

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
COLORADO STATE OFFICE
2850 YOUNGFIELD STREET
LAKEWOOD, COLORADO 80215-7093

CO-922
3160

MAY 30 2003

Memorandum

To: Field Office Manager, Glenwood Springs (CO140)

From: Branch Chief, Fluid Minerals (CO922)

Subject: Roan Plateau Reasonable Foreseeable Development (RFD)

Attached please find a final copy of the Reasonable Foreseeable Development (RFD), dated May 29, 2003, for the Roan Plateau Planning Area (RPPA). In September 2002, a draft version of this RFD was routed to the Glenwood Springs and Grand Junction Field Offices as well as the Washington Office (310) for review and comments. Based upon your suggestions and comments, a revised RFD was prepared in December 2002. Subsequent to this date, the following factors have necessitated further revision of the RFD.

In accordance with the guidance found in BLM Handbook 1624, Planning for Fluid Mineral Resources, a RFD should be for the life of plan. Accordingly, we revised the Roan Plateau Planning area RFD to be consistent with this guidance and to reflect the 20 year timeframe of the plan.

Recently the Colorado Oil and Gas Conservation Commission (COGCC) approved Williams Production's application for 10 acre well density on private lands in portions of the Grand Valley, Parachute and Rulison Fields. The COGCC approval was based upon pilot project data submitted by Williams, which demonstrated that 10 acre well density was necessary to effectively drain the gas reserves in the highly lenticular Williams Fork Formation of the Mesaverde Group. Because the same geologic conditions extend across the RPPA, the RFD now places a greater emphasis on 10 acre well density development for the lower plateau.

At your request, we have eliminated road, well pad and pipeline disturbance projections from this RFD since those projections will be provided by the contractor in the RPPA environmental impact statement.

The attached version of the RFD contains the revisions discussed above. If you have any questions, please contact Pat Gallagher at 303.239.3756.



Attachment-Roan Plateau RFD

cc: Kermit Witherbee, WO-310
Wayne Bankert, GJFO

5/29/03
Roan Plateau Planning Area
Oil and Gas Reasonable Foreseeable Development

Summary

The Roan Plateau Planning Area (RPPA) can be divided into two areas: upper plateau and lower plateau (See Figure 1). The Oil and Gas Reasonable Foreseeable Development (RFD) for the RPPA is that 1,987 Mesaverde and Wasatch federal mineral estate wells are forecasted to be drilled within the RPPA. From these federal mineral estate wells, 2,239 BCF¹ of gas and 4,856 MBO will be recovered over the next 20 years - predominantly from the Mesaverde formation. Of the 1,987 wells projected to be drilled, 335 are projected for the upper plateau and 1,652 wells are projected for the lower plateau within the RPPA. While Coal Bed Methane exists in the Cameo Coal zone of the Mesaverde in the RPPA, it is found at much deeper depths and does not have the well-developed natural fracture permeability exhibited elsewhere in the rocky mountain region. As such, the Cameo Coal zone in the RPPA produces little associated water (<4 BWPD) and is not expected to have the water disposal problems associated in other areas of the rocky mountains. According to the Energy Information Agency, Colorado's gas reserves are 10.4 TCF and the national gas reserves are 177 TCF as of December 31, 2000. The RFD federal mineral estate gas from the RPPA represents about 22% of Colorado's current reserves and 1% of the Nation's reserves. Total gas from the RPPA represents 38% of Colorado's current reserves and 2% of the Nation's reserves. According to Dwights energy data, only 13 dry holes were drilled out of 415 wells drilled within the RPPA. This represents a 97% success ratio. RFD projections on private minerals as well as federal minerals are summarized in Table 2. Road, pipeline and well pad disturbance projections will be discussed in the RPPA Environmental Impact Statement and are therefore not part of this RFD.

Introduction

The RPPA consist of 127,009 acres. Of which 73,602 acres contain federal minerals available for oil and gas development². Of the 73,602 acres, about 18,066 acres are presently leased. Contained entirely within the RPPA are NOSRs 1 and 3 which were transferred to the BLM from the Department of Energy (DOE) under the Defense Authorization Act of 1997. About 36,362 and 18,992 acres comprise NOSRs 1 and 3, respectively. 53,798 acres comprise the upper plateau which contains most of NOSR1. The upper plateau contains approximately 65%

¹1M = 1,000; 1B = 1MMM = 1,000,000,000; 1T = 1MB = 1,000,000,000,000;
W-Water; O-Oil; G - Gas; D - Day

² The Roan Planning Area of 127,009 acres was determined from the GSFO "roanplat_pby" gis shape file. The public oil and gas minerals were obtained from the GSFO "Rplstmno" and "Nosr_parcel" gis shape files.

federal and 35% private land. BLM leased 8,379 acres of the NOSRs 1 and 3 effective May 1, 1999, to Barrett Resources (now Williams). Table 1 provides an area summary of the RPPA.

The RPPA contain parts of three active gas fields including the Grand Valley, Parachute and Rulison (See Figure 1). The major productive horizons include the Mesaverde Group and the Wasatch Formation. The deeper Mesaverde group is the principal development objective and includes the Williams Fork Formation, the Corcoran, the Cameo Coal Zone and the Rollins Sandstone. Development started in the 1940s. According to Dwights Energy October, 2001, data, 415 wells have been drilled within the Roan Study Area. Of those drilled, 22 have been plugged and abandoned (P&A). Only 13 out of the 415 wells drilled were plugged and abandoned without production. 393 wells (291 Mesaverde, 87 Wasatch and 15 other) remain as productive wells as of October, 2001, in the RPPA. Of the 415 wells, 88 were drilled on federal oil and gas minerals. Drilling started on federal land on the NOSR in 1980, by the DOE. Figure 1 depicts mineral ownership, petroleum field boundaries, land and mineral ownership and existing leases within the RPPA. Production is mainly gas with a little associated condensate mainly from the Mesaverde.

