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DEVELOPMENT PROSPECT

HUGOTON FIELD KANSAS

HAMILTON COUNTY, KANSAS

February, 1966

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SUMMARY

This drilling proposal consists of 1,440 acre block of leases located in Township 26 South, Range 40 West of Hamilton, County, Kansas. The leases are offset to the south and east by Hugoton Field gas wells and are so situated that two maximum gas units of 640 acres each may be formed. One well should be drilled on each of these units.

Three segments of the Hugoton pay are productive in the offset wells; these are known as Krider, Winfield and Fort Riley. By the use of proper drilling and completion practices, any one of these segments of Hugoton may be an economical success. It is expected that a deliverability of 1,000 MCFD can be obtained from each of these two proposed wells.

Gas sales from the offset wells are being made to two purchasers. Cities Service Gas Company has indicated a willingness to connect and contract purchases for 12.5 cents per MCF. It is believed that Cities Service Gas Company has a better market than Colorado Interstate Gas Company, the other purchaser in the area.

The estimated well cost of $23,500.00 is expected to pay out 2.3 years after producing 246,000 MCF. A successful completion should yield from 1.0 to 2.0 Billion cubic feet of reserve after the well has paid out.

The possibility of production of oil and gas from the zones below the Hugoton exists. This possibility would be preserved on this acreage by the drilling the two proposed wells.

INTRODUCTION

The acreage included in this proposal consists of 1,440 acres and is covered by seven oil and gas leases. These base leases are all located in Township 26 South, Range 40 West of Hamilton County, Kansas. They are more particularly described as follows:

1.	SE/4	Section 26	Dated	9-15-61
2.	NE/4	Section 26	Dated	7-18-61
3.	NW/4	Section 26	Dated	7-18-61
4.	SW/4 &N/2	Section 26 Section 35	Dated	6-20-61
5.	NE/4	Section 27	Dated	8-21-61
6.	NE/4	Section 34	Dated	8- 7-61
7.	SE/4	Section 35	Dated	1-25-66

Five of these leases are for a 10 year period dating from 1961. The sixth lease (SE/4-26) was written for five years and has an expiration date of September 15, 1966. The seventh lease is for five years dating from January 1966.

This acreage is offset on both the east and south sides by wells which are producing gas from the Hugoton Field.

It is proposed that two gas units of 640 acres each be formed and a well be drilled on each of the units.

GEOLOGY

The geological formation of prime interest here is the Chase group of Permian Age. This group is commonly referred to as the Hugoton pay. There are three members of this group productive of gas in the wells offsetting this acreage. The productive members in their depth sequence, are known as Krider, Winfield and Fort Riley.

The total thickness of each of these beds are from forty (40) to sixty (60) feet. The composition is dolometic limestone or limey dolomite with some sanding. The beds are separated by shale beds having thickness which vary from 10 to 20 feet. Separation of the production of these zones has not been practiced. Porosity of these zones are often very high, frequently more than 25%. These beds dip regionally to the east at the rate of approximately 20 feet per mile.

In the immediate area of the prospect acreage, the regional dip appears to have been interrupted by a trough along a northeast-southwest direction. This can been seen on the enclosed maps which are contoured on

top of both the Krider and Winfield formations.

The Krider section was present in each of the "dry" holes drilled in Sections 20 and 23 of 26 South, 40 West. Under more favorable cementing and completion practices, these wells might have been productive.

The proven portion of the prospect, hence the most desirable locations, is to the southeast. The recommended locations in order of development are C SE Section 35 and C SE of Section 26 both of Township 26 South, Range 40 West.

It is believed that wells drilled on these two locations would be at least as good as the Ashland Oil and Refining Company's Heltemesa #2 (36-26-40) and the Sinclair Oil and Gas Company's Vath #1 (1-27-40). These wells have a cumulative production of 1,215,111 MCF and 986,454MCF respectively to July 1, 1965.

Electric logs which have been run in the area are not as definitive as present day logging programs. Some of the wells were drilled and completed without electric logs. The Ashland-Heltemesa #2 (36-26-40) was one of the wells that does not have an electric log run.

The Gamma-Ray and Neuton logs that were run on the Sinclair-Guldner #1 (2-27-40) are included in this report. A study of this log indicates some of the important features in the area.

1. The Krider section from 2320 to 2350 has porosity less than 10%. It is probably not contributing materially to the wells production.

2. The Winfield is very porous in the intervals of 2354 to 2362 and 2376 to 2387 T.D. These two sections have a total of 17 feet which has greater than 20% porosity. The maximum porosity logged by the neutron is something in excess of 35% at 2556.

