	195,772	1061	824,802
49007219380000	6/1/2002	16	91	8	444,394	138,897	1091	393,179
49007221900000	6/1/2002	16	91	17	1,162,641	538,606	1091	1,150,574

9) **Blue Sky Unit** is located in T15N, R91W and has 10 wells and the gas production is disappointing. Production began in mid 2003. The Blue Sky Unit wells have an average EUR of 0.074 BCF. The following table summarizes the production for an average well in the Blue Sky Unit.

Blue Sky Summary					
Wells Used in Averages	Average Date of 1st Production	Average EUR, Mscf	AvgCumulative Gas, Mscf	Avg Days Producing	Average Cumulative Water, bbls
12	8/3/2003	7,430	4,742	663	486,976

The following table summarizes individual well productions for Blue Sky Unit.

Blue Sky Unit								
API No.	1st Prod Date	T	R	S	EUR, Mscf	Cum Gas, Mscf	Days Producing	Cum Water, Bbls
49007221850000	11/1/2003	15	91	9	236	203	573	858,597
49007221780000	10/1/2003	15	91	9	276	263	604	617,347
49007221860000	9/1/2003	15	91	9	612	606	634	425,745
49007222490000	9/1/2003	15	91	16	2,229	2,223	634	391,627
49007222160000	9/1/2003	15	91	16	2,296	2,288	634	706,852
49007221820000	7/1/2003	15	91	8	2,652	2,624	696	182,317
49007221800000	7/1/2003	15	91	8	2,789	2,694	696	238,994
49007221740000	7/1/2003	15	91	5	3,688	3,566	696	367,437
49007221730000	7/1/2003	15	91	5	4,194	4,053	696	513,067
49007221830000	7/1/2003	15	91	8	8,857	7,640	696	427,167
49007221700000	7/1/2003	15	91	5	17,603	11,607	696	419,729

49007221690000	7/1/2003	15	91	5	43,741	19,148	696	694,838

10) Doty Mountain Unit is located T17N, R91W and targets the Almond and Allen Ridge Formations. There are currently 24 wells and they have an average depth of 2,189 feet. These wells were completed late in the year 2004 and are just beginning to produce gas, and hence decline curve is not possible at his time. All of these wells began to produce gas after 1 to 2 months of de-watering and this suggests that these coals are (or nearly) gas saturated. CBNG is being developed on 80-acre spacing.

11) Brown Cow Unit is located in T14N, R91W and targets the Almond and some Allen Ridge Formations which have a depth range of 1,425 to 1,825 feet. There is currently only water production from five wells. CBNG is being developed on 80-acre spacing.

References

1. Malkewicz Hueni Associates, 'Evaluation of Coalbed Methane Well Types in the San Juan Basin', March 2004, Appendix D, pages 4 and 7-11.

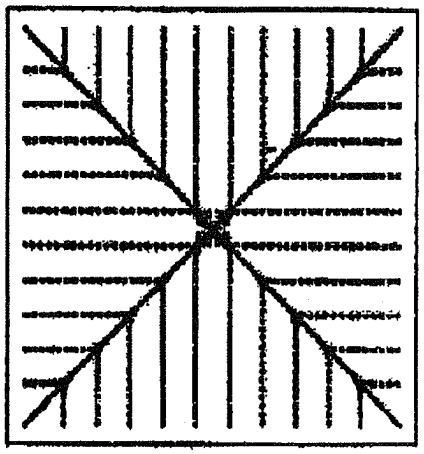
2. Robert A. Lamarre and Stephen K. Ruhl ,'Atlantic Rim Coalbed Methane Play: The Newest Successful CBM Play in the Rockies', Rocky Mountain Section AAPG Meeting, August 9, page 1.

3. P.R.Onsager and D.O. Cox, 'Aquifer Controls on Coalbed Methane Development in the Powder River Basin, Wyoming', paper SPE 63090, October 2000, pages 3 and 4.

Z-Pinnate Drilling System

'Z-Pinnate' is an environmentally favored drilling development plan (developed by and patented by CDX Gas, LLC. 'Z-Pinnate' system consists of drilling a central vertical borehole (8 5/8' diameter) to the coal seam's depth. Then a branched herringbone pattern of uncased 4 ¾ inch diameter horizontal boreholes are drilled horizontally from the central borehole, to form a 'Pinnate' pattern (similar to a shape of a leaf). Four pinnate patterns (each oriented 90 degrees from each other) can be drilled from the central well and the resulting drainage area could encompass 1200 acres. The 'Z-Pinnate' system increase ultimate gas recovery and rates. A down-hole separation of gas and water is achieved by a pipe located in the center of the borehole where the water is pumped and gas flows in the annulus space. This down-hole separation eliminates the de-watering time. 'Z-Pinnate' drilling has been used in Appalachia but has not yet been used in the AR Area and would likely require a learning curve for its implementation. President of CDX Gas (Doug Wight) has expressed interest in implementing a 'Z-Pinnate' system in the Powder River Basin (Wyoming) coals this year. Costs for a 'Z-Pinnate' system are contingent on many variables. Historically costs have been approximately 1.5 million dollars per 1200 acre system. Simulation studies suggest a recovery of 80-90 % of the gas in place. The 'Z-Pinnate' system at this time in Wyoming must be considered to be a new technology and will no doubt need to be refined for the local conditions in Wyoming.

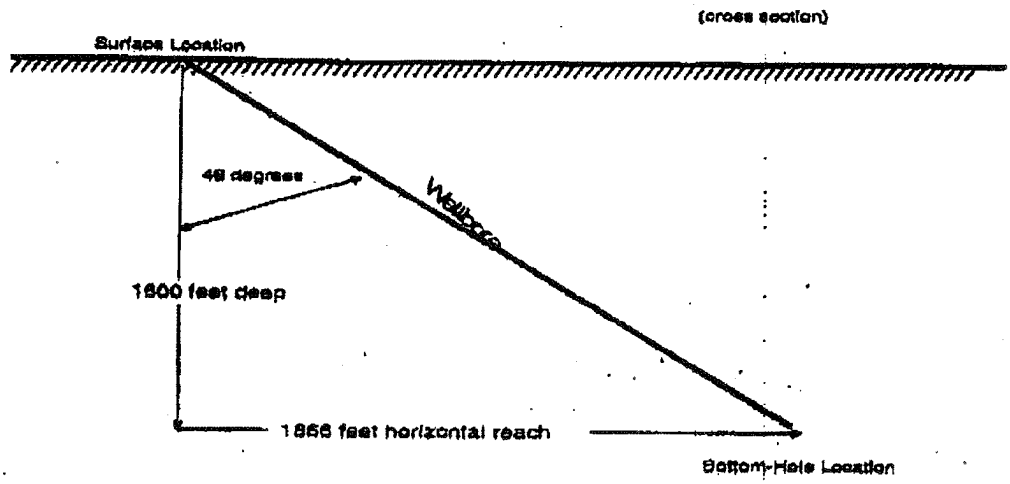
This diagram represents the horizontal boreholes' pinnate pattern. The square boundary may represent a 1200 acres drainage area.

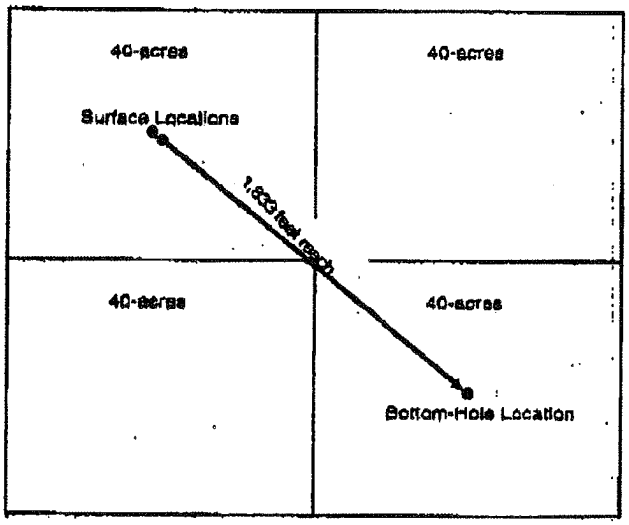


Z-PINNATE℠ System Pattern

Attachment No.2 – 'Z-Pinnate' System

Reservoir Management Group, Lee Almasy, Petroleum Engineer, June 16, 2005





Attachment No.3 - Diagrams of Directional Well's deviation angles and bottom-hole departure.

Reservoir Management Group, Lee Almasy, Petroleum Engineer, June 16, 2005

Annual CashFlow Report

Lease Name: COW CREEK UNIT - 'Type Well' (43-12)
County, ST: CARBON, WY Operator: DOUBLE EAGLE PETROLEUM & MINING COMPANY
Location: 12 16N 92W NW NE SE

Date	Well Count	Gross Production Oil (Bbl)	Gross Production Gas (Mcf)	Net Production Oil (Bbl)	Net Production Gas (Mcf)	Average Prices Oil ($/Bbl)	Average Prices Gas ($/Mcf)	Sales Total ($)
12/2005	1	0	67,058	0	58,676	0.00	5.58	327,489
12/2006	1	0	95,120	0	83,230	0.00	5.58	464,424
12/2007	1	0	112,029	0	98,025	0.00	5.58	546,982
12/2008	1	0	78,278	0	68,493	0.00	5.58	382,192
12/2009	1	0	36,404	0	31,863	0.00	5.58	177,742
09/2010	1	0	13,825	0	12,097	0.00	5.58	67,502
Grand Total:		0	402,714	0	352,375	0.00	5.58	1,966,251

Date	Operating Expenses ($)	Taxes ($)	Operating Income ($)	Other Costs ($)	Periodic Cash Flow ($)	Cumulative Cash Flow ($)	5% Cash Flow ($)
12/2005	60,000	38,110	229,299	900,000	-670,701	-670,701	-673,496
12/2006	60,000	54,059	350,365	0	350,365	-320,337	323,866
12/2007	60,000	63,669	423,313	0	423,313	102,976	373,980
12/2008	60,000	44,487	277,705	0	277,705	380,682	234,529
12/2009	60,000	20,689	97,053	0	97,053	477,735	78,156
09/2010	45,000	7,857	14,645	0	14,645	492,379	11,323
Grand Total:	345,000	228,872	1,392,379	900,000	492,379	492,379	348,439

Discount Present Worth:
0.00 % 492,379
5.00 % 348,439

Economic Dates:
Effective Date 01/2005
Calculated Limit 09/2010
Economic Life 69 Months
5 Years 9 Months

Economics Summary:

	Bbl Oil	Mcf Gas
Remaining Gross	0	402,714

Economics Information:
Net Payout Date: 10/2007
Rate of Return: 22.97 %
Return on Investment: 1.55
Disc Return on Invest 1.39

Initial Division of Interest:

		NRI	ORI
WI: 100.000000	Oil:	87.500000	0.000000
	Gas:	87.500000	0.000000

Attachment No.4 – Cash Flow Statement – vertical CBNG well with 0.4 BCF reserves

Reservoir Management Group, Lee Almasy, Petroleum Engineer, June 16, 2005

Annual CashFlow Report

Lease Name: COW CREEK UNIT - 'Type Well'(43-12)
County, ST: CARBON, WY Field Name: COW CREEK
Location: 12 16N 92W NW NE SE

Date	Well Count	Gross Production Oil (Bbl)	Gross Production Gas (Mcf)	Net Production Oil (Bbl)	Net Production Gas (Mcf)	Average Prices Oil ($/Bbl)	Average Prices Gas ($/Mcf)	Sales Total ($)
12/2005	1	0	67,058	0	58,675	0.00	5.58	327,409
12/2006	1	0	95,120	0	83,230	0.00	5.58	464,424
12/2007	1	0	112,029	0	98,025	0.00	5.58	546,982
12/2008	1	0	78,278	0	68,493	0.00	5.58	382,132
12/2009	1	0	36,404	0	31,853	0.00	5.58	177,742
09/2010	1	0	13,825	0	12,097	0.00	5.58	67,502
Grand Total:		0	402,714	0	352,375	0.00	5.58	1,966,251

