GEOLOGIC REPORT

ON THE

ROCK CANON ANTICLINE

PUEBLO COUNTY, COLORADO

BY

H. W. LOWRIE, JR.

1917

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Denver, Colorado, June 15, 1917

Mr. C. A. Fisher,
Denver, Colorado.

Dear Sir:

In compliance with your oral request, I have examined the properties located near Pueblo, Colorado, and beg to submit the following report:

The property examined is known as the Rock Canon arch or fold and is located roughly six miles west of the town of Pueblo in Pueblo County, Colorado. The area covered by this report is shown on the accompanying map and lies within Townships 20 and 21 South, Ranges 65 and 66 West.

GEOLOGY

The highest formation exposed in the field is the Niobrara formation. Below this in their normal stratigraphical sequence come the underlying cretaceous and older formations. These formations were studied in detail both west of the town of Florence and near Beulah where they have been brought to the surface by the Rocky Mountain uplift.

Beginning then with the Niobrara formation, we have for the area covered by this report the following geologic section:

1-	Niobrara formation	0 to 100'
2-	Carlile shale	0 to 210
3-	Greenhorn Limestone	0 to 40'
4-	Graneros shale	0 to 200'
5-	Dakota limestone	250'
6-	Morrison formation	200'
7-	Fountain formation (Red Beds)	2150'
8-	Millsap limestone	200'
9-	Harding sandstone	30'
10-	Granite	

At this point I will state that the above given thicknesses were obtained in part from Gilbert's Pueblo folio, in part from well records, and in part from measurements made near Beulah, Colorado.

The Niobrara formation consists of a series of gray lime shales with a thick bed of limestone near its base; immediately below this limestone comes a 20' bed of soft yellow sandstone followed by 190' of Black Carlile shales. Below the shale is the 40' bed of gray to pale blue (Greenhorn) limestone in thin layers with shale partings, which is in turn followed by the Graneros shale which consists of 200' of dense black shale.

Below this last named formation comes the Dakota sandstone, a white to gray sandstone, 250' thick. This sandstone is divided by shale layers into beds 20 and more feet thick.

Below the Dakota sandstone come the green and maroon colored clays and shales with thin contained layers of fresh water limestone belonging to the Morrison formation. Below the Morrison comes 2150' of Red, Brown and White sandstones and shales belonging to the Fountain formation which rests unconformably on the Millsap limestone. At this point I will state that it is within the sandstones in the lower measures of the Fountain formation that oil if found

will most probably occur. At several different horizons in this formation sandstones were found lying below shale or clay partings of sufficient magnitude and compactness to act as an impervious cover to prevent the escape of the oil into the overlying strata.

The Millsap limestone belonging to the carboniferous system and underlying the Fountain formation consists of 200' of buff to purple massive limestone, largely dolomitic. Owing to the fact that at the points examined it has been extensively metamorphosed no fossil remains or impressions could be found. Below the Millsap limestone comes 20-30 feet of white, sugarlike sandstone, which in turn rests upon granite.

Unfortunately the Arkansas River which traverses the Rock Canon arch near the center has cut through the overlying cretaceous shales and exposed the crest of the dome. This opening naturally permitted the escape of any oil that could have accumulated in any of the sands of the Benton shales and rendered this fold of value only with reference to black oil. As to whether or not the carboniferous limestones which underlie this fold will be productive of black oil cannot be told until after the field has been tested. However, the fact must not be overlooked that in the Lander fields in Wyoming the carboniferous limestones while differing somewhat in character and greatly in thickness are productive of black oil and that at different points along the entire Rocky Mountain front range, from Wyoming into New Mexico, black oil is found seeping from these limestones or the formations immediately overlying them.

