31-32-40

GEOLOGY DIVISION WELL FORECAST

COUNTY Morton STATE Kansas

WELL NAME Snyder "C" #1 NUMBER

LOCATION NW SE Section 6-33S-40W (Richfield E.)

ELEVATION 3375' Est. GL

RECOMMENDATIONS:

ESTIMATED TOTAL DEPTH 5950'

(CASING - APPROXIMATE DEPTHS)

SURFACE CASING SET AT 1610'

INTERMEDIATE CASING SET AT --

PRODUCTION CASING SET AT 5950'

ESTIMATED NO. OF DRILL STEM TESTS* 7

ESTIMATED AMOUNT OF CORING --

LOGGING PROGRAM IES - TD to surf csg.

Acoustic-GR-Caliper - TD to surf csg.

Contact Caliper - minimum.

Gas Detector Unit on at 2000'.

GEOLOGY LABOR 7 days: TD - 5950' or St. Louis + 150'

DEPTH AT WHICH HOLE MUST BE IN SHAPE FOR DST'S OR CORING 2800 - 3000'

REMARKS Catch & dry a sample at each connection from surf csg to 3000'; catch & dry 10' samples from 3000' to TD. Keep 10' drilling time from surf csg to 2000'; keep 5' drilling time from 2000' to 2800'; keep 1' drilling time from 2800' to TD.

Wayne Verrett - office phone 62[redacted]

Estimated Formation Tops

B/Cimarron	1615'
1/Council Grove	2600'
Pennsylvanian	3030'
Morrow	5090'
1/*U. Mw Purdy Sd	5200'
1/*U. Mw Cimarron Sd	5260'
1/*U. Mw "W" Sd	5290'
1/*U. Mw "H" Sd	5320'
1/*L. Mw upper "G"	5500'
1/*L. Mw Keyes	5590'
1/* St. Louis	5800'

* DST INTERVALS

Exact DST intervals to be determined by wellsite geologist.

1/ Probable Producing Formation

SIGNED Wayne Verrett
Wayne Verrett

DATE February 26, 1974

APPROVED Ben T. Whitefield
Ben T. Whitefield

Tops, Core Intervals and DST Intervals subject to revision from information obtained during drilling.

RECOMMENDATION FOR DRILLING

STATE Kansas COUNTY Morton TYPE Exploratory

PROPOSED LOCATION NW SE Section 6-33S-40W

RECOMMENDED BY Wayne Verrett APPROVED BY _____

DATE November 6, 1973 REJECTED BY _____

PROSPECT NAME Richfield (E) DEFERRED UNTIL _____

DATE _____

TOTAL DEPTH, OBJECTIVE HORIZON AND APPROXIMATE COST

A well drilled to 5950 feet will be sufficient to penetrate 150 feet into the St. Louis and test the same. The cost for a 5950 foot St. Louis test is expected to be $45,500 dry.

POSSIBLE PAY ZONES

Zone	Depth	Thickness	Probability
U. Morrow Purdy Sand	5200'	15'	7%
U. Morrow Cimarron Sand	5260'	25'	10%
U. Morrow "W" Sand	5310'	25'	10%
U. Morrow "H" Sand	5340'	20'	10%
L. Morrow upper "G"	5500'	25'	50%
L. Morrow Keyes	5580'	30'	10%
St. Louis	5800'	20'	5%

NEARBY PRODUCING AREAS

Cimarron Valley, one and one-half miles south of this prospect, has produced over 1,216,000 barrels of oil and has remaining primary recoverable oil in excess of 1,000,000 barrels in the St. Louis.

Wilburton field, to the southwest of this prospect, has produced over 5,200,000 barrels of oil and is now producing 600,000 barrels of oil per year from the Upper Morrow.

Berryman-Richfield, to the west, has produced 2,280,000 barrels of oil and is expected to recover an additional 2,500,000 barrels of oil from the Upper Morrow.

The Keyes, lower and upper "G", to the north, from an average of single and multiple zone completions in these sands, averages 2.9 BCF/well.

PROSPECT GEOLOGY

Structure

At and around this prospect, structural dip is much steeper than is reasonably expected from regional work. The presence of a fault is regarded as possible, although in the limited control in the area, there is no apparent wellbore evidence for its presence. If such a fault is indeed present in this area, its most likely location would be northwest of this prospect and it would further enhance the prospect; nevertheless, the stratigraphy alone is sufficient to recommend this prospect now.

Stratigraphy

This location falls within the area in which the Upper Morrow Purdy bar development is possible. Attractive production could be established if this bar development is present.

The Upper Morrow Cimarron sand (see attached map) is regarded as highly prospective at this location. A trap is formed in the updip direction by reworking of the sand interval during a later depisode. Structure should be sufficient to encounter the sand well above any hydrocarbon-water contact.

The Upper Morrow "W" and "H" sands are both expected to be developed here and are prospective although there is some doubt about where the water contacts in these sands are in this area. Too little is known about the sand development in this area to form firm conclusions.

The "M" sand, while possible at this location, is regarded as not very likely to be developed. If the sand is developed, structure should be sufficient for production.

The upper "G" sand is expected to be developed and could produce at this location.

The Keyes is prospective at this location. It is apparent that the old Keyes production in Section 8 of this township is in a separate reservoir, although on trend with Keyes development

to the northwest. With a downdip water contact established in the abandoned Cimarron Valley Keyes field, it is then necessary to conclude that this prospect, if the Keyes is present, will encounter the Keyes in a separate reservoir.

The St. Louis lower "A" porosity zone is expected to be well developed at this location, with the upper "A" zone less well developed. The lower "A" porosity thins and disappears to the northwest; this, in conjunction with the structure here, should be sufficient trapping mechanism. Thus, the St. Louis is highly prospective at this location.