Date	Operating Expenses ($)	Taxes ($)	Operating Income ($)	Other Costs ($)	Periodic Cash Flow ($)	Cumulative Cash Flow ($)	5% Cash Flow ($)
12/2005	60,000	38,110	229,299	900,000	-670,701	-670,701	-673,496
12/2006	60,000	54,058	350,365	0	350,365	-320,337	323,946
12/2007	60,000	63,669	423,313	0	423,313	102,976	373,980
12/2008	60,000	44,487	277,705	0	277,705	380,682	234,529
12/2009	60,000	20,689	97,053	0	97,053	477,735	78,156
09/2010	45,000	7,857	14,645	0	14,645	492,379	11,323
Grand Total:	345,000	228,872	1,392,379	900,000	492,379	492,379	348,439

Discount Present Worth:
0.00 % 492,379
5.00 % 348,439

Economic Dates:
Effective Date 01/2005
Calculated Limit 09/2010
Economic Life 69 Months
5 Years 9 Months

Economics Summary:

	Bbl Oil	Mcf Gas
Remaining Gross	0	402,714

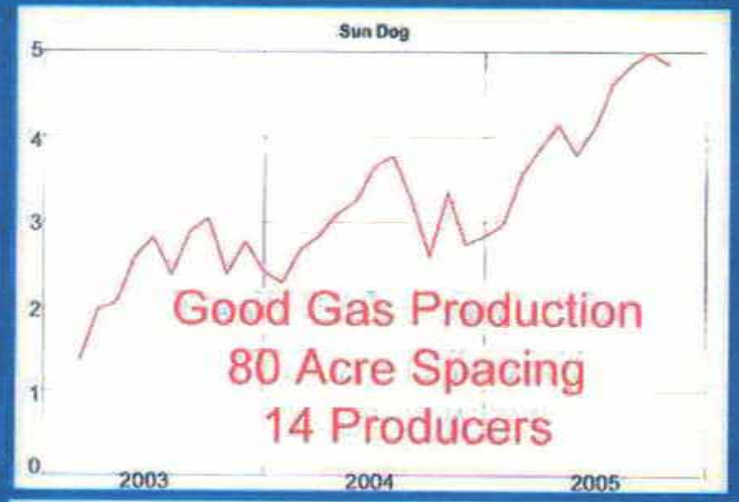
Economics Information:
Net Payout Date: 10/2007
Rate of Return: 22.97 %
Return on Investment:1.55
Disc Return on Invest1.39

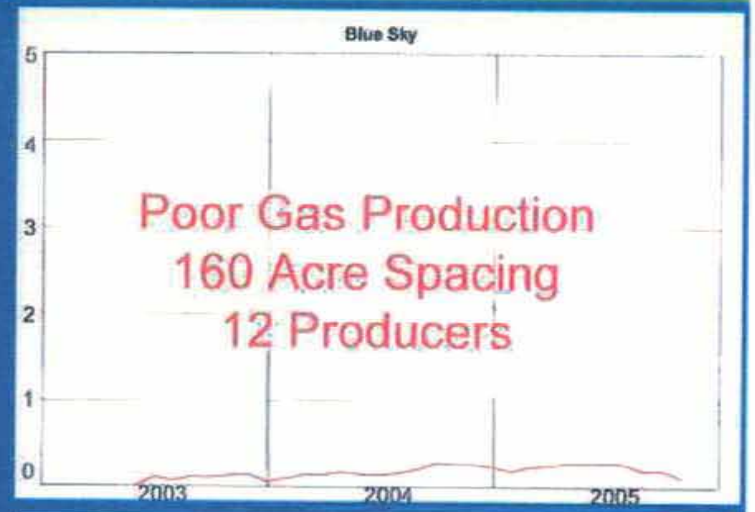
Initial Division of Interest:

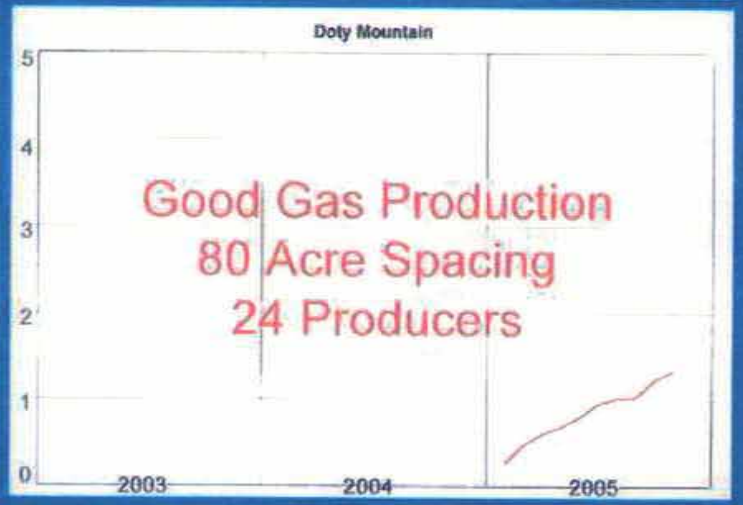
		NRI	ORI
WI: 100.000000	Oil:	87.500000	0.000000
	Gas:	87.500000	0.000000

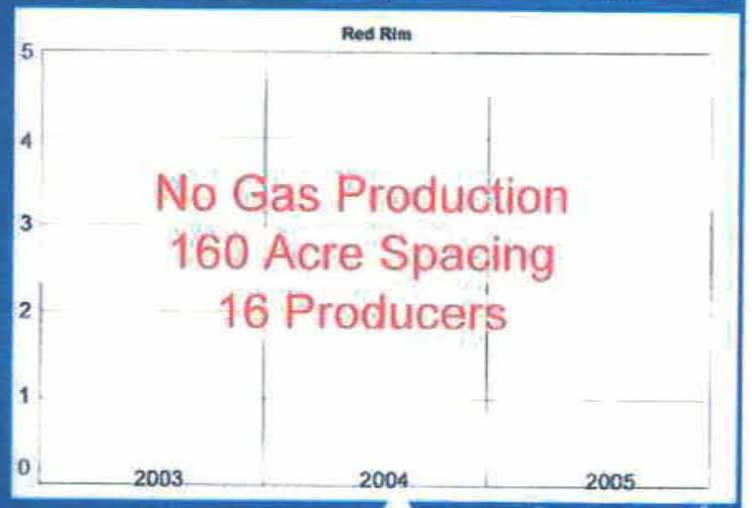
Attachment No.5 – Cash Flow Statement – directional CBNG well with 0.4 BCF reserves

Production Supports 80's
Gas Production (MMcfd)









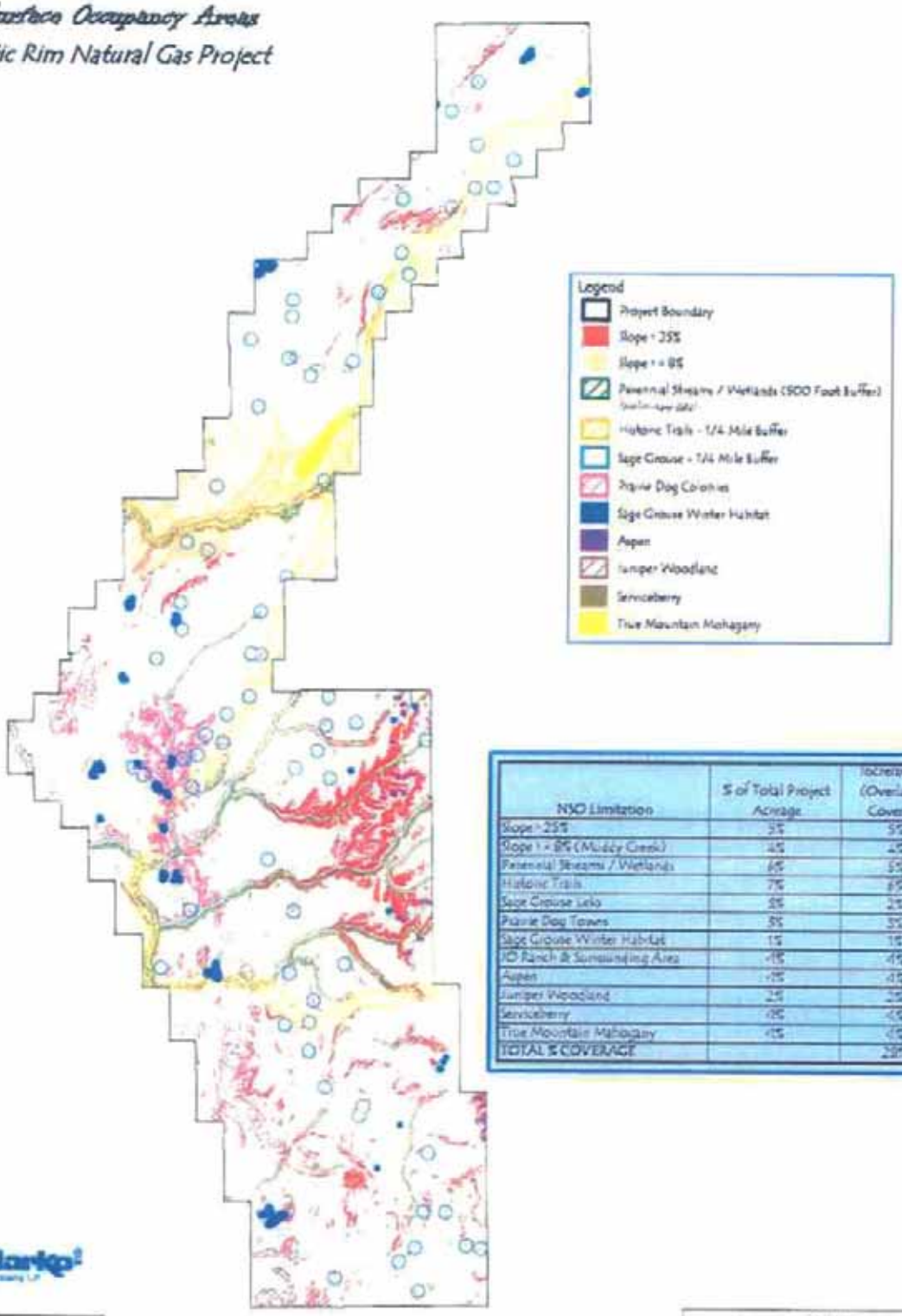
Anadarko

Exhibit E to
Anadarko's Comments on
the Draft Atlantic Rim EIS

Alternative C

No Surface Occupancy Areas

Atlantic Rim Natural Gas Project



NSO Limitation	% of Total Project Acreage	Incremental (Overlap) % Coverage
Slope > 25%	5%	5%
Slope > 8% (Muddy Creek)	4%	4%
Perennial Streams / Wetlands	6%	5%
Historic Trails	7%	6%
Sage Grouse Leks	2%	2%
Prairie Dog Towns	5%	5%
Sage Grouse Winter Habitat	1%	1%
JO Ranch & Surrounding Area	<1%	<1%
Aspen	<1%	<1%
Juniper Woodland	2%	2%
Serviceberry	<1%	<1%
True Mountain Mahogany	<1%	<1%
TOTAL % COVERAGE		28%

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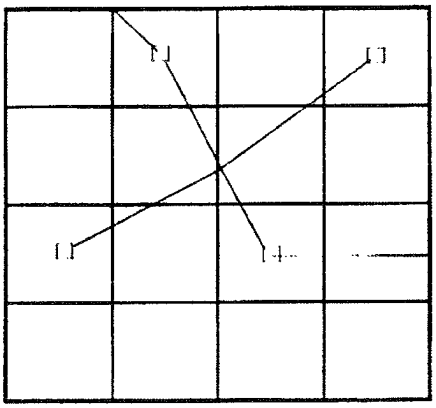
Exhibit F to
Anadarko's Comments on
the Draft Atlantic Rim EIS