3. The Fort Riley sections were not drilled in this well.

The porosity development of more than 20% in 17 feet is adequate to make a good well if casing is set through and fractured using the "single-point" entry technique. It is believed that both of the proposed locations may have more than one section as good as was logged on the Sinclair-Guldner #1 (2-27-40).

Although the Hugoton zone is the prime consideration of this proposal, the possibility of oil and gas from the deeper horizons is present. Several of the existing

oil and gas field of Western Kansas are located on the immediate flank of the Hugoton gas field. Perhaps the largest of these is the Interstate Field of Morton County, Kansas. This field has produced in excess 7,000,000 barrels of oil in 11 years from more than 80 wells from an upper morrow sand. It presently is under waterflood operations.

DISCUSSION OF OFFSET WELLS

A. Drilling and completion.

The seven producing wells which directly offset this acreage were drilled with rotory and completed with cable tools generally along this outline.

1. 8 5/8" OD or 10 3/4" OD surface casing set from a minimum of 309 feet to a maximum of 518'.

2. 4 1/2"OD, 5 1/2" OD of 7" production casing was set and cemented in the top of the Krider or Winfield members of the Chase group and rotory tools were released.

3. Cable tools were then used to drill the well into the productive portions of the Krider and/or Winfield and in some cases the upper Fort Riley member was drilled and found productive.

4. The wells were then acid and/or fracture treated in volumes ranging from a minimum of 3000 gallons to a maximum of 22,000 gallons of acid. Generally, the well which was treated with the largest volume made the best well. Further discussion of treatment procedures is found in another part of this report.

B. Production and proration.

The production from these wells is prorated under the Field Rules of the Hugoton Field. The gas is being sold

to two purchasers. Namely Cities Service Gas Company and Colorado Interstate Gas Company.

Deliveribility, as defined in the Hugoton Field Rules, is the main controlling factor in determining each well's allowable. As a general rule, each well's average annual production will be approximately 100 times its determined deliveribility.

Wellhead shut-in pressure affects the assigned allowable in a manner designed to prevent drainage from other wells in the field. A study of the original pressures of the more recently drilled wells shows them to be materially lower than was observed in the earlier wells. From this pressure reaction, it must be consluded that the well having the greatest deliverability will, in fact, be allowed to produce the greatest amount of gas. The Wellhead shut-in pressure will likely stay high in the well that has the greater ability to produce or deliverability.

The production decline curves of these offset wells have followed these principles. That is, the well having the largest deliverability will maintain its high wellhead shut-in pressure while selling more gas than the well with the lower deliverability. The cummalative production

to January 1, 1965, from these wells has ranged from a high of 1,215,11 MCF in 13 years life for the Ashland Heltemesa #2 (36-26-40) to a low of 120,727 MCF during its 8 year life for the Kuhn-Kritzmire #1 (24-26-40). The Kuhn-Kritzmire well has a deliverability of 140MCFD while the Ashland-Heltemesa #2 has a deliverability of 880 MCFD.

The average reservoir pressure in the area is expected to be approximately 300#/sq. in.

RECOMMENDED DEVELOPMENT PROCEDURE

A. Make a two well contract with contractor familiar with area in order to obtain best drilling rate.

B. Acreage involved can be unitized into two gas units of 640 acres each. The well locations must be no closer to unit boundries than the center of governmental quarter section. Make location for first well in C SE/4 Section 35, Township 26 South, Range 40 West.

C. Set approximately 500 feet of 8 5/8" OD casing as surface string. Cement this casing by circulating neat cement with 3% HA-5 (or equivalent).

D. Drill to base of Cimarron Anhydrite with salt gel, native muds and 3# loss circulation materials as mud additives. Water loss and weight need not be controlled.

E. Install mud logging unit for gas detection at the base of Cimarron Anhydrite. It is expected to occur in this location between the depths of 1750 and 1800 feet.

F. Control water loss in mud from base of Cimarron Anhydrite to total depth by adding starch to the mud system. The water loss should be maintained to 10 C.C.

or less in order to prevent shale from hydrating. This is necessary in order to assure good cement bonding on the production casing string.

G. Drill through the Krider, Winfield and upper Fort Riley members of the Chase group.

H. At total depth, run Gamma-Ray, Sonic, Laterlog and Caliper as open-hole logs.

I. Run 4 1/2" OD casing to total depth with adequate scratches and centralizers and cement with 150 sacks of neat cement (salt saturated) with 3/4% CFR-2 (or equivalent). Release rotory tools at this point.