This prospect is recommended for drilling.

ACREAGE INFORMATION

The drillsite section is HBP by Hugoton production. Anadarko owns all rights above and below the Hugoton, free of ORR burden. The NW/4 Section 6 reverts to the Federal Government regardless of production in 1987. There are also 1987 reversions in Section 5, Section 7 and Section 8. There are 1989 reversions in Sections 1 and 12 of 33S-40W.

See detailed land plat for additional information.

Wayne Verrett

WV/jr
Attachments

GEOLOGY - CIMARRON VALLEY AREA

In the upper St. Louis, the lower "A" porosity zone is primarily an oolite with some inter-crystalline porosity. The major depositional factor for this lower zone appears to have been water currents. The porosity trends sub-normal to depositional strike in the St. Louis (approx. N50°W dip to the NE). It is believed the oolites have been transported into the area and deposited.

In the upper St. Louis, the upper "A" porosity zone is primarily oolites with some fragmental shell debris--more debris than the lower zone. A series of narrow (approx. one mile wide) oolite bars is formed generally parallel to depositional strike. The water depths are believed to be shallow--above wave base in many cases.

A persistent shale (green-waxy in this area) separates the St. Louis from the Ste. Genevieve. At the close of Meramec time, the upper Ste. Genevieve was eroded to varying extent and at the close of Mississippian time, widespread erosion occurred with complete removal of the Chester sequence locally.

Morrow deposition began with marine transgression with the basal Morrow "Keyes" sand deposited probably during minor regressions.

The Keyes is a complex of nearly blanket like near-shore bars--beach sand and is composed of medium to coarse quartz sand with some feldspar and glauconite. It is a good reservoir in this area and, although generally structurally dependent, it has considerable stratigraphic aspects.

Contemporaneous with Keyes deposition (near-shore bars), further seaward the lower "G" sand and the upper "G" sand were also being deposited as widespread, nearly blanket like, off-shore bars. Their deposition is represented in an overlapping sequence of bar development. As a general rule, with some exceptions, the lower "G" sand is somewhat finer grained sand than the Keyes and, likewise, is somewhat coarser grained than the upper "G" sand.

In the stratigraphic sequence, this deposition appears as Keyes, marine shale, then lower "G" sand, marine shale, then upper "G" sand, marine shale, with any sand having a possibility

of being locally absent. The "G" sands form good reservoirs locally and have considerable stratigraphic implications. The Keyes, lower "G" and upper "G" trend parallel to depositional strike (NNE-SSW).

Keyes thickness ranges from 0 to over 100 feet. Lower "G" thickness ranges from 0 to over 40 feet and upper "G" thickness ranges from 0 to over 50 feet.

The Lower Morrow marker, a sandy limestone generally, occasionally a calcareous sandstone, is present throughout the area and has the potential, where porosity is developed, to contribute gas reserves to wells. It is not generally a good reservoir and it has not been mapped.

The Upper Morrow has a varied and complex depositional history. In view of the major production and significant potential of this interval, a high level of effort has been expended on it.

In brief summary, the salient points are:

Marine shales were deposited widespread with thin beds of limestone and sandstone in the sequence. A minor regression occurred and sub-areal exposure with a drainage system developed. The "H" sand, a channel, is seen trending from the north to the south and slightly west. Sand deposited in the channel is productive in the Wilburton field. This channel is a good target for exploration. An episode of transgression occurred and depositional strike at this time, at this area, now appears to be virtually north-south with east dip. Offshore bars, the "W" sand, formed and they, too, present good exploration targets. This bar development is productive in the Wilburton field.

A questionable section was then deposited -- a nice sand development, the "M" sand, is seen in a portion of the area. This sand may have been deposited in a near-shore marine environment and it, too, represents an exploration target. It does not lend itself to prediction readily and is not productive in this area, although it does appear to have good productive potential.

Next, quite possibly a stillstand condition with encroaching landward sedimentation. In Cimarron Valley proper, a small episode of deltaic sedimentation occurred with a source to the northwest where the record has been obliterated by later events. This is the Cimarron sand.

Again, marine transgression occurred with a sequence of marine shales, thin limestone and thin sandstone beds.

Regression or stillstand condition ensued beginning the Upper Morrow "Purdy" depisode. In the lower Purdy, widespread reworking of the section in the northwest part of the study area took place. Some relatively minor amounts of lower Purdy sand were deposited.

The major Purdy deposition is a deltaic sequence in T33S-R41W (Berryman) with one of the distributary channels trending northeastward (Richfield). To the northeast of Richfield is a pro-delta sequence of fine sands, silts and clays with isolated small bars developed. It seems possible that additional distributary channels may be present in the area, as yet undiscovered. It also seems possible that an additional deltaic sequence may be present and undiscovered in an unexplored area south of Berryman. Contemporaneous with the Berryman-Richfield delta complex, offshore barrier bar development was occurring. This is represented by a very good bar development in Wilburton and a fairly large area east of Berryman-Richfield is thus high prospective in light of possible additional bar development.

Another marine transgression took place and again a sequence of thinly bedded limestone and sandstone in marine shale was deposited. An offshore bar development is seen in this interval locally, but this is not viewed as a significant exploratory zone in this area. Higher in the section, toward the end of Morrowan deposition, there is a possible originally widespread sand developed, but the erosion that took place at the end of Morrowan time removed the sand and some underlying section locally. Because of this erosion, no depositional framework can be worked out for this sand. Sub-areal exposure of the sand in places apparently has been detrimental to its reservoir quality.

On balance, this area affords excellent wildcat possibilities and several drilling recommendations are being made.

Wayne Verrett

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11/8/73