160 Acres Spacing
One 640 acre section

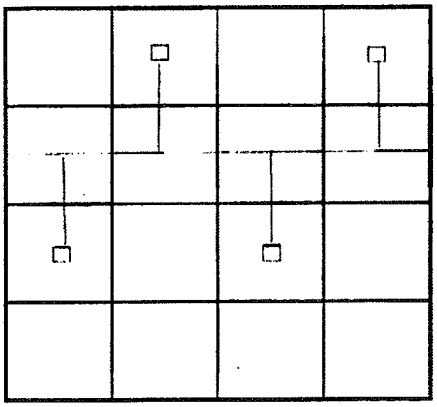
Well
Road Segment

11.52
1.92 average miles / section



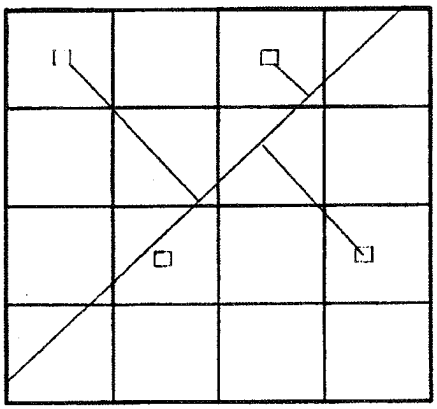
Road Lengths	Segments	Totals
1980	1	1980
2950	1	2950
2340	2	4680
933	1	933
		10543

Miles 2.00



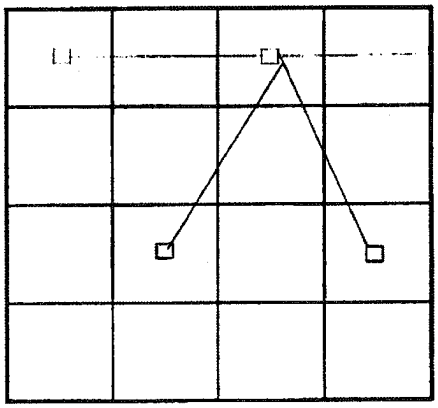
Road Lengths	Segments	Totals
5280	1	5280
1320	4	5280
		0
		10560

Miles 2.00



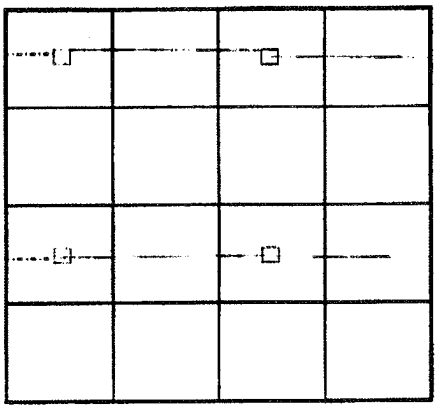
Road Lengths	Segments	Totals
7230	1	7230
2635	1	2635
530	1	530
100	1	100
1975	1	1975
		12470

Miles 2.36



Road Lengths	Segments	Totals
3440	2	6880
1980	1	1980
2640	1	2640
		0
		11500

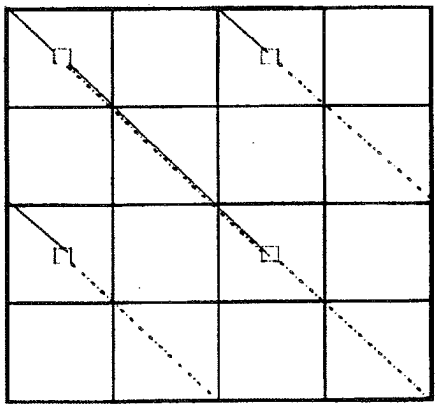
Miles 2.18



Road Lengths	Segments	Totals
1980	2	3960
2640	2	5280
		9240

Miles 1.75

Road Lengths	Segments	Totals
660	2	1320



Road Lengths	Segments	Totals
933.4	3	2800.2
3730	1	3730
		6530.2

Miles 1.24

2800	3	8400
3730	1	3730

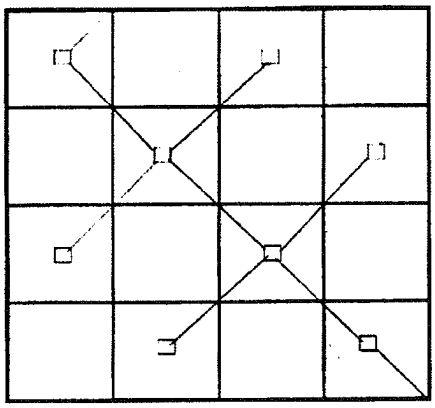
Exhibit G to
Anadarko's Comments on
the Draft Atlantic Rim EIS

80 acres spacing
One 640 acre section

Well
Road Segment

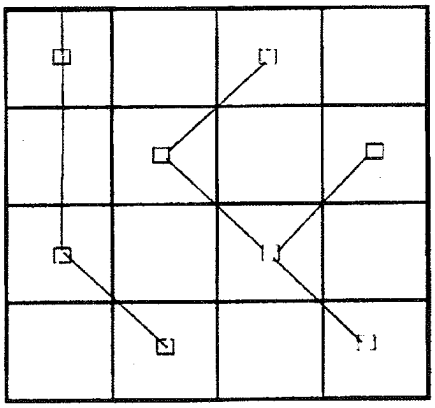
16.15

2.69	average miles / section



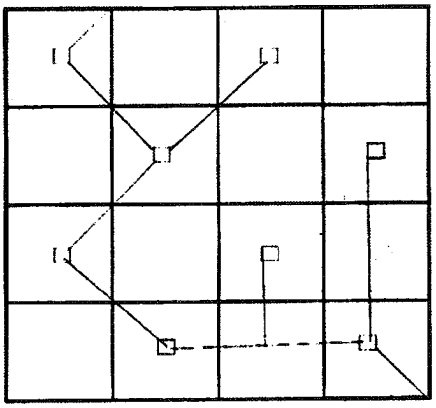
Road Lengths	Segments	Totals
1866.7	7	13066.9
933.35	2	1866.7
-200	4	-800
Discount road Across Pad		
		14133.6

Miles 2.68



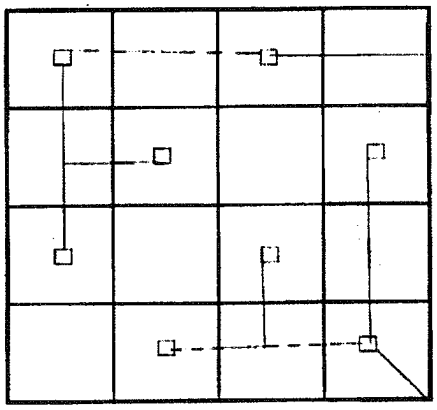
Road Lengths	Segments	Totals
660	2	1320
1866.7	5	9333.5
2640	1	2640
-200	5	-1000
		12293.5

Miles 2.33



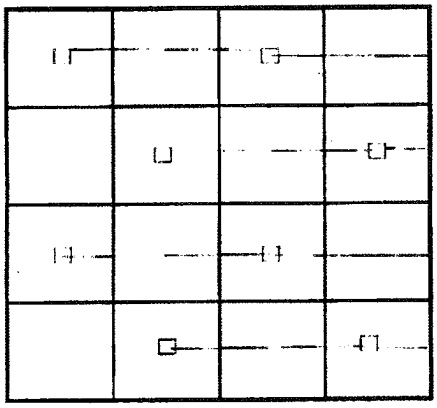
Road Lengths	Segments	Totals
933.4	2	1866.8
1866.7	4	7466.8
2640	2	5280
1320	1	1320
-200	5	-1000
		14933.6

Miles 2.83



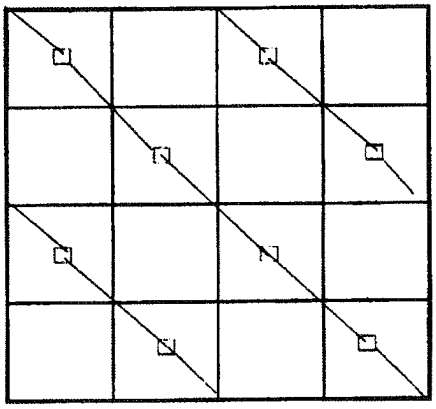
Road Lengths	Segments	Totals
933.4	1	933.4
1980	1	1980
2640	4	10560
1320	2	2640
-200	3	-600
		15513.4

Miles 2.94



Road Lengths	Segments	Totals
660	2	1320
1980	2	3960
2640	4	10560
-200	4	-800
		15040

Miles 2.85



Road Lengths	Segments	Totals
933.4	6	5600.4
1866.7	5	9333.5
-200	8	-1600
		13333.9

Miles 2.53

Exhibit H to
Anadarko's Comments on
the Draft Atlantic Rim EIS

PBSJ

An employee-owned company

February 9, 2006

David Applegate
Northern Regulatory Supervisor
Anadarko Patroleum Corp
900 Werner Court, Suite 200
Casper, WY 82601

RE: Soil Comments – Atlantic Rim Natural Gas Project Draft EIS

Dear David,

This letter summarizes my comments on the Atlantic Rim Natural Gas Project Draft EIS. I am prepared to provide additional comment if you have other issues or concerns you would like me to address or if you want additional detail for the comments provided.

Experience Related to this Project

I am currently a Certified Professional Soil Scientist (ARCPACS) and a Registered Professional Soil Scientist (NSCSS) with over 25 years experience. I have conducted soil inventories covering over 3 million acres of rangeland, forest lands, agricultural lands and urban areas including BLM lands. I currently represent the National Society of Consulting Soil Scientists at the National Cooperative Soil Survey Program. I have conducted dozens of soil, vegetation and wetland reclamation/restoration projects. I have also provided soil information for several dozen environmental impact statements and have acted as overall project manager for six environmental impact statements.

DEIS Comments

1. Soil information, analysis and conclusions in the DEIS are based on a Third-Order soil survey. Third Order soil surveys are conducted using remotely sensed data including such things as air photos, satellite imagery and geologic maps with limited field verification (USDA Soil Survey Manual 1993). The soil mapping units delineated on these maps are broad and are intended for use in general planning but are very limited in use for site-specific projects with small areas of disturbance. These soil units are mostly "complexes" and "associations" of soil instead of individual soil types. They usually include 2-3 individual soils that cover most of the unit (often about 75%) with "inclusions" of other soils making up the remaining 25%. This heterogeneous mixture of soils usually results in a

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Exhibit I to
Anadarko's Comments on
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2. wide range of soil factors such as water and wind erosion potential, runoff potential, topsoil ratings, road ratings and others. In chapter 3 the DEIS itself states that *"Basically, the soils are highly variable across this broad area."* It is therefore difficult or impossible to assign one rating to these map units and make accurate quantitative comparisons between units across large areas. The DEIS appears to have rated soil units based on the most limiting soil features. This is a common procedure for planning purposes but tend to skew the results toward the worst case. I cannot see the rational or justification for using this general soil information to make such a quantitative statement that Alternative C would meet the soil significance criteria while the other alternatives would not (Chapter 4).

3. The DEIS refers to *"sensitive soils"* but I do not see a definition of what they are, how they are defined or the rational for rating individual soils as sensitive. Even if the rational for sensitive soils is sound, alternative comparisons are still limited by the broad nature of the Order 3 Soil Survey. This also makes it impossible to make a quantitative statement that Alternative C would meet the soil significance criteria while the other alternatives would not (Chapter 4). This level of accuracy is usually achieved at a future level of permitting when site-specific data is collected and analyzed.

4. The DEIS identifies "significance criteria" for soils but does not explain the rational for establishing these criteria or present any data to support them. For instance, what data are available documenting the soil types that will achieve interim reclamation success within three years and those that will not. What data are available documenting soil types that will have reduced productivity versus those that will not. Even if the rational for the significance criteria is sound, it is still impossible to make the quantitative statement that Alternative C would meet the soil significance criteria while the other alternatives would not based on the general nature of the soil survey. This level of accuracy is usually achieved at a future level of permitting when site-specific data is collected and analyzed.