J. Move in double-drum type pulling unit 48 to 72 hours after casing has been cemented and clean cement residues from the casing below all anticipated perforating depths.

K. Run Neutron log to correlate the casing collars to the previously run open-hole logs. Run cement bond log to establish quality of cement outside of 4 1/2" OD casing.

L. Perforate the 4 1/2" OD casing with 2 or 3 1/2" Jet shots in each of the most porous zones of the Krider, Winfield and Upper Fort Riley.

M. Breakdown the perforations with 15% acid and sufficient rubber ball sealers to assure that all perforations are open.

N. Fracture treat with a minimum of 20,000 gallons of 5% acid with 1/2# sand per gallon and adequate balls to assure that all zones are treated in proportion to predetermined amounts.

O. After 8 to 16 hours, swab back fracture fluids, flow well until it is clean of fracture fluids.

P. Run desireable and prescribed test on well to determine if completion is satisfactory.

MARKET AND ECONOMICS

Cities Service Gas Company has indicated a willingness to connect the proposed wells and contract for the gas at a price of 12.5¢ per MCF. It is believed that Colorado Interstate Gas Company, the other purchaser in the area, does not have as good a market as does Cities Service Gas Company.

It is believed that the proposed wells can be completed with deliverabilities of approximately 1000MCFD if the recommended development procedures are followed. The recommended procedures have been proven on approximately 75 wells in the Bradshaw Gas Area in the northern part of Hamilton County.

Using a well cost of $23,500.00, which is based on the attached recommended development procedures, a pay-out of the investment would occur after the production of 246,000 MCF. This would occur in 2.3 years for each well having a deliverability of 1000MCFD. A working interest of 81.25% has been assumed.

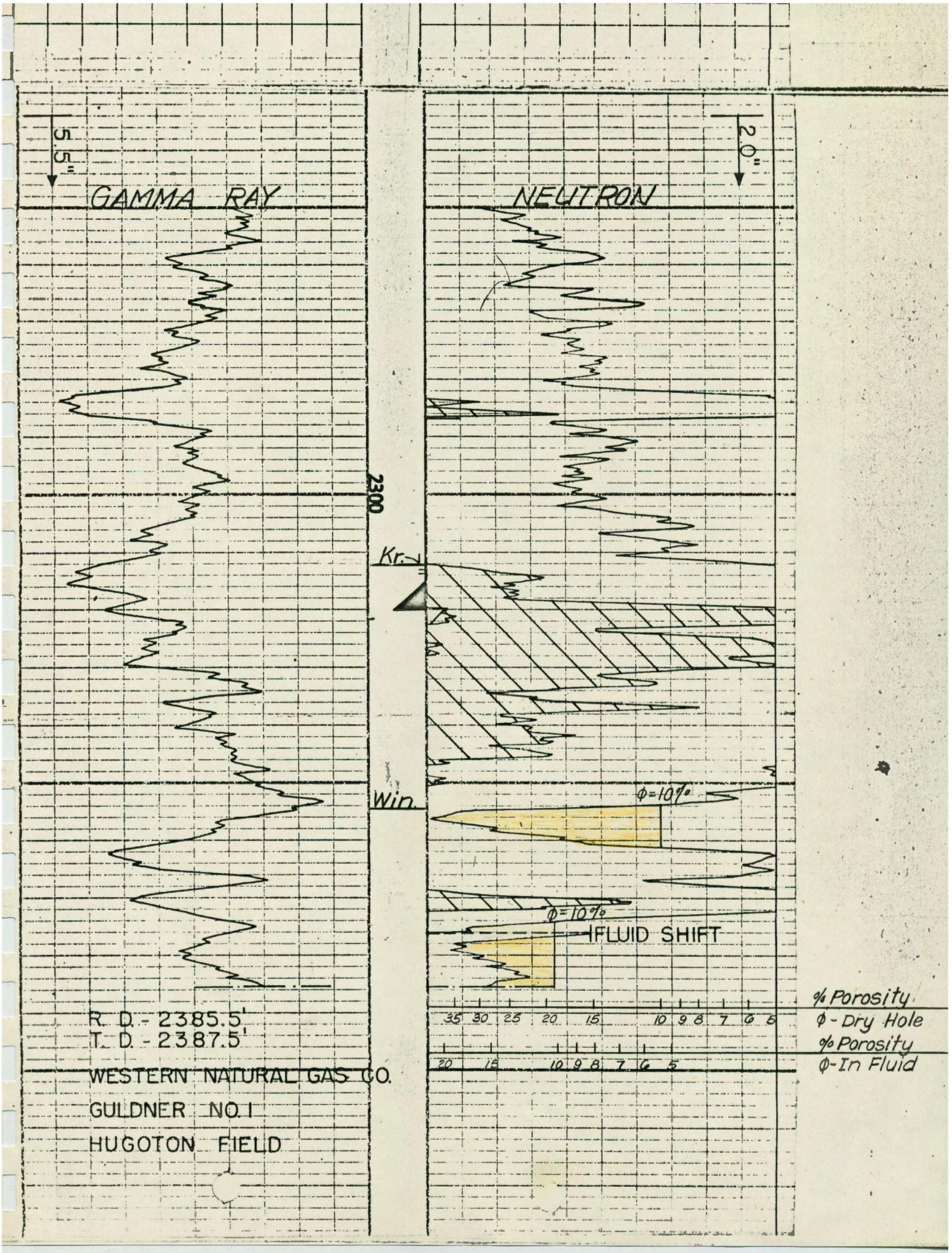
Production decline curves indicate that reserves should be one to two billion cubic feet after pay-out is realized. These reserves would have a value of $125,000.00 to $250,000.00. These values would show a return on investment in the range of 5.3 to 10.6 to 1.