Geology

The DOE has prepared two recent reports discussing reserves, development potential and geology for the NOSRs 1 and 3. The first is entitled, "Naval Oil Shale Reserves 1 and 3 Oil and Gas Reserves Evaluation" and the second is entitled, "Naval Oil Shale Reserve No. 3 Commercial Development Study". Both were prepared in July, 1998. In addition, Ron Gunnifson, BLM Colorado State Office Geologist, prepared a report on the geologic potential of the area on October 14, 1999. The following paragraph and list of assumptions incorporate information from those reports, except where otherwise noted.

The major productive horizons include the Mesaverde Group and the Wasatch Formation. The deeper Mesaverde group is the principal development objective and includes the Williams Fork Formation, the Corcoran, the Cameo Coal Zone and the Rollins Sandstone (See Figure 5 for stratigraphic column). While Coal Bed Methane exists in the Cameo Coal zone, it lacks the well-developed natural fracture permeability associated with prolific water and gas flows exhibited in some areas of the northern San Juan Basin and on the Divide Creek anticline in the eastern Piceance Basin. The Wasatch and Mesaverde produce little or no water and the Mesaverde will produce some associated condensate. Both zones contain multiple lenticular sandstones that are limited in horizontal extent. A typical well may encounter 10 to 25 or more of these lenses. Also, there is virtually no continuity of these sands even in closely spaced wells (1,000 ft. ±). While deeper, the primary drilling target is the Mesaverde which has about eight times the average pay section, three times the permeability and 40% greater porosity. In the lower plateau, depth to the Wasatch is about 3500' and to the Mesaverde is about 9000'. On the upper plateau where NOSR 1 is located, depths are about 2000 to 3000' greater. The greater overburden and elevation will negatively impact development but the topography on top of the plateau is sufficiently flat to make drilling possible over most of the entire surface. In addition to greater snow depths that will limit access, additional drilling costs and less porosity and

permeability can be expected on the plateau. Based on the above reports, Mesaverde reserves range between .7 to 1.88 BCF/Well and initial well production averaging 1360 MCF/D. Wasatch reserves are estimated to be about .7 BCF/Well and initial well production averages 270 MCF/D. During an April, 2001, spacing hearing before the Colorado Oil and Gas Conservation Commission, Williams estimated Mesaverde reserves to be 1.25 -1.86 BCF /Well. For just the existing four leases in the NOSR, Williams is planning on drilling 50 wells per year for the next ten years.

Oil and Gas Activity

Past Development

In the early 1980's, private companies began to develop natural gas reserves in the Rulison, Parachute and Grand Valley Fields, just outside of NOSR3. In, 1985, to protect federal gas resources from drainage, DOE initiated its own drilling program. DOE drilled 24 wholly-owned wells and entered into joint ownership or Communitization Agreements (CAs) with private developers for some 25-30 additional wells. The wells in which the U.S. holds an interest are located along the southern boundary of the reserve. This area is referred to in the DAA as the "developed tract of Oil Shale Reserve Numbered 3".

From Dwights Energy Data, as of May 1, 1999, Cumulative gas and oil production from the Mesaverde and Wasatch was 124 BCF and 188 MBO for the RPPA. Cumulative gas and oil production from just federal oil and gas minerals of the Mesaverde and Wasatch as of May 1, 1999, was 26 BCF and 49 MBO for the RPPA. Production is summarized in Table 1.

Drilling on federal mineral estate from 1980 to 1991 was sporadic, averaging less than three wells per year. Since 1991, activity had increased, averaging about six wells per year, a total of 79 wells by October, 2001. The number of wells drilled annually on federal and private mineral estate is depicted on Figure 2.

Present Development

During January, 1999, a Supplemental Environmental Impact Statement (SEIS) covering impacts from oil and gas development in the Glenwood Springs Resource Area, including the developed portion of the NOSR was completed. The undeveloped portion of the NOSR3 and NOSR 1 were not included in the analysis. The production area of the NOSR covers 12,029 acres. During March, 1999, 8,379 acres of this area was divided into four parcels and leased. The effective date of the leases is May 1, 1999. As of June, 2001, the Automated Fluid Minerals Support System (AFMSS) report GLB.89 reveals that there are 109 completed and proposed wellbores, including 76 producing gas wells, 3 drilling wells, 26 Notices of Stakings/Applications for Permits to Drill (NOS/APDs), four abandoned wells and 1 dual completion. These completions and proposed wells are located on the 4 NOSR leases and on adjacent land covered by 29 Communalization Agreements.

During Fiscal Year (FY) 2000, there were 17 directional wells permitted on federal leases in the RPPA. While directional drilling is generally more expensive in this area, directional drilling allows for wells to be drilled on a common pad resulting in less surface disturbance. Currently, the operator of the NOSR leases (Williams) is proposing 160 federal wells for this area to be drilled from 39 new locations and 21 existing locations. The environmental assessment for this proposal is the Wheeler to Webster Geographic Area Proposal and is dated July 2002. This averages to be two to three wells per location with as many as seven wells on a single location. Down-hole spacing for the Mesaverde is 20 acres per well. Williams reports that the 20 acre wells perform as well or better than wells drilled at 40 acre spacing. In addition, Williams is currently piloting ten acre Mesaverde spacing on 320 acres of private land in the area. During an April 10, 2003, Colorado Oil and Gas Association spacing hearing, Williams provided the results of the pilot. Based on the pilot, it was determined that 20 acre well spacing would recover only 40% to 45% of the gas in place. Wells drilled on 10 acre spacing would recover 80% of the gas in place. As such, little or no production interference was exhibited between wells and the 10 acre spacing is supported.

However, on the upper plateau, an additional 2000 to 3000 feet of Wasatch must be penetrated. The operator reports that this additional overburden presents drilling challenges, including sloughing clays and water flows, which have not been overcome as of yet. A Mesaverde well nor directional well has yet to be drilled on the upper plateau. A review of four Allen Point Wasatch wells located on the upper plateau reveal that drilling times were seven times the drilling times of an average lower plateau Wasatch well. Additionally, the upper plateau is limited to a single suitable access road, weather allows for drilling only five months of the year, and an average Mesaverde well drilling and completion would be extended to 30 days.