5. The DEIS indicates that Alternative C will meet the soil significance criteria at 4 wells per section while the proposed action and Alternative B would not at 8 wells per section. Such generalizations as wells per section are appropriate for general planning purposes to indicate if impacts may be significant but actual impacts are too site-specific for such generalizations. The actual impact is most influenced by final site evaluation, planning and implementation. A few wells with one set of BMPs may have more impacts that a larger number of wells in another setting with a different set of BMPs. Final design and implementation are the key and not general soil conditions. It could be that 8 wells per section could have the same impact as 4 if proper BMPs are implemented.

6. As described in Chapter 3, the soil limitation and suitability ratings used in the DEIS (such as "severe" and "poor") do not indicate that the soil cannot be used or that the impact significance criteria cannot be met. These ratings only indicate the relative ease in doing so. Soils with severe limitations or poor ratings simply

require more care, effort and expense than those rated as having slight limitations or high ratings.

7. Alternative C is described as not exceeding the soil significance criteria however, one of the criteria is that soil productivity not be reduced. It is unlikely that some if not most of the soils disturbed will recover to pre-disturbance levels in the foreseeable future. Therefore Alternative C does not meet the soil significance criteria listed in Chapter 4.

8. The main difference in impacts on soils between Alternative C and the other alternatives is simply the total area of disturbance. Less area of disturbance will result in less impact to soils and related resources. The additional mitigation requirements for soils in this alternative could also help reduce impacts but these could be applied to other alternatives as well.

9. In summary, I do not see a clear soil-based rational for endorsing Alternative C over other alternatives based on the information presented in the DEIS. Soil impacts for different alternatives cannot be compared in a quantitative manner with the existing Order 3 soil information. Soil impacts at individual sites can only be determined after more detailed soil surveys are completed at each location during the next stage of the permitting process when individual sites are evaluated. It is completely reasonable to assume that soil significance criteria can be met on most sites when more detailed soil information is generated and appropriate resource protection measures are applied.

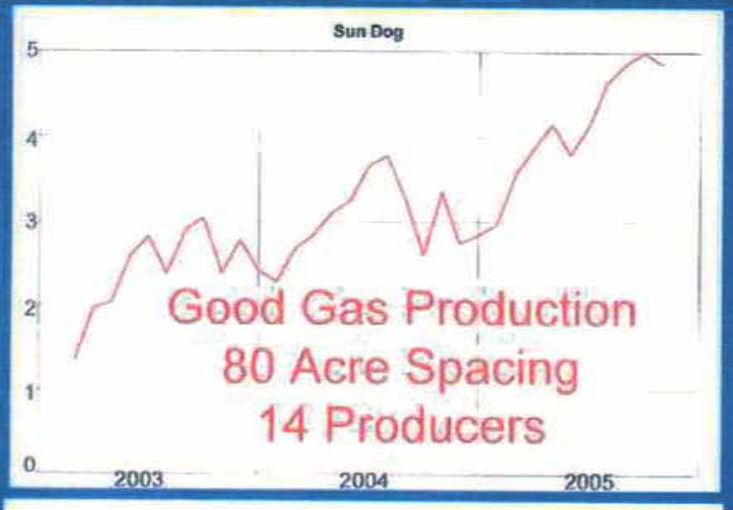
Please contact me if you need additional information or have other questions concerning soil resources.

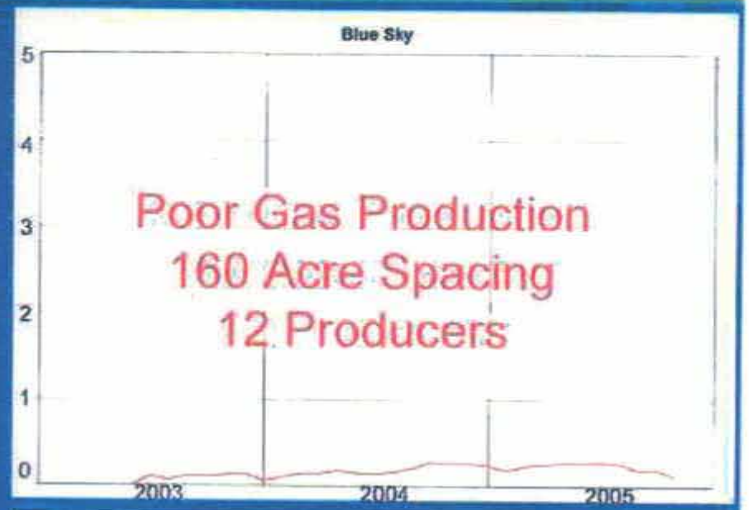
Regards,

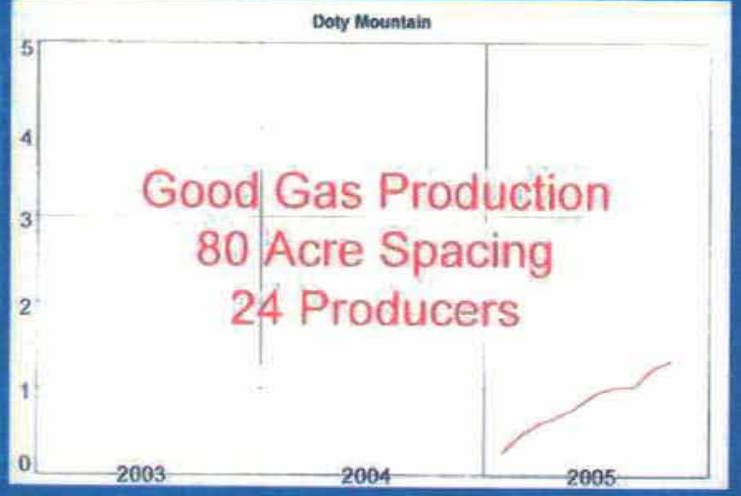
Barry L Dutton

Barry L. Dutton
CPSS, RPSS

Production Supports 80's
Gas Production (MMcfd)







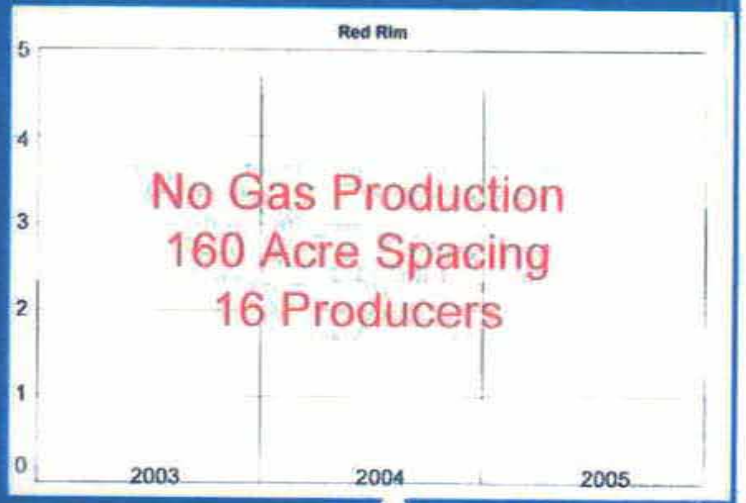


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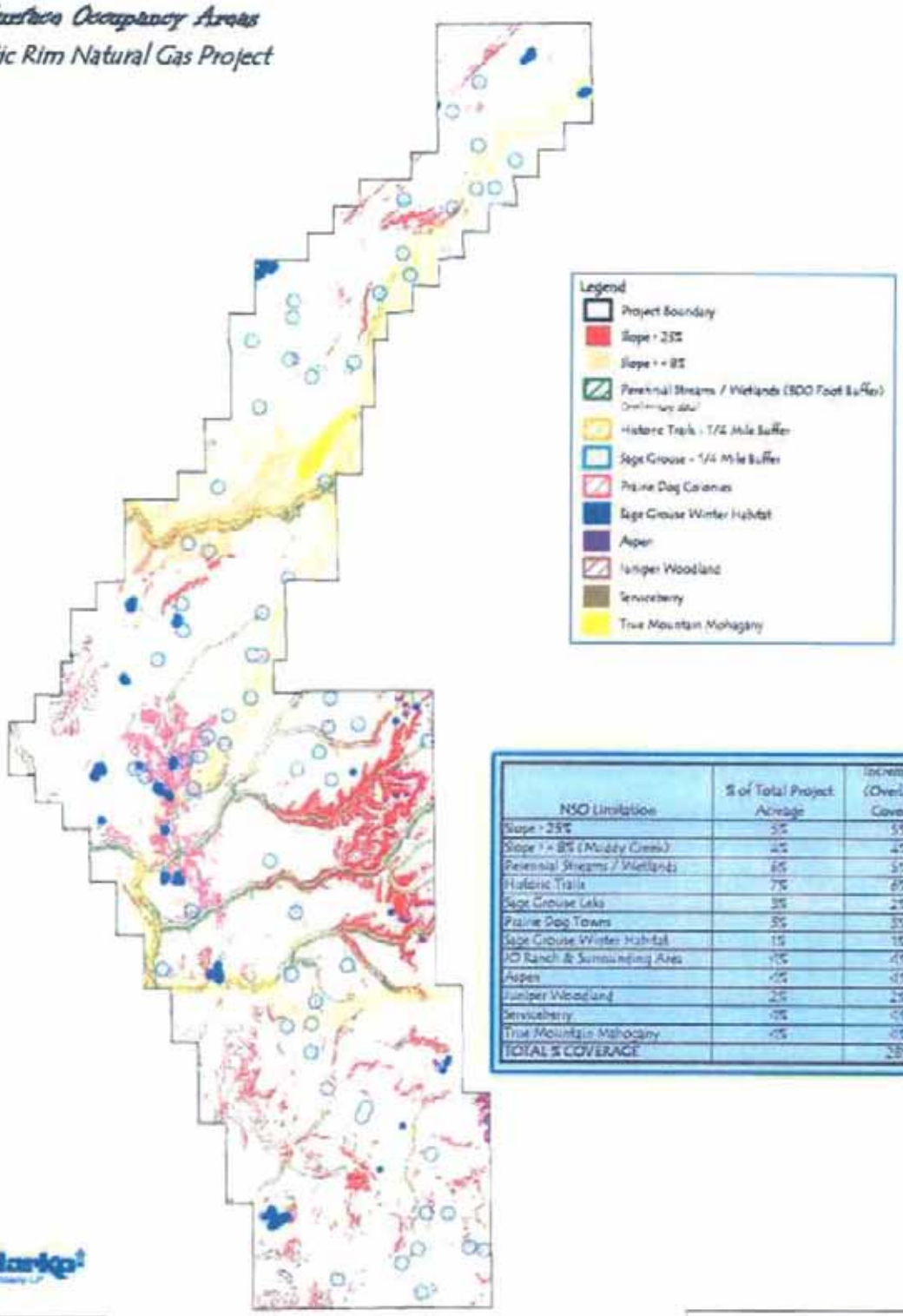
Exhibit E to
Anadarko's Comments on
the Draft Atlantic Rim EIS

Alternative C

No Surface Occupancy Areas

Atlantic Rim Natural Gas Project



NSO Limitation	% of Total Project Acreage	Incremental (Overlap) % Coverage
Slope > 25%	5%	5%
Slope > = 8% (Muddy Creek)	4%	4%
Perennial Streams / Wetlands	6%	5%
Historic Trails	7%	6%
Sage Grouse Leks	3%	2%
Prairie Dog Towns	3%	3%
Sage Grouse Winter Habitat	1%	1%
XO Ranch & Surrounding Area	<1%	<1%
Aspen	<1%	<1%
Juniper Woodland	2%	2%
Serviceberry	<1%	<1%
True Mountain Mahogany	<1%	<1%
TOTAL % COVERAGE		28%