At a point on Oil Creek about 27 miles west of the Rock Canyon field there is an area of a hundred or more feet square which contains considerable amounts of tar sand. This point is located near the base of the Morrison formation at the intersection of two major faults. Black oil can at the present time be seen seeping from the loose pleistocene sands and gravel on the bed of the creek. This oil, in my opinion, undoubtedly rises along these faults from the underlying carboniferous strata. Similar occurrences are reported at other localities, namely on Hardscrabble Creek about 25 miles farther southeast and near the town of Beulah.

STRUCTURE

The attitude of the surface sedimentary formations exposed in the field was determined by means of a teloscopic alidade and plane table, the entire area embraced within the accompanying map being mapped on a scale of 2000 feet to the inch, all levels being run and contours drawn on the base of the timpas limestone. The map which accompanies this report is enlarged to a scale of 1500' = 1 inch. The scale used in obtaining the cros-section profile is 200' = 1". Owing to the great thickness of the Fountain formation as compared with the other strata involved, I could not draw the thickness of the different formations shown in the cross-section to scale; they are merely sketched in. The columnar section on the right hand side of the map however, gives the correct thickness and sequence of the different formations involved. As I was unable to locate a U. S. G. S. bench mark to tie to, I simply assumed an elevation at my starting point of 1000'. It can therefore be seen that the elevations given on the map are only relative and have no bearing whatsoever on the elevation above sea level.

In closing the structure on the north and it was necessary to take into consideration other factors than actual elevations on the key bed as the top of the Carlile sandstones, or rather the base of the Timpas limestones

which was used in this instance is covered by the overlying Niobrara shales in this section of the field.

As the key bed above mentioned underlies the Niobrara it is easily apparent that its elevation at any point on the surface is less than that of the point by the distance between the point and the base of the Niobrara formation. By taking a series of elevations on surface and then determining as nearly as possible the distance, above the base of the Niobrara, of the points at which these elevations were taken I was able to roughly obtain the approximate elevation of my key bed at a sufficient number of points in the north end of the field.

That the structure is plunging to the north in Sections 11, 12, 13, and 14, Township 20 South, Range 66 West is proven by the fact that points taken at surface 50 to 100 feet above the base of the Niobrara are found to be 40 to 50 feet lower than points on the key bed farther south.

The structure as finally determined may be described as an elliptical dome with its axis trending in a general north and south direction. It is completely closed on all sides and is as nearly as could be determined between 150' and 175' high, having its spilling plane located at approximately the elevation of the 1080' contour. It includes within its closed contours as shown by the map roughly 10 square miles. Of this area that which is most promising is the territory lying within the 1180' contour. As the extent of the area of saturation can never be accurately foretold in advance of development I would advise that all territory possible be obtained within the last closed or 1080' contour.

The most advisable point for the first well, in my opinion, would be about the center if the NE¼ of the NW¼ of Section 25, Township 20 South, Range 66 West. This well should reach the top of the Millsap limestone at a depth of approximately 2800'. The adjoining area from which this fold can collect oil extends roughly a distance of 12 miles to the west and 6 miles to the east and comprises an area of roughly 225 square miles. This is, in my opinion, sufficient to give quite an area of saturation.

CONCLUSIONS

In finally summing up the conditions found to exist in this field, the following salient facts are noted:

FIRSTLY: Favorable structure with ample collecting area exists in this field.

SECONDLY: The field is underlain by formations productive of oil in other localities that can be reached by the drill.

THIRDLY: Oil in considerable quantities is found seeping from one of these formations in at least one locality in this general section.

FOURTHLY: Oil is found in commercial quantities in the Higher cretaceous formations at Florence, Colorado, twenty miles west of this location.

FIFTHLY: Conditions both for operating and marketing are ideal, the field being within 6 miles of the city of Pueblo, and crossed by the Denver & Rio Grande railroad, close to cheap fuel and with an abundance of water.

Considering these facts, I feel that there is a fair chance for this structure to be productive and recommend that at least one test well be drilled at the location previously designated.

Respectfully submitted,

(Signed) H. W. Lowrie, Jr.

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