RPPA Production

Between May 1, 1999, and June 1, 2001, Cumulative gas and oil production from the RPPA has increased from 124 BCF and 188 MBO to 173 BCF and 260 MBO. Monthly gas production from the RPPA between the same periods increased from 1,584 MMCF to 2,304 MMCF. Monthly oil production decreased slightly from 2,780 BO to 2,695 BO. Between the same periods, federal oil and gas minerals cumulative production has increased from 26 MMCF and 49 MBO to 36 MMCF and 68 MBO. Monthly federal gas and oil has increased from 327 MMCF and 864 BO to 550 MMCF and 885 BO. These figures support a production increase of about 40% of federal and private land to 70% on just federal land between the periods. As of June 1, 2001, cumulative gas production from the Mesaverde is 26 BCF and 10 BCF from the Wasatch. From these figures, one can conclude that Mesaverde is about 72% of the total production. Cumulative Total and Federal water production is 1,139 and 318 BW as of June 1, 2001. Production figures are from the October, 2001, Dwights Energy Data and are summarized in Table 1.

From FY 2000, AFMSS data, net government production from the four NOSR leases and on adjacent land covered by 29 Communalization Agreements (CAs) is about 9,005 MCFGD which

represents about 4% of the Federal Colorado production of 201,164 MCFGD from the FY 2000 Minerals Management Service's State Mineral Summaries report. 9,005 MCFGD also represents about 3% of gas production from the Piceance basin (265,374 MCFGD), and about 5% of gas production from the Grand Valley, Rulison and Parachute fields (167,978 MCFGD) according to Dwights as of June 1, 2001.

Over the period from 1994 to 2001, production from the Piceance Basin has inclined at about 5% per year (Figure 3) and production from the Grand Valley, Rulison and Parachute fields has inclined at about 19% per year (Figure 4).

Reasonable Foreseeable Development

The Reasonable Foreseeable Development (RFD) is the level of oil and gas development activity that an objective reviewer might reasonably expect to occur over a specified range of time. The actual amount of future oil and gas development activity is dependent on many factors, such as actual field life, commodity prices, changes in technology, availability of infrastructure to transport the product, inflation, availability of capital, legislation, and taxes.

RFDs for this area in the past have been based upon historical development rates and have been consistently low in estimating development activity - Appendix B of the 1991 Final Colorado Oil and Gas Leasing and Development EIS (FEIS) forecast 54 wells to be drilled on BLM lands for the period of 1989, throughout 2010, with 36 expected within a high oil and gas potential areas, known as Region 4. The projections were subsequently increased to 90 wells total and 72 in Region 4. By 1997, or six years after implementation of the FEIS, 72 wells had been authorized in Region 4.

Section 4.20 of the 1999 FSEIS forecast 300 BLM wells to be drilled from 1999 to 2018 in Region 4 with 65 or 70 wells projected for the four Naval Oil Shale Reserve (NOSR) leases. Three years after the FSEIS implementation, 12 wells were drilled on the NOSR with an application for 160 additional wells as covered in a July 2002 Environmental Analysis. As such, more of an emphasis is being placed on recent oil and gas activity, operator plans and the geology of the productive horizons, rather than on historical drilling for development of this RFD.

Exploration activity on the upper plateau will be limited due to one suitable access road, a weather drilling window of five months, 3000 feet of additional unconsolidated Wasatch zone which all combine to result in less favorable well economics and fewer wells as compared to the lower plateau area. It is assumed that anticipated directional drilling difficulties due to the extra 3000 feet of overburden would make directional drilling infeasible. Also, wells drilled on the upper plateau would be limited by five drilling rigs drilling for five months per year and would take 30 days average time to drill each well. As such, the ultimate development number of wells for the upper plateau would be limited to an RFD of 380 Mesaverde wells and 127 Wasatch wells or a total of 507 wells as presented in Table 2. This represents an average of 125 acre

spacing for the Mesaverde (47,638 acres/380 wells) for the upper plateau.

For the lower plateau Mesaverde, it is assumed that some of the lower plateau would not support 10 acre spacing. Given that the RPPA has exhibited a 97% success ratio, it is further assumed that the entire area is capable of development at 20 acre spacing. As such, it is assumed that 80% of the lower plateau would be drilled on 10 acre downhole spacing and the remaining 20% would be drilled on 20 acre downhole spacing. For purpose determining the number of well pads, it is assumed that all Mesaverde wells would be drilled on 40 acre surface locations. For the Wasatch, wells would be co-located with Mesaverde wells every 160 acres on the lower plateau and co-located with every fourth Mesaverde well on the upper plateau. For the RFD on the lower plateau, the number of wells is limited by an estimated number of wells that can be developed during the projected life of the RPPA (20 years). Recent estimates from Williams are that they will drill approximately 100 private and federal wells per year in this area. This year, Encana is projecting drilling 200 wells in the nearby Grass Mesa/Hunter's Mesa units and currently has 20 drilling rigs running. Williams holds most all of the 18,066 acres that are presently leased within the RPPA. 16,476 acres of the lower plateau remain to be leased. An average, weighted by acreages yields about 148 wells per year for the lower plateau $((16,476*200+18,066*100)/16,476+18,066)$. Adding the upper plateau's projected 507 wells over 20 years (25 wells/year) yields a total of about 173 wells per year or 3,460 federal and private wells within the RPPA (See Note 10 of Table 2 for calculations).