Anadarko

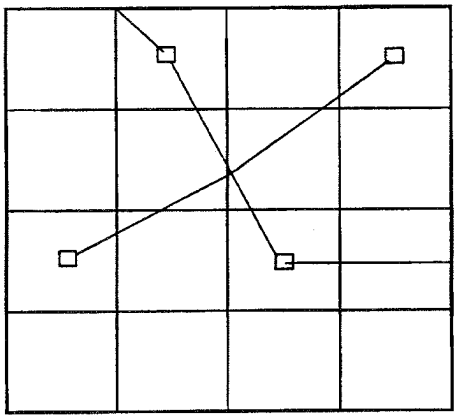
PBSJ

Exhibit F to
Anadarko's Comments on
the Draft Atlantic Rim EIS

160 Acres Spacing
One 640 acre section

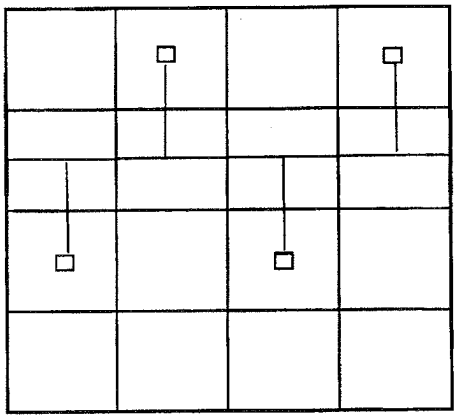
Well
Road Segment

11.52
1.92 average miles / section



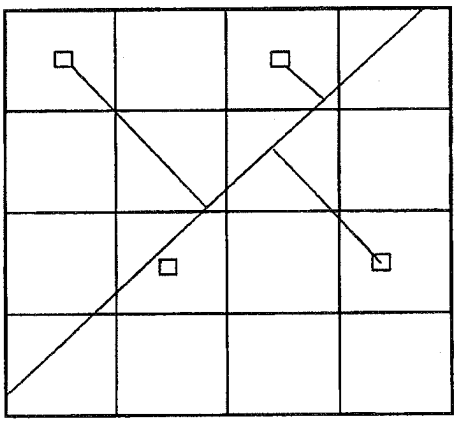
Road Lengths	Segments	Totals
1980	1	1980
2950	1	2950
2340	2	4680
933	1	933
		10543

Miles
2.00



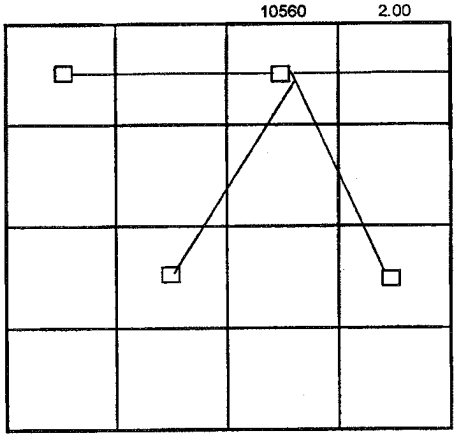
Road Lengths	Segments	Totals
5280	1	5280
1320	4	5280
		0
		10560

Miles
2.00



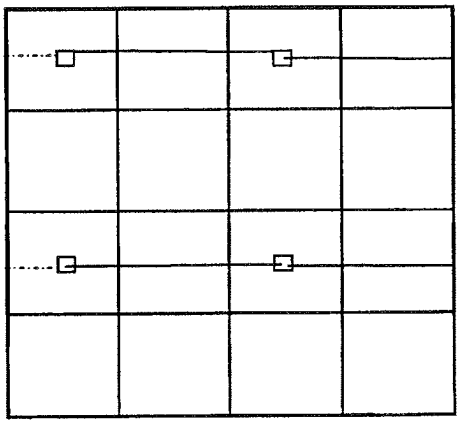
Road Lengths	Segments	Totals
7230	1	7230
2635	1	2635
530	1	530
100	1	100
1975	1	1975
		12470

Miles
2.36



Road Lengths	Segments	Totals
3440	2	6880
1980	1	1980
2640	1	2640
		0
		11500

Miles
2.18

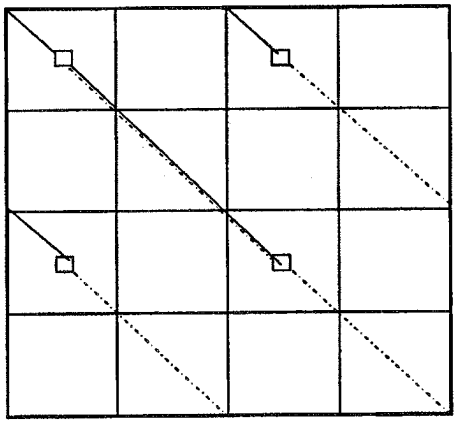


Road Lengths	Segments	Totals
1980	2	3960
2640	2	5280
		9240

Miles
1.75

Road Lengths	Segments	Totals
660	2	1320
2640	2	5280
		6600

Miles
1.25



Road Lengths	Segments	Totals
933.4	3	2800.2
3730	1	3730
		6530.2

Miles
1.24

2800	3	8400
3730	1	3730
		12130

Miles
2.30

Exhibit G to
Anadarko' Comments on the
Draft Atlantic Rim DEIS

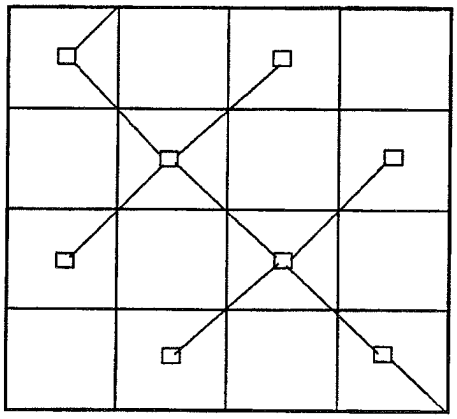
One 640 acre section

Well

Road Segment

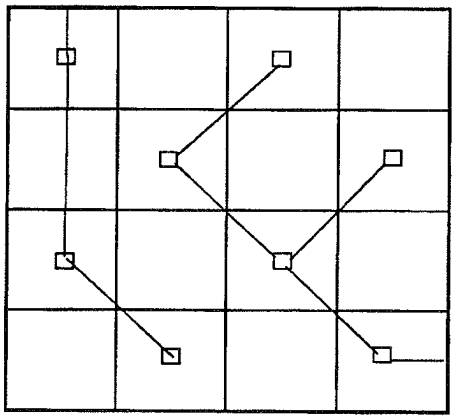
16.15

2.69 average miles / section



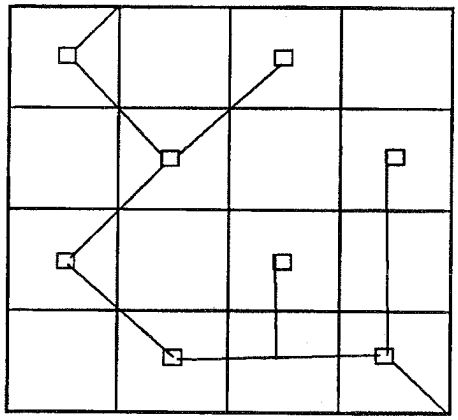
Road Lengths	Segments	Totals
1866.7	7	13066.9
933.35	2	1866.7
Discount road -200	4	-800
Across Pad		
		14133.6

Miles 2.68



Road Lengths	Segments	Totals
660	2	1320
1866.7	5	9333.5
2640	1	2640
-200	5	-1000
		12293.5

Miles 2.33



Road Lengths	Segments	Totals
933.4	2	1866.8
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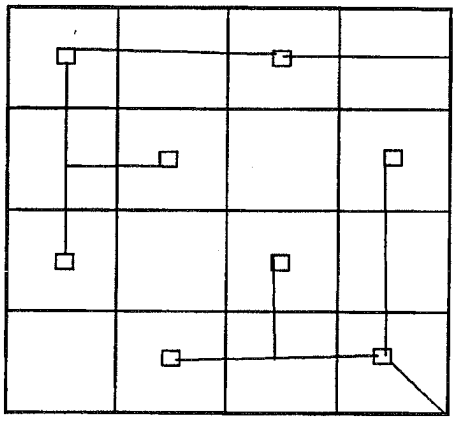
2640	2	5280
1320	1	1320
-200	5	-1000
		14933.6

Miles 2.83



Road Lengths	Segments	Totals
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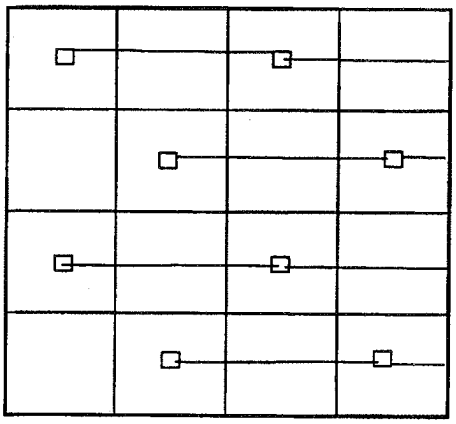
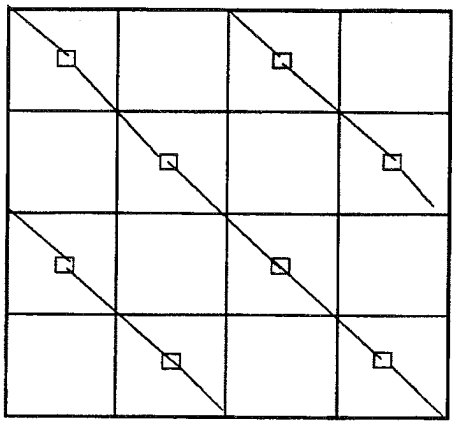
1980	1	1980
2640	4	10560
1320	2	2640
-200	3	-600
		15513.4

Miles 2.94



Road Lengths	Segments	Totals
660	2	1320
1980	2	3960
2640	4	10560
-200	4	-800
		15040

Miles 2.85



Road Lengths	Segments	Totals
933.4	6	5600.4
1866.7	5	9333.5
-200	8	-1600
		13333.9

Miles 2.53

Exhibit H to
Anadarko's Comments on
Draft Atlantic Rim EIS

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An employee-owned company

February 9, 2006

David Applegate
Northern Regulatory Supervisor
Anadarko Patroleum Corp
900 Werner Court, Suite 200
Casper, WY 82601

RE: Soil Comments – Atlantic Rim Natural Gas Project Draft EIS

Dear David,

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Experience Related to this Project

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DEIS Comments

607-136

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Exhibit I to
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607-136

2. wide range of soil factors such as water and wind erosion potential, runoff potential, topsoil ratings, road ratings and others. In chapter 3 the DEIS itself states that *"Basically, the soils are highly variable across this broad area."* It is therefore difficult or impossible to assign one rating to these map units and make accurate quantitative comparisons between units across large areas. The DEIS appears to have rated soil units based on the most limiting soil features. This is a common procedure for planning purposes but tend to skew the results toward the worst case. I cannot see the rational or justification for using this general soil information to make such a quantitative statement that Alternative C would meet the soil significance criteria while the other alternatives would not (Chapter 4).

607-137

3. The DEIS refers to *"sensitive soils"* but I do not see a definition of what they are, how they are defined or the rational for rating individual soils as sensitive. Even if the rational for sensitive soils is sound, alternative comparisons are still limited by the broad nature of the Order 3 Soil Survey. This also makes it impossible to make a quantitative statement that Alternative C would meet the soil significance criteria while the other alternatives would not (Chapter 4). This level of accuracy is usually achieved at a future level of permitting when site-specific data is collected and analyzed.

607-138

4. The DEIS identifies "significance criteria" for soils but does not explain the rational for establishing these criteria or present any data to support them. For instance, what data are available documenting the soil types that will achieve interim reclamation success within three years and those that will not. What data are available documenting soil types that will have reduced productivity versus those that will not. Even if the rational for the significance criteria is sound, it is still impossible to make the quantitative statement that Alternative C would meet the soil significance criteria while the other alternatives would not based on the general nature of the soil survey. This level of accuracy is usually achieved at a future level of permitting when site-specific data is collected and analyzed.