APPENDIX

1. Area Maps
2. Geology Maps
3. Tabulations
4. Detail estimate of well costs
5. GR-Neutron - Sinclair Oil & Gas Guldner

PERFORMANCE DATA
For
OFFSET WELLS

Oper. Farm Name & Well No.	Location	First Production	Int. Rock Pres.	Last Test Date	PRESENT Del in MMCF.	PRESENT RP in Lb.	Cumulative to 7-1-65	Deliverability X 100	Ave. Prod. Per Year	Prod. Zone
HAMILTON COUNTY-T26S-R40W										
Kuhn-Kirtzime No. 1	Sec-24	4-57	389	7-64	.14	307	120,727	14,000	15,090	Krider
Ashland-Heltemesa No. 3	Sec-25	6-52	421	7-63	.04	305	132,290	4,000	10,176	Winfield
Ashland-Heltemesa No. 2	Sec-36	5-52	409	4-64	.88	287	1,215,111	88,000	93,470	Krider, Winfield & U. Ft. Riley
STANTON COUNTY-T27S-R40W										
Sinclair-Vath No. 1	Sec.1	7-54	405	4-63	.79	315	986,454	79,000	89,678	Krider & Winfiel
Sinclair-Guldner No. 1	Sec-2	12-54	413	4-64	.10	299	421,969	10,000	38,361	Krider & Winfiel
G-Michaelis-Ediger No. 1	Sec-3	1-61	348	4-63	.35	293	165,496	35,000	41,374	Winfield
G-Michaelis-Plummer No. 1	Sec-4	5-55	405	3-64	.13	311	152,140	13,000	15,214	Winfield


5.5"
GAMMA RAY
2.0"
NEUTRON
2300
Kr.
Win.
ϕ=10%
ϕ=10%
FLUID SHIFT
% Porosity
ϕ - Dry Hole
% Porosity
ϕ - In Fluid
35 30 25 20 15 10 9 8 7 6 5
20 15 10 9 8 7 6 5
R. D. - 2385.5'
T. D. - 2387.5'
WESTERN NATURAL GAS CO.
GULDNER NO. 1
HUGOTON FIELD

R 40 W

R 39 W

T 26 S

T 27 S

WESTERN NAT. GAS
COBB NO. 1
+996

PAN-AMERICAN PET. CO.
LAHMEYER NO. 1
872

W. J. COPPINGER
KIRTZMIRE NO. 1

ASHLAND O. & R. CO.
HELTEMESA NO. 1

KUHN
KIRTZMIRE NO. 1
+921
+929

ASHLAND O. & G. CO.
HELTEMESA NO. 3
+929

ASHLAND O. & G. CO.
HATTRUP NO. 1

ASHLAND O. & G. CO.
HELTEMESA NO. 2
+930

PAN-AMERICAN PET. CO.
HELTEMESA NO. 1
+913

+946

880
900
920
940
960

HAMILTON COUNTY
STANTON COUNTY

GRAHAM-MICHAELIS
PLUMMER NO. 1
+985

GRAHAM-MICHAELIS
JACQUART NO. 1
+975

GRAHAM-MICHAELIS
EDIGER NO. 1
+970

SINCLAIR O & G.
GULDNER NO. 1
+954

SINCLAIR O. & G.
VATH NO. 1
+938

PAN-AMERICAN PET. CO.
BUCKLIN
+935

980

GRAHAM-MICHAELIS
PLUMMER C NO. 1

GRAHAM-MICHAELIS
PLUMMER A NO. 1
+971

SINCLAIR
HELFNER NO. 1

PAN-AMERICAN PET. CO.
VATH NO. 1
+952

PAN AMERICAN PET. CO.
MOORE
+943

1000

BY: D. W. JACKSON

HUGOTON FIELD PROSPECT

HAMILTON COUNTY, KANSAS
CONTOURED ON TOP OF KRIDER
C. I. = 20'