RFD Assumptions:

Based on the above information, the following assumptions are made in determining the RFD. The results are presented in Table 2:

1. All potentially productive areas are open under standard lease terms and conditions (i.e., lease form without stipulations).
2. The surface covered by lands in excess of 50% slopes will be precluded from use. However, directional drilling of 1400' * offsets will be utilized to obtain reserves otherwise precluded by steep slopes.
3. Wasatch reserves will be .7BCF/Well and development will occur on 160 acre downhole spacing throughout the lower plateau and at one Wasatch well for every 4 Mesaverde wells on the upper plateau.
4. Based upon a 4/10/03 Colorado Oil and Gas Conservation Commission (COGCC) 10 acre spacing hearing data that Williams submitted, Mesaverde reserves will be 1.17 BCF/well and will occur on 10 acre downhole spacing on 80% of the lower plateau and 20 acre spacing on 20% of the lower plateau.
5. With the exception of the upper plateau, for 10 acre downhole spacing, an average of 4 Mesaverde wells will be drilled from a single 40 acre location - one well drilled vertically and the other three drilled directionally. For 20 acre downhole spacing, an average of 2 Mesaverde wells will be drilled from a single 40 acre location – one drilled vertically and the other drilled directionally.
6. Because of anticipated directional drilling, access and weather limitations on the upper plateau, the total number of upper plateau wells is limited to 507 (30.4 days/yr*5 rigs*1 well/30 days*5 months*20 yrs). While actual well spacing may be closer, average well spacing is at 125 acres (47,638 acres/507 wells).
7. Because of overall rig availability limitations and 20 year RFD projection limit, 148 wells per year will be assumed to be the maximum number of wells that can be drilled on private and federal lands on the lower plateau.
8. Surface spacing for the Mesaverde will generally be at 40 acres throughout the RPPA.
9. Wasatch wells will share Mesaverde well pads.
10. Development of the Wasatch will occur after much of the Mesaverde development because of the greater reserve and initial production potential and the fact that not much recent emphasis has been placed on the Wasatch (last Wasatch well was drilled in 1994). Development of the upper plateau will occur after much of the lower plateau is developed because of more favorable

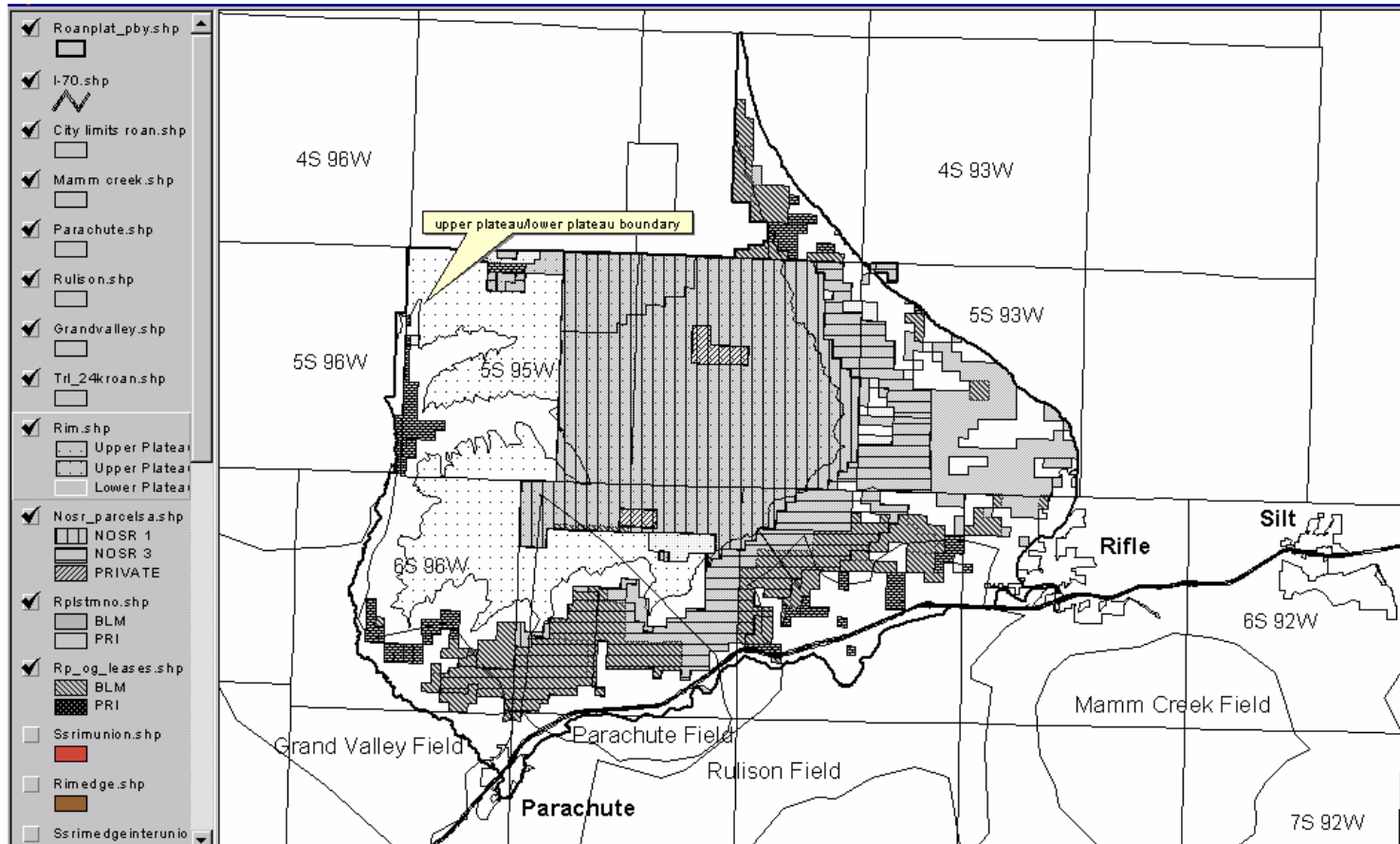
economics (last upper plateau well was completed in November 1990).