5. The DEIS indicates that Alternative C will meet the soil significance criteria at 4 wells per section while the proposed action and Alternative B would not at 8 wells per section. Such generalizations as wells per section are appropriate for general planning purposes to indicate if impacts may be significant but actual impacts are too site-specific for such generalizations. The actual impact is most influenced by final site evaluation, planning and implementation. A few wells with one set of BMPs may have more impacts that a larger number of wells in another setting with a different set of BMPs. Final design and implementation are the key and not general soil conditions. It could be that 8 wells per section could have the same impact as 4 if proper BMPs are implemented.

6. As described in Chapter 3, the soil limitation and suitability ratings used in the DEIS (such as "severe" and "poor") do not indicate that the soil cannot be used or that the impact significance criteria cannot be met. These ratings only indicate the relative ease in doing so. Soils with severe limitations or poor ratings simply

require more care, effort and expense than those rated as having slight limitations or high ratings.

607-139

7. Alternative C is described as not exceeding the soil significance criteria however, one of the criteria is that soil productivity not be reduced. It is unlikely that some if not most of the soils disturbed will recover to pre-disturbance levels in the foreseeable future. Therefore Alternative C does not meet the soil significance criteria listed in Chapter 4.

8. The main difference in impacts on soils between Alternative C and the other alternatives is simply the total area of disturbance. Less area of disturbance will result in less impact to soils and related resources. The additional mitigation requirements for soils in this alternative could also help reduce impacts but these could be applied to other alternatives as well.

9. In summary, I do not see a clear soil-based rational for endorsing Alternative C over other alternatives based on the information presented in the DEIS. Soil impacts for different alternatives cannot be compared in a quantitative manner with the existing Order 3 soil information. Soil impacts at individual sites can only be determined after more detailed soil surveys are completed at each location during the next stage of the permitting process when individual sites are evaluated. It is completely reasonable to assume that soil significance criteria can be met on most sites when more detailed soil information is generated and appropriate resource protection measures are applied.

Please contact me if you need additional information or have other questions concerning soil resources.

Regards,

Barry L. Dutton

Barry L. Dutton
CPSS, RPSS

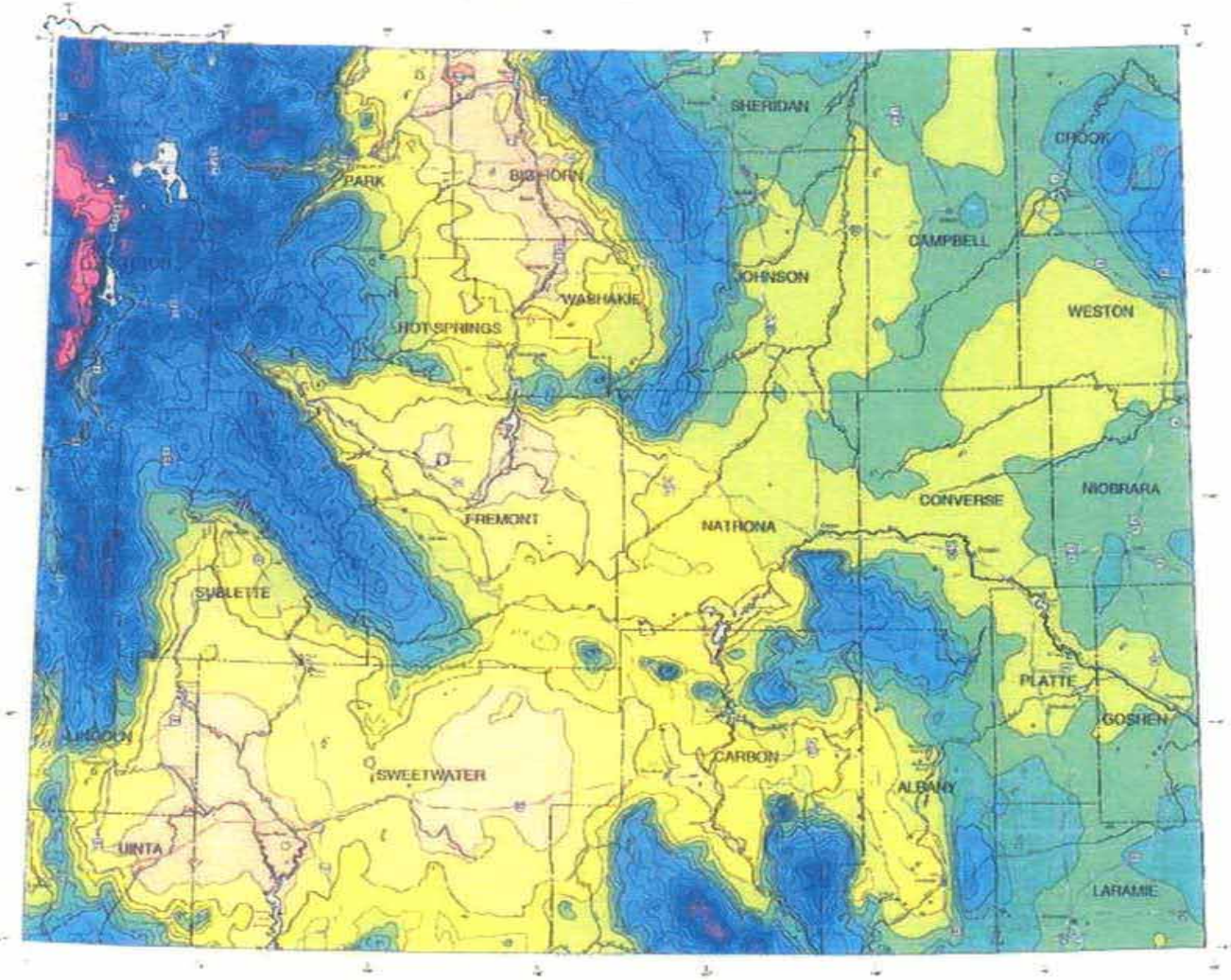
U.S. DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE

WYOMING
ANNUAL PRECIPITATION

Average
Annual Precipitation
1961-1990
inches per year

- <6
- 6-8
- 8-10
- 10-12
- 12-14
- 14-16
- 16-18
- 18-20
- 20-24
- 24-28
- 28-32
- 32-36
- 36-40
- 40-44
- 44-48
- 48-52
- 52-56
- 56-60
- 60-70
- 70-80
- 80-90



SCALE 1:1,185,000

Exhibit J to
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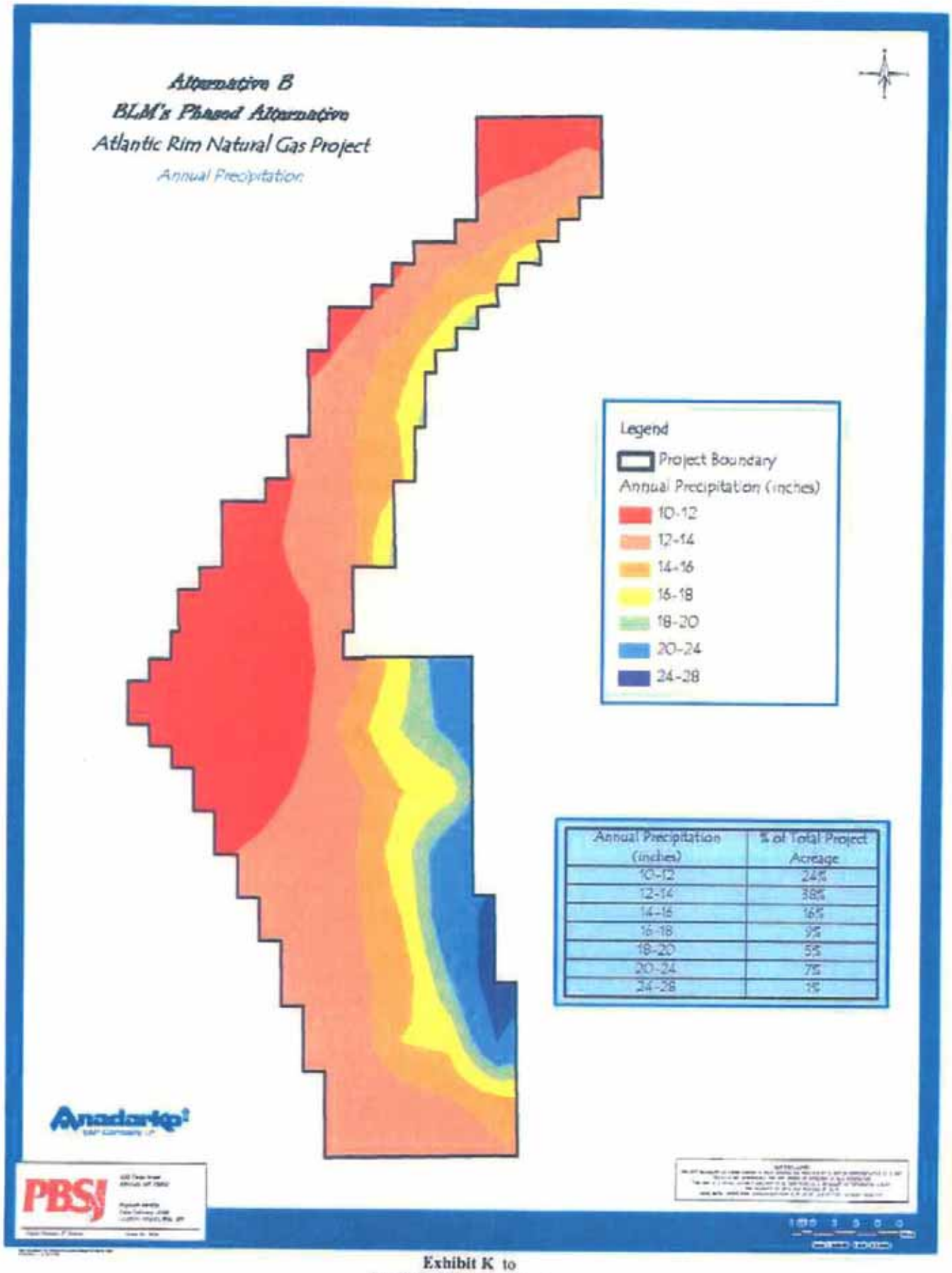

Annual Precipitation (inches)	% of Total Project Acreage
10-12	24%
12-14	38%
14-16	16%
16-18	9%
18-20	5%
20-24	7%
24-28	1%

Exhibit K to
Anadarko's Comments on
the Draft Atlantic Rim EIS

PUBLIC OPINION
STRATEGIES

Turning Questions Into Answers

Public Opinion Strategies conducted this telephone survey of 300 adults throughout Carbon County, Wyoming, on January 10-12, 2006. Interviews were proportional based on population throughout the county and representative of key demographics. The margin of error associated with a sample of this type is ± 5.66%.

KEY FINDINGS

Over three-quarter of Carbon county residents say they favor additional natural gas production in the Atlantic Rim area.

- A stunningly high 78% of local residents indicate they support additional natural gas production based on what they know now, with a mere 12% opposed, 4% saying it depends on circumstances and 6% undecided at this time. The intensity of this support is also significant, as 34% strongly favor additional natural gas production, compared to just 6% who strongly oppose it in the Atlantic Rim area.

  This is the strongest support level of support my firm has recorded across multiple projects measuring local sentiment toward these types of resource projects on public lands. In fact, this is one of the strongest levels of support for ANY land use decision I have personally seen in over 8 years of polling on these types of issues.

Notably, this support is broad-based and tends to be even stronger with those who are most interested in the project.

- Support stands at 70% or higher in every region and with every key demographic group in the county.
- Among those who express the most interest in the project, 82% favor additional natural gas production in the Atlantic Rim area.

Residents support additional natural gas production in large part because they feel it will benefit the local economy – the issue they describe as the single most important problem facing this part of Wyoming.

- Over one-quarter (27%) volunteer jobs or other economic concerns as their top concern for the area. In fact, residents are fairly mixed in their evaluation of the local economy, with 34% viewing it as in excellent or good condition, 35% as fair, and 28% as poor or failing.