* Wells drilled on 20 acre spacing mathematically provide for individual well drainage of 526 feet. Typical directional wells drilled in this area have horizontal displacements of about 800 feet to 900 feet. Therefore, wells can obtain reserves a distance equal to a well's horizontal displacement plus its drainage radius (offset), or about 1400 feet.

r:\pgallagh\...\roanrfd2-6.doc

Figure 1

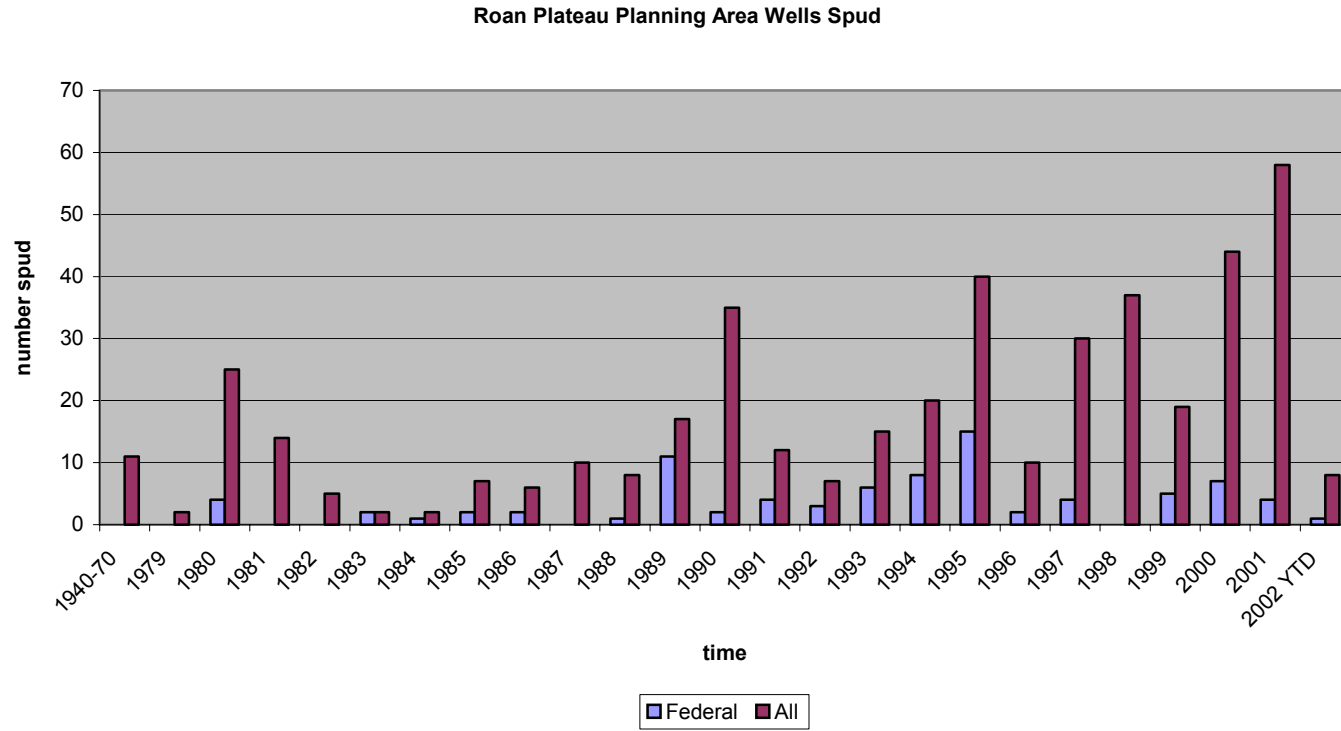
ROAN PLATEAU PLANNING AREA



r:\...pgallagh\gisdata\avproj\rportrait12.doc

This plat shows the boundaries of the Roan Plan Area, NOSRs 1 and 3, federal leases, mineral and surface estates and petroleum field boundaries.

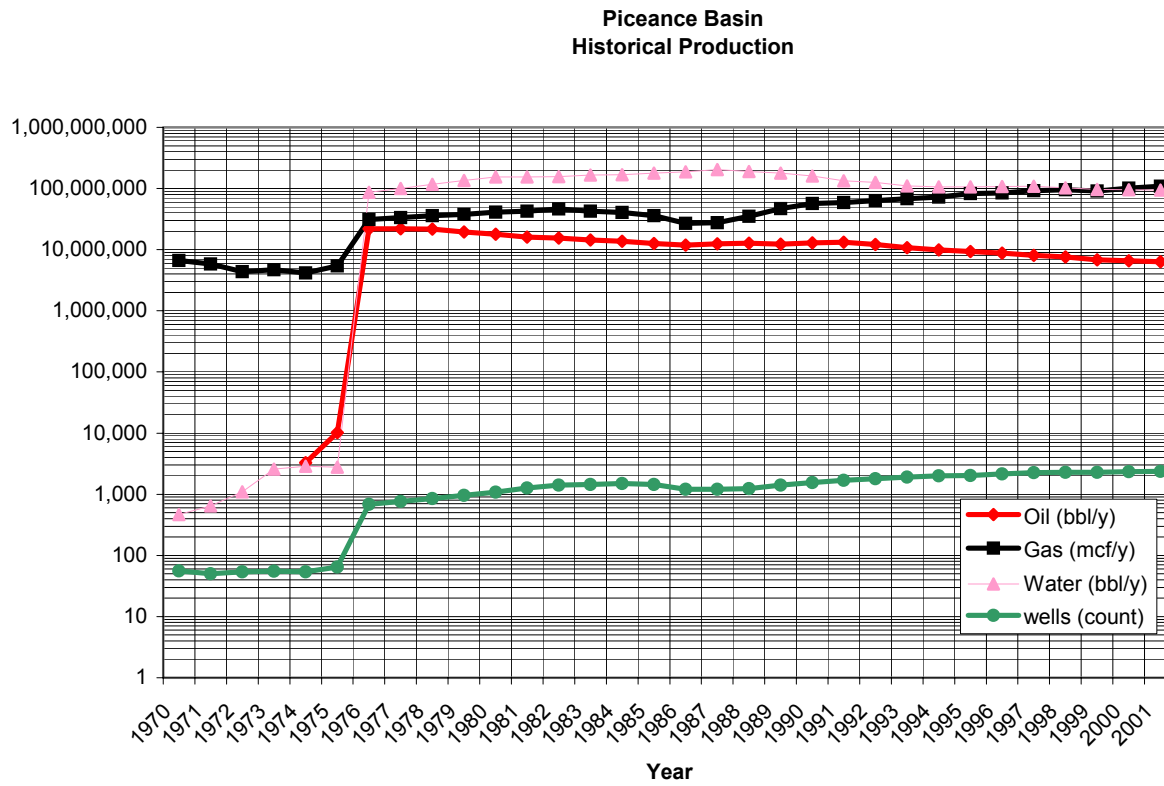
Figure 2



r:\pgallagh\nosr\...\roanplateaurfd.xls

This graph shows the number of federal and all wells that were spud (drilling starts) in the Roan Plateau Planning Area. Data is by fiscal year and was obtained from Dwights as of December 13, 2001.

Figure 3

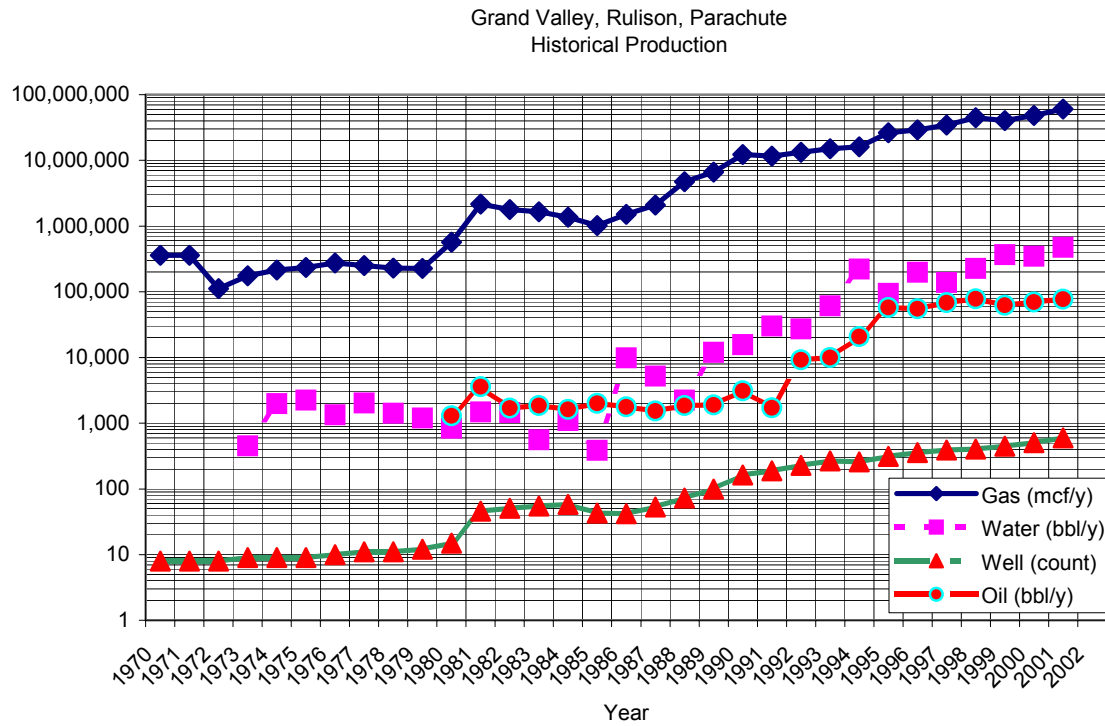


This figure shows historical production from the Piceance basin (data from Dwights). For the last 8 years, gas production exhibits a nominal incline of about 5% per year.

R:\pgallagh\nosr\piceance1.xls

R:\pgallagh\nosr\piceance.txt

Figure 4

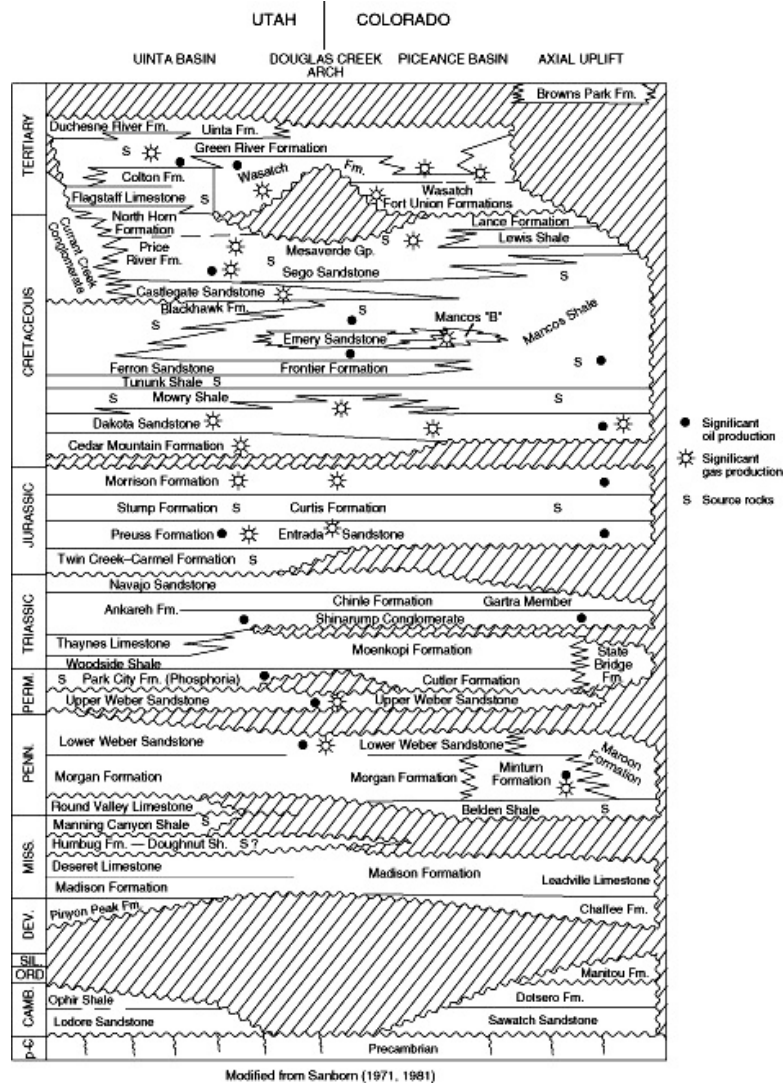


This figure shows the historical production of the Grand Valley, Rulison and Parachute fields (Data from Dwights). The RPPA contains production from all three of these fields. For the last 8 years, gas production exhibits a nominal incline of about 19% per year.

r:\pgallagh\nosr\grandpararulison1.xls

r:\pgallagh\nosr\grandpararulison1.txt

Figure 5



Stratigraphic column of the Piceance Basin (from USGS web site <http://certnetra.cr.usgs.gov/1995 OGDData/Region3/PR20ST.JPG>).