- Fully 48% of those who favor additional gas production cite as their reason something related to the beneficial impact it will have on creating jobs and economic growth in the

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county. In addition, another 5% say they already work in the industry or related industries and would benefit from the additional production. Still, 81% of those who already view the economy as excellent or good support additional natural gas production.

- Notably, just 2% of respondents mention anything related to natural gas production as the top problem affecting the area – far behind other concerns, such as drugs/alcohol (16%), education (4%), health care (3%), or local government issues (3%).

The support for additional natural gas production in the county may also be rooted in Carbon county residents' very positive impressions of the oil and gas industry.

- By a seven-to-one margin, local residents have a favorable impression of "the oil and gas industry" rather than an unfavorable impression (69% favorable, 15% half-and-half, 10% unfavorable). In fact, 43% rate their opinion as "very favorable," compared to a mere 4% who have a "very unfavorable" view of the industry.

- More specifically, Anadarko Petroleum Corporation is also viewed very positively. By a nine-to-one margin, local residents have a favorable impression of Anadarko, rather than an unfavorable impression (38% favorable, 10% half-and-half, 4% unfavorable). The company is obviously less well known than the industry as a whole (30% have never heard of it).

Conversely, residents are more likely to have an unfavorable, rather than a favorable impression of one of the chief critics of the Atlantic Rim project.

- Just 12% hold a favorable impression of the Biodiversity Conservation Alliance, while 7% give it a "half-and-half" rating, and 14% an unfavorable rating. A majority (51%) have never heard of the group.

In summary, residents are strongly supportive of additional natural gas production in the Atlantic Rim area, with broad-based support throughout the county and among all demographic subgroups. Residents believe this project will be beneficial to the economy, which they view as the area's top problem. This support is also grounded in very positive feelings toward the oil and gas industry.

Atlantic Rim EIS Appendix L

Alternative C Mitigations - Appendix L of the Draft AR EIS

	Data Source Resource Concern	Protection Measure	Anadarkois **opposed to** these mitigations.	Anadarko **seeks** clarification **on these** mitigations
	Water and Soil fvianagoment			
	Steep Slopes >2b%, iron 30 meter DEM data. These less steep slopes present more complexity in planning, road design, and can require larger pad. Appendix M Map: Alt. **C--slopes >25%**	1) No pad, compressor or water transfer sites can be located in these areas.		
	Perennial Waters, Wetlands, Identified on National Wetlands Inventory or PFC with 500 ft. buffer on waters and PFC. **Appendix** M Maps: Alt. C--Perennial Surface **Waters** and Wetlands	No pad, compressor or water transfer sites t be located in these areas.		
607-140-1	Topsoils with excess salts providing difficulty with reclamation, Reclamation success is essential for modification of impacts to surface hydrology, especially the interim reclamation. Increasing reclamation success has many benefits to other resources. **Appendix** M Maps: Topsoils with **Excess** Salts	1) Pump reserve pit and do earth work for reclamation right after drilling, put in top soil and plant first good season, interim reclamation will be completed **one** year after **sp**ud date.		Interim reclamation within one year may not be possible at all locations due to timing stipulations.
607-140-2		2) Low impact road design for resource roads (roads into individual pads) on slopes <5%, if road can be built with no side slopes. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel.		What is brush beating? What is the purpose of frabic, mat and gravel?
607-140-3		3) Improve road surface on newly constructed or improved local and collector roads with 95% compaction on the road base and non-chlorine dust abatement product or suitable alternative treatment each year.		Why 95% compaction? What dust abatement product does BLM envision that is non-chlorine?
		4) Put together seed mix that includes salt tolerant plants		

607-140

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607

Atlantic Rim EIS Appendix L

Alternative C Mitigations - Appendix L of the Draft AR EIS

	Data Source Resource Concern	Protection Measure	Anadarko is opposed to **these** mitigations.	Anadarko seeks clarification on these mitigations
607-141-1	Soils with high runoff potential contribute to higher peak flows and can cause hillslope erosion by forming rills and gullies. Appendix M **Maps:** Alt. C--Soils with High Runoff Potential.	1) Reduce pad density to 4 locations per section and the associated infrastructure and limit initial disturbance (i.e. short-term) total to <20 acres per section.	This is not an acceptable mitigation since 80-acre spacing is needed to develop the gas resource nor is it justified by the analysis in the DEIS.	
		2) Place waddles any potential flow path and at culvertentrances and exits.		
607-142-2		3) Deep ripping (18 inches or more) before planting to increase percolation.		why 18 inches deep? What is the basis for this depth of ripping and in what conditions would it apply?
607-141-3		4) Closed system, pitless, or shared pit drilling.		This measure should be addressed at the APD level. Clarify the objective of the mitigation with respect to this resource.
607-141-4		5) Low impact road design for resource roads (roads into individual pads) on slopes <5%. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel.		What is brush beating? What is the purpose of frabic, mat and gravel?
		6) Crimped weed-free hay stubble mulch to increase surface roughness.		

607-141

Atlantic Rim EIS Appendix L

Alternative C Mitigations - Appendix L of the Draft AR EIS

		Data Source **Resource** Concern	Protection **Measure**	Anadarko is **opposed** to **these** mitigations.	Anadarko **seeks clarification on** these mitigations
607-142-1	607-142	Soils with severe road rating typically dominate by one soil particle size component and road bases can become very unstable with insufficient maintenance. Appendix M Maps: Soils with Severe Road Rating	1) Low impact road design for resource roads (roads into individual pads) on slopes <5%. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel		What is brush beating? What is the purpose of (rabic, mat and gravel?
607-142-2			2) Improve road surface on newly constructed or improved local and collector roads with 95% compaction on the road base and non-chlorine dust abatement product or suitable alternative treatment each year.		Why 95% compaction? What dust abatement product does BLM envision that is non-chlorine?
607-143-1	607-143	Soils with poor topsoil ratings make reclamation difficult and can leave soils susceptible to erosion. Reclamation success is essential for modification of impacts to surface hydrology, especially the interim reclamation. Increasing reclamation success has many benefits to other resources. Appendix M Maps: Soils with Poor/Fair Topsoil Ratings	1) Pump reserve pit and do earth work for reclamation right after drilling, put in top soil and plant first good season, interim reclamation will be completed one year after spud date.		Anadarko would consider this on a site-by-site basis to be addressed at the APD level. interim reclamation, especially given that this term is not defined, within one year may not be possible at all locations due to timing stipulations.
607-143-2			2) Crimped weed-free hay stubble mulch to increase surface roughness.		This measure fails to consider alternate techniques such as use of hydromulch. Should only be employed if site-specific conditions support.
607-143-3			3) Use silt fencing to reduce wind erosion during construction.		How is silt fence anticipated to reduce wind erosion?
607-143-4			5) Apply soil amendments to increase reclamation success unless testing demonstrates no need for amendments.		What amendments are anticipated and under what conditions would they be applied?

Atlantic Rim EIS Appendix L

Alternative C Mitigations - Appendix L of the Draft AR EIS

		Data **Source Resource** Concern	Protection Measure	Anadarko **is opposed** to **these** mitigations.	Anadarko seeks clarification **on** these mitigations
		Vegetaviott Resources			
607-144-1	607-144	Vegetation communities on >8% slopes present reclamation difficulties. **Appendix** M **Maps**	Reduced initial surface disturbance (i.e. short-term) total to 420 acres per section.	This is not an acceptable mitigation since 80-acre spacing is needed to develop the gas resource, nor is it justified by the analysis in the DEIS.	
607-145-1	607-145	The limited geographic extent of certain vegetation communities and their importance to a variety of wildlife species warrant special consideration. **Appendix** M Maps: Project Area with Vegetation Communities	1) Avoid surface disturbances within aspen, juniper-woodland, mahogany, and serviceberry communities.		
			2) Limit surface disturbances within the silver sagebrush/bitterbrush vegetation community to <20 acres mi2	This is not an acceptable mitigation since 80-acre spacing is needed to develop the gas resource, nor is it justified by the analysis in the DEIS.	

Atlantic Rim EIS Appendix L

Alternative C Mitigations - Appendix L of the Draft AR EIS

	Data Source **Resource** Concern	Protection **Measure**	Anadarko is **opposed to these** mitigations.	Anadarko seeks clarification **on** these mitigations
607-146-1	Rangelzlivi Resources			
607-146	Loss of livestock; disruption of management operations	Operators shall establish and enforce speed !units throughout the project area.		Clarify Anadarko's authority to enforce speed limits.
607-146-2		2) Erect signs in lambing/calving areas, shipping pastures or adjacent to working corrals to warn vehicle operators.		Any such actions will require coordination with livestock operators. Will BLM require in grazing permits?
607-147	Disruption of management operations. Appendix M **Maps:** Project Area with **Grazing** Allotments	1) Operators shall provide a plan speac to pastures or regions so livestock operators can plan acUvitieslworic around development to reduce conflicts.		Why would these be required? Duplicative of development plan.
607-147-1				
607-148	Dust on vegetation and erosion	1) Improve road surface on newly constructed or improved local and collector roads with 95% compaction on the road base and non-chlorine dust abatement product or suitable alternative treatment each year.		Why 95% compaction? What dust abatement product does BLM envision that is non-chlorine?
607-148-1				

Atlantic Rim EIS Appendix L

Alternative C Mitigations - Appendix L of the Draft AR EIS

		Data Source **Resource Concern**	**Protection Measure**	Anadarko is **opposed to** these mitigations.	**Anadarko seeks clarification on** these mitigations
		Wildlife Resource Management			
	607-149	Disturbance of greater sage grouse and Columbian sharp-tailed grouse nesting & brood rearing habitat. Appendix M **Maps:** Alt. C--**Greater** Sage Grouse	1) Limit initial disturbance (short term) total to <20 acres per section	This is not an acceptable mitigation since 80-acre spacing is needed to develop the gas resource nor is it justified by the analysis in the DEIS.	
607-150-1	607-150	Disturbance of winter relief habitats for greater sage-grouse and Columbian sharp-tailed grouse. Appendix M **Maps:** Alt. **C--Grouse** Severe Winter **Relief** Habitat	1) No surface disturbance		How has this area been defined? What process is being used to define this area? Will the area indicated change over the development period?
607-151-1	607-151	Disturbance of big game crucial winter range. Appendix M Maps: Seasonal pronghorn antelope, **mule** deer and **elk** ranges (3 **Maps)**	1) Limit initial disturbance (i.e. short-term) total to <20 acres per section	This is not an acceptable mitigation since 80-acre spacing is needed to develop the gas resource nor is it justified by the analysis in the DEIS.	

Alternative C Mitigations - Appendix L of the Draft AR EIS

607-152-5 607-152-4 607-152-3 607-152-2 607-152-1

607d-1

Data Source **Resource** Concern	Protection **Measure**	Anadarko is **opposed** to these mitigations.	**Anadarko seeks clarification on these** mitigations
Visual Resource Management			
Failure to use special mitigations will result in a project that will exceed VRM Class III Management Objectives and therefore be out of compliance with Land Use Planning guidance. Minimizing surface disturbance and aboveground facilities will help minimize visual impacts. Maximizing facility distance from primary roads will help minimize visual impacts. Using any topographic screening available to hide facilities and roads will help minimize visual impacts. Appendix M **Maps:** Alt. **C--Areas** Visible from Main Roads in **VRM** Class III with Slopes <5%.	In Visible portions of VRM Class 111 Areas, the following apply;		
	1) Pads shall not be located on or near ridgelines - use subsurface or low-profile facilities to prevent protrusion above horizon line when viewed from any State, County orBLM roads.		This is a measurement that should be addressed at the APD level. Measure is not justified by the analysis in the DEIS
	2) Maximize pad distance from State, County or BLM roads	This mitigation will increase surface disturbance by increasing the length of roads to individual wells.	
	3) Low Impact road design for resource roads (roads into individual pads) on slopes <5%, if road can be built with no side slopes. This will include ditch-witching utilities within **the** ROW, brush beating, some type or fabric or matting and gravel (See Map 2.6)		What is brush beating? What is the purpose of frabic, mat and gravel?
	4) Minimize pad size - use pitless, shared pit or closed system drilling.		Please clarify the objectives of this mitigation?
	5) Pump reserve pit and do earth work for reclamation right after drilling, put in top soil and plan first good season, interim reclamation will be completed one year after spud date.		Anadarko would consider this on a site-by-site basis to be addressed at the APD level. Because the BLM has not defined the parameters of interim reclamation, we question whether it can be completed within one year at all locations especially given the constraints due to timing stipulations.