Table 1

**Roan Plateau Planning Area
Area Summary**

	Planning Area			NOSR1	NOSR3
1 Total Area (Acres)	127,009			36,362	18,992
2 Federal oil and gas minerals (Acres)	73,602			36,362	18,992
3 Nonfederal oil and gas minerals (Acres)	53,405			0	0
4 Federal leased oil and gas minerals (Acres)	18,066			166	8,213
5 Federal unleased oil and gas minerals (Acres)	54,932			36,196	10,779
6 Steep slopes greater than 50% (Acres)	29,211			5,357	7,359
7 Steep slopes left after 1400' buffer for directional drilling (Acres)	0			0	0
8 Fee and Federal wells drilled	415			0	79
9 Federal wells drilled	88			0	41
	Planning Area			NOSR1	NOSR3
	Mesaverde	Wasatch	Total	Total	Total
10 Federal cumulative gas produced (6/1/01 - BCF)	26	10	36	0	17
11 Federal cumulative oil produced (6/1/01 - MBO)	67	1	68	0	20
11' Federal cumulative water produced (6/1/01 - MBW)	317	0	318	0	158
12 Federal cumulative gas produced (5/1/99 - BCF)	18	9	26	0	13
13 Federal cumulative oil produced (5/1/99 - MBO)	48	1	49	0	18
14 Federal monthly gas as of 5/1/99 (MMCF)	272	56	327	0	123
15 Federal monthly oil as of 5/1/99 (BO)	864	0	864	0	206
16 Federal monthly gas as of 6/1/01 (MMCF)	509	41	550	0	224
17 Federal monthly oil as of 6/1/01 (BO)	885	0	885	0	121
18 cumulative gas produced (6/1/01 - BCF)	132	41	173	0	17
19 cumulative oil produced (6/1/01 - MBO)	257	3	260	0	20
19' cumulative water produced (6/1/01 - MBW)	1,129	10	1,139	0	158
20 cumulative gas produced (5/1/99 - BCF)	87	37	124	0	13
21 cumulative oil produced (5/1/99 - MBO)	185	3	188	0	18
22 monthly gas as of 5/1/99 (MMCF)	1,428	156	1,584	0	123
23 monthly oil as of 5/1/99 (BO)	2,767	13	2,780	0	206
24 monthly gas as of 6/1/01 (MMCF)	2,176	128	2,304	0	224
25 monthly oil as of 6/1/01 (BO)	2,695	0	2,695	0	121
26 Current producing wells (6/1/01)	210	69	279	0	34

Notes:

- 1 Total Area from roanplt_pby.shp and Nosr_parcel.shp (NOSR1 includes 924 acres of private surface/Federal oil and gas minerals)
- 2 Federal oil and gas minerals from Rplstmno.shp and Nosr_parcel.shp
- 3 Non oil and gas minerals = planning area total less Federal oil and gas minerals
- 4 Federal leased oil and gas minerals from Rp_og_leases.shp
- 5 Federal unleased oil and gas minerals = Federal leased oil and gas minerals less federal leased oil and gas minerals
- 6 Steep Slopes greater than 50% is from Rp_slope50.shp intersected with NOSR_parcelsa.shp (slopeparcelsinter.shp)
- 7 Steep Slopes left after 1400' buffer for directional drilling - buff5.shp
- 8 Fee and federal wells drilled from completed wells in roanplatwells1001.shp and AFMSS GLB.89 report (this report includes associated agreement wells and fed)
- 9 Federal wells drilled from roanplatfedwells1001.shp and nosrwells1001.shp
- 10 Federal cumulative gas from roanfedwellsmv.mdb; roanfedwellswasatch.mdb and nosrwells.mdb
- 11 Federal cumulative oil and water from roanfedwellsmv.mdb; roanfedwellswasatch.mdb and nosrwells.mdb
- 12 Current wells producing from roanwellsmv.mdb; roanwellswasatch.mdb and nosrwells.mdb

This table provides a development summary of wells, Cumulative gas production and monthly gas rate at the Time of the sale (5/1/99) and as of the last data point (6/1/01) for the NOSRs and RPPA. Non-federal and federal oil and gas mineral estate acreages are also provided

Table 2
05/29/2003

Roan Planning Area
Reasonable Forseeable Development *

	*****Planning Area*****			*****Upper Plateau*****			*****Lower Plateau*****		
	private and federal	federal	private	private and federal	federal	private	private and federal	federal	private
*****Area distribution*****									
1 oil and gas minerals (Acres)	127,005	73,602	53,403	53,798	34,758	19,040	73,207	38,844	34,363
2 Steep slopes greater than 50% (Acres)	29,092	16,552	12,540	6,160	3,257	2,903	22,932	13,295	9,637
3 50% Steep slopes remaining after 1400' directional drilling on all areas except NOSR and upper plateau (Acres)	12,011	7,559	4,452	6,160	3,257	2,903	5,851	4,302	1,549
4 oil and gas minerals after steep slopes are directionally drilled (Acres)	114,994	66,043	48,951	47,638	31,501	16,137	67,356	34,542	32,814
*****Preliminary wells*****									
5 Existing Wells (#, as of 6/1/01, see Table 1)	415	88	327	4	0	4	411	88	323
6 New Mesaverde wells (before 10 acre spacing, #)	3,596	1,945	1,651	380	251	129	3,216	1,693	1,523
7 New Mesaverde wells (80% -10 acre, 20%- 20 acre, #)	6,134	3,294	2,840	380	251	129	5,754	3,043	2,711
8 New Wasatch wells (#)	445	278	167	127	84	43	318	194	124
9 Total wells (lines 7 and 8, #)	6,579	3,572	3,007	507	335	172	6,072	3,237	2,835
*****RFD wells, pad numbers and reserves*****									
10 Total RFD wells (limited by 173 wells/year development) (#)	3,460	1,987	1,473	507	335	172	2,953	1,652	1,301
11 Mesaverde RFD wells	3,178	1,804	1,373	380	251	129	2,798	1,553	1,244
12 Wasatch RFD wells	282	183	100	127	84	43	155	99	57
13 Mesaverde gas RFD reserves (BCF)	3,719	2,111	1,606	445	294	151	3,274	1,817	1,456
14 Wasatch gas RFD reserves (BCF)	197	128	70	89	59	30	108	69	40
15 Total gas RFD reserves (BCF)	3,916	2,239	1,676	534	353	181	3,382	1,886	1,495
16 Mesaverde and total oil RFD reserves (MBO)	8,553	4,856	3,694	1,023	677	347	7,530	4,179	3,348
17 New Mesaverde and wasatch well pads (#)	1,220	717	502	380	251	129	839	466	373

Notes:

- * Planning area includes NOSR 1, NOSR 3 and other areas. NOSR1 consist of mostly upper plateau and some lower plateau areas. Well and reserve projections exclude existing wells.

- 1 oil and gas minerals obtained from the Glenwood Springs Field Office (GSFO).
- 2 Steep Slopes greater than 50% is from the GSFO
- 3 Steep Slopes left after 1400' buffer for directional drilling is from buff5.shp for the entire planning area and estimated based on acreage for the upper and lower plateau areas
- 4 oil and gas minerals less steep slopes remaining after directional drilling
- 5 Fee and federal wells drilled obtained from completed wells in roanplatwells1001.shp and AFMSS GLB.89 report (this report includes associated agreement wells and fed). Federal wells drilled from raanplatfedwells1001.shp
- 6 Upper Plateau: Because of activity limitation due to one suitable access road, drilling weather window of 5 months, 3000 feet of additional unconsolidated wasatch zone and less favorable well economics as compared to the lower plateau area, it is assumed that wells drilled on the upper plateau would be limited by 5 drilling rigs drilling for 5 months per year and would take 30 days average time to drill each well and thus limit the total number of upper plateau wells to
 $507 \text{ wells } (30.4 \text{ days/yr} * 5 \text{ rigs} * 1 \text{ well/30 days} * 5 \text{ months} * 20 \text{ yrs})$.
In addition, anticipated directional drilling difficulties due to the extra 3000 feet of unconsolidated wasatch zone would make directional drilling infeasible.
As such, MV wells will be on single well pads except when colocated with a wasatch well.
Based on 4 MV wells drilled for every Wasatch well, the 507 wells would consist of 127 wasatch and 380 mesaverde wells.
Lower Plateau: The rest of the planning area would be drilled at 20 acre downhole spacing on 40 acre surface locations with 20 acre surface exceptions when drilling under steep slopes.
The existing wells from Table 1 were subtracted from this total leaving the projected new wells.
For this calculation, it is assumed that 75% of the wells are Mesaverde and 25% of the wells are Wasatch.
To find the split between upper and lower plateau and private and federal, a ratio of acreages was used
- 7 Sum of Mesaverde federal RFD wells and Additional Mesaverde wells on 10 acre spacing
Additional Mesaverde wells on 10 acre spacing - recent tests conducted by Williams support development on 10 acre spacing. Assuming there will be some areas not supporting 10 acre spacing, 80% of the area, less the upper plateau, will be assumed to be developed on 10 acre spacing utilizing existing 40 acre surface locations. while actual spacing may be closer, for the purpose of well pad number calculations, the upper plateau will be drilled on an average of 125 acre spacing for the mesaverde (47,638 acres/380 mv wells) because of access, rig availability, and weather limitations

8 Downhole spacing of 160 acres per Wasatch well on lower plateau and a wasatch well for every 4 MV wells on upper plateau.

9 Sum of Mesaverde wells, including those spaced at 10 acre, and wasatch wells. To determine the number of RFD wells, this number will be reduced based on a 20 year projected activity in Note 10 below.

10 Williams holds all of the 18,066 acres that are leased within the RPA. Recent estimates from Williams is that they will drill between 50 and 150 wells per year. This year, Encana is projecting drilling 200 wells in the nearby Grass Mesa/Hunter's Mesa units and currently has 20 rigs running. While this may be an exceptional year for Encana, it does represent the company's capability to obtain rigs and develop.

From above, 16,476 (34,542 - 18,066) acres of the lower plateau remain to be leased. An average, weighted by acreages yields about 148 wells per year $(16,476*200 + 18066*100)/(16,476+18066)$ on private and federal acreage for the lower plateau.

Adding the upper plateau's projected 507 wells over 20 years(25 wells/year) yields a total of about 173 wells per year.

11 Mesaverde RFD wells is the ratio of the total RFD wells (line 10) to the total wells (line 9) times the Mesaverde wells (line 7).

12 Wasatch RFD wells is the ratio of the total RFD wells (line 10) to the total wells (line 9) times the Wasatch wells (line 8)

13 Mesaverde gas reserves (2/16/2003 article published in the GSPI) 1.17 BCF/Well

14 Wasatch gas reserves (1998 DOE NOSR3 Commercial Development study) 0.7 BCF/Well

16 Mesaverde oil reserves (1998 DOE NOSRs1+3 Oil and Gas Reserves Evaluation) 0.0023 BO/MCF

17 Mesaverde:40 acre drill islands (2 wells per island for 20 acre spacing, 4 wells/island for 10 acre spacing) on all lands beside the upper plateau.

On upper plateau, 1 Mesaverde well per 40 acre pad.

Wasatch: an additional wasatch well is added on Mesaverde locations for every 8 - 20-acre Mesaverde wells and for every 16 - 10-acre Mesaverde wells

drilled on all lands beside the upper plateau and for every 4 Mesaverde wells drilled the

upper plateau lands (I.e., no additional well pads for Wasatch). It is assumed that 75% of wells will be

Mesaverde and 25% of wells will be Wasatch

roanc108(2)

roanc10acre52903.xls