607

Alternative C Mitigations - Appendix L of the Draft AR EIS

Data Source Resource **Concern**	Protection Measure	Anadarko is **opposed** to **these** mitigations.	Anadarko **seeks clarification on** these mitigations
Cow Butte/Wild Cow SMA			
Existing road network. Appendix M Maps: Alt. **C -** Special Management **Areas Overview**	**1)** Road density within the SMA targeted for less than 3 miles/mile(2).	This is off-site mitigation and would need to be performed voluntarily by the mineral lessee. Not supported by the analysis in the DEIS.	
	2) Where existing road paths do not provide sufficient lease access or are located within highly erosive soils or in proximity to sensitive wildlife resources, reclamation of existing roads (either inside or outside the ARPA) would provide for the construction of new road paths	This is off-site mitigation and would need to be performed voluntarily by the mineral lessee. Not supported by the analysis in the DEIS.	
	3) Improment of existing roads or construction of new roads would be designed to minimize hydrologic alteration. Specific road design criteria would be based on site-specific review and likely include a combination of mitigation options.		This mitigation is unclear. Please provide additional details on the objective of the mitigation. Appears to be an issue that is better addressed at the site-specific level.
Human presence	1) Existing levels of public access would be maintained in most cases, this would require new and improved roads be gated.		Anadarko requests clarification as to its authority.
	2) Remote monitoring of wel l locations would be employed where feasible.		This should not be a requirement.
Wildlife movements	1) Convert fences to BLM standards or designs (e.g. rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permittees.		The extent or fesibility of this off-site mitigation is not clear. Please provide additional information.
Limited vegetation communities. Appendix M maps: Project Area with Vegetation Communities	1) No surface disturbances within aspen, mahogany and serviceberry communities.		

607-153-1 607-153-2 607-153-3 607-153-4 607-153-5 607-153-6 607-153

Atlantic Rim EIS Appendix L

Alternative C Mitigations - Appendix L of the Draft AR EIS

	Data Source **Resource** Concern	Protection **Measure**	**Anadarko is opposed** to **these** mitigations.	Anadarko **seeks clarification on these** mitigations
	Historic Trails SMA			
607-154-1	Historic trail corridors **Appendix** M Maps: Alt. **C -** Historic Trails and 2-Mile Visibility	1) Brush hog and gravel surface for temporary roads at the drilling phase instead of constructing crowned and ditched roads on all locations.		Clarify the objectives of this mitigation and how these objectives relate to the Historic Trails resource?
607-154-2		2) Begin reclamation at the time most optimal to regenerate the native species. Replace native shrubs to decrease visibility,		Provide examples of how this mitigation would be implemented. What criteria would be used for selecting and evaluating reclamation with shrubs.
		3) Use existing roads/two-tracks if doing so would minimize visibility otherwise construct roads in minimally visible areas.		
607-154-3		4) Limit trail crossings to existing corridors.	This measure is not justified by the analysis in the DEIS and ignores BLM policy.	
607-154-4		5) Construct smaller well pads.	Not justified by the analysis in the DEIS.	
607-154-5		6) Construct low-impact roads.		Please clarify the definition of low-impact. What are the design criteria for a low-impact road?

607-154

Atlantic Rim EIS Appendix L

Alternative **C Mitigations - Appendix L of the Draft AR EIS**

	Data Source Resource Concern	Protection Measure	**Anadarko** is **opposed to** these mitigations.	Anadarko seeks **clarification on these mitigations**
607-154-6 607-154		7) Require multiple well locations per pad in order to decrease visibility.	>1 drilling is not technically feasible in this field for coalbed natural gas. The DEIS dismissed this as an alternative. Not supported by the analysis in the DEIS.	

Alternative C Mitigations - Appendix L of the Draft AR EIS

	Data Source Resource Concern	Protection Measure	**Anadarko** is opposed to these mitigations.	**Anadarko seeks clarification on these mitigations**
607-155-1	Historic trails within the ARPA	1)Allow no surface disturbance within 1/4 mile of contributing segments of historic trails, including the Overland and Rawlins to Baggs Freight Road or the trail's associated sites.	These measures are not justified by the analysis in the DEIS, nor are these trails designated historic trails.	
607-155-2		2) Limit trail crossings to existing disturbance corridors.		Does not consider site specific conditions.

607-155

Alternative C Mitigations - Appendix L of the Draft AR EIS

Data **Source Resource** Concern	Protection **Measure**	Anadarko is **opposed to** these mitigations.	Anadarko seeks clarification **on** these mitigations
Upper Muddy Creek Watershed/Grizzly **SMA**			
Additional road development would alter hydrologic conditions that create and maintain key habitat features of importance to BLM sensitive fishes (Bower 2005). Given the limited distribution of these fishes, alteration of the suitability of habitats within the SMA wouldlikely increase the validity of listing petitions under the Endangered Species Act. Appendix M **Maps:** Alt C - special Management Areas Overview	1) Road density within the SMA target for less than 3 miles/mile(2).	This is oil-site mitigation and would need to be performed voluntarily by the mineral lessee. Not supported by the analysis in the DEIS.	
	2) Transportation and well access roads would utilize existing road paths where feasible.		
	3) Where existing road paths do not provide sufficient tease access or are located within highly erosive soils or in proximity to sensitive wildlife resources, reclamation of existing roads within the SMA (Either inside or outside the ARPA) would provide for the construction of new road paths.	This is off-site mitigation and would need to be performed voluntarily by the mineral lessee. Not supported by the analysis in the DEIS.	
	4) Improvement of existing roads or construction of new roads would be designed to minimize hydrologic alteration. Specific road design criteria would be based on site-specific review and likely include a combination of mitigation options.		This mitigation is unclear. Please provide additional detail on the objective of the mitigation.
	5) Detail development, transportation, and reclamation plans,including road design, Specific to those areas within the SMA will be required.		This measure is unclear.
Slopes >8% within the Upper Muddy Creek Watershed/Grizzly SMA boundary from 30-m DEM. Road construction on steep slopes would exacerbate the alteration of hydrologic conditions that create and maintain key habitat features of importance to BLM sensitive fishes, Appendix M **Maps:** Alt. **C - Muddy Creek SMA Slopes >8%.**	) No Surface disturbance	This mitigation eliminates a significant portion of the geologic target from drilling. Not supported by the analysis in the DOS.	
	2) Detailed transportation plan required in order to avoid areas of >8% slope.	A detailed transportation plan would be submitted but it will not be possible to avoid 8% slopes in this area. Not supported by the analysis in the DEIS.	

607-156-1 607-156-2 607-156-3 607-156-4 607-156-5 607-156-6 607-156

Alternative C Mitigations - Appendix L of the Draft AR EIS

	Data Source Resource Concern	Protection Measure	Anadarko is opposed to these mitigations.	Anadarko seeks clarification on these mitigations
607-156-7 607-156-8 607-156-9	1:24,000 NHD within the Upper Muddy Creek Watershed/Grizzly SMA boundary. The fragmentation of fish habitats and wildlife corridors as well as risks posed by the increased probability of exotic species introductions warrant avoidance of additional road crossings of Muddy Creek.	1) No new road crossings of Muddy Creek	Not supported by the analysis in the DEIS.	
		2) Detailed development and transportation plan required In order to design access routes that avoid Muddy Creek	Not supported by the analysis in the DEIS.	
	Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of sage-grouse leks and raptor nests	1) Existing leveis of public access would be maintained. In most cases, this would require new and improved roads be gated.		Anadarko questions its authority to implement this measure.
		2 Remcte monitoring of well locations would be required where feasible.		
607-156-10 607-156	Chloride deicing agents are toxic to a variety of plants, fish and other aquatic organisms and tend to increase the mobility of chemical elements in soil, such as heavy metals (Amrhein 1992; National Research Council 1991).	1) Use only non-chloride deicing and dust control agents within the Upper Muddy Creek VVatershediGrizzly SMA		What dust abatement product is envisioned. Please provide additional information.
607-156-11	The limited geographic extent of certain vegetation communities and their importance to a variety of wildlife species warrant special consideration.	1) No surface disturbances within aspen, juniper woodland , true mountain mahogany, and serviceberry communities.	This measure is not justified by the analysis.	
607-156-12	The combination of increased disturbance of big game resulting from development activities and existing fragmentation of movement corridors by fences would likely result in increased mortality.	1) Convert fences to BLM standard or designs (e.g. rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permitees.		The extent or feasibility of this off-site mitigation is not clear. Please provide additional information.

Atlantic Rim EIS Appendix L

Alternative C Mitigations - Appendix L of the Draft AR EIS

	Data Source Resource Concern	Protection Measure	Anadarko is **opposed to these** mitigations.	**Anadarko seeks** clarification **on these** mitigations
	Sand Hills SMA			
607-157-1 607-157-2 607-157-3 607-157-4 607-157-5 607-157-6 607-157-7 607-157-8 607-157-9 607-157	There is currently an extensive road network within the SMA including those portions within the ARPA. Reducing the density of roads within the area and incorporating appropriate designs when improving existing roads would help to reduce disturbance of the unique vegetation community important to big game, greater sage-grouse, and Columbian sharp-tailed grouse.	1) Net reduction in road ensity within the SMA to a target of less than 3 miles/rnie(2).	justified by the analysis in	
		2) Transportation and well access roads would utilize road paths where feasible.	justifted by the analysis in	
		3) Where existing road paths do not provide sufficient lease access or are located within sensitive vegetation, highly erosive soils, or in proximity to sensitive wildlife resources, reclamation of existing roads (either inside or outside the ARPA) would provide for the construction of new road paths.	This measure iS not justified by the analysis In the DEIS,	
		4) Improvement of existing roads or construction of new roads would be designed to minimize alteration of sensitive vegetation communities.	justified by the analysis in	
		5) Detailed development, transportation, and reclamation plans, including road design, specific to those areas within the SMA will be required.	justified by the analysis in ra-	
	Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of leks and raptor nests.	1) Existing levels of public access would be maintained, In most cases, this would require new and improved roads be seasonally closed.	This measure is not justified by the analysis in the DEIS.	
		2) Remote monitoring of well locations wouldbe required where feasible.	This measure is not justified by the analysis in the DEIS.	
	Chloride deicing agents are toxic to a variety of plants and tend to increase the mobility of chemical elements in soil, such as heavy metals (Amrhein 1992; National Research Council 1991).	) Use only non-chlorine deicing and dust control agents within the Sand Hills SMA.		What dust abatement product is envisioned. Please provide additional information.
	The limited geographic extent of certain vegetation communities and their importance to a variety of wildlife species warrant special consideration.	1) Limit surface disturbances with the silver sagebrush/bitterbrush community of the Sand Hills to <20 acresimi(2).	This is not an acceptable mitigation since 80-acre spacing is needed to develop the gas resource. Not supported by the analysis in the DEIS.	

Atlantic Rim EIS Appendix L

Alternative C Mitigations - Appendix L of the Draft AR EIS

		Data Source Resource Concern	Protection Measure	Anadarko is opposed to these mitigations.	Anadarko seeks clarification on these mitigations
607-157-10	607-157	The combination of increased disturbance of big game resulting from development activities and existing fragmentation of movement corridors by fences would likely result in increased mortality.	1) Convert fences to BLM standards or designs (e.g. rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permitees.		The extent or fesibility of this off-site mitigation is not clear. Please provide additional information.
607-158-1	607-158	Historic Trails SMA	See Historic Trails SMA for special protective measures.		
		JO Ranch property **Appendix** M **Maps: Alt. C -** Special **Management** Areas **Overview**	1) no surface disturbance within the 18 acres surrounding	This measure is not justified by the analysis in the DEIS.	