R 40 W | R 39 W

T 26 S

T 27 S

HAMILTON COUNTY

STANTON COUNTY

WESTERN NAT. GAS
COBB NO. 1

AVOACE ELLISON DWJ 7/27/71

KATIE MATTENS DWJ 7/29/71

PAN-AMERICAN PET. CO.
LAHMEYER NO. 1

Iva C. Zimmerman Widow

W. J. COPPINGER
KIRTZMIRE NO. 1

KUHN
KIRTZMIRE NO. 1

5.5"@ 2507-2470
4000 G. ACID KR
120,727 - .14
AVE. - 15,090

ASHLAND O. & R. CO.
HELTEMESA NO. 1

7"@ 2393-2471
23,000 G. KR-WIN
1,903,768 - 1.780
AVE. - 146,443

MIKEY Buhrer out

8-21-71 DWJ

7-18-71

7-18-71

ASHLAND O. & G. CO.
HELTEMESA NO. 3

7"@ 2442-TD-2492
3000 ACID-WIN.
132,290 - .040
AVE. 10,176

ASHLAND O. & G. CO.
HATTRUP NO. 1

7"@ 2478-TD-2545
21,000 G. KR-WIN.
1,501,060 - .870
AVE. - 115,467

FLORE E. McCARTY 7-29-71 DWJ

ELWIN McCARTY 7/29/66 DWJ

8-15-66

April 1

REAM Bros. Inc. 5-14-71 DWJ

8-7-71

6-20-71

ASHLAND O. & G. CO.
HELTEMESA NO. 2

7"@ 2364-TD-2503
22,000 G. ACID-KR-WIN. UF
1,215,111 - .880
AVE. - 93,470

PAN-AMERICAN PET. CO.
HELTEMESA NO. 1

5.5"@ 2584-TD-2609
9000 G., 18,000
KR-WIN. U & LFR
1,432,580 - 1.030
AVE. - 142,153

HERAMSey Jr. 5-21-71 DWJ

OPAL Sims 6-2-71 DWJ

LAKE GU #1
1-27-71

Phillips 11/15/72 Rel

1-16-74

Phillips 11/12/73 Rel 11/15/73

GRAHAM-MICHAELIS
PLUMMER NO. 1

Abandoned

5.5"@ 2279-TD-2295
6000 G. 12,000 - KR-WIN.
152,140 - .130
AVE. - 15,214

GRAHAM-MICHAELIS
JACQUART NO. 1

GRAHAM-MICHAELIS
EDIGER NO. 1

4.5"@ 2343-TD-2349
3500 G. 4000-WIN.
165,496 - .350
AVE. - 41,374

SINCLAIR O. & G.
GULDNER NO. 1

7"@ 2324-TD-2388
11,000 ACID + 5500 KR, WIN.
421,969 - .100
AVE. 38,361

SINCLAIR O. & G.
VATH NO. 1

7"@ 2337-TD-2419
10,000 G. ACID + 7000 SAND
KR-WIN.
986,454 - 0.790
AVE. - 89,678

PAN-AMERICAN PET. CO.
BUCKLIN

5.5"@ 2541-TD-2565
32,500 G-KR, WIN
U + LFR
1,364,142 - 4,080
AVE. - 113,678

LEGEND

PROD. CSG. DEPTH - TOTAL DEPTH
TREATMENT PROD. ZONES
CUMULATIVE PROD. - MCF PRESENT DEL. - MMCF
AVE. ANNUAL PROD. - MCF

GRAHAM-MICHAELIS
PLUMMER C NO. 1

7"@ 2295-TD-2306
75,000 + 3500 KR-WIN.
561,555 - .560
AVE. - 93,592

GRAHAM-MICHAELIS
PLUMMER A NO. 1

5.5"@ 2459-TD-2386
10,000 G. + 5000 - KR-WIN.
674,449 - 1.050
AVE. - 110,761

SINCLAIR
HELFNER NO. 1

7"@ 2240-TD-2315
12,000 G. + 1500 WIN.
1,228,971 - .930
AVE. - 122,897

PAN-AMERICAN PET. CO.
VATH NO. 1

5.5"@ 2433-TD-2453
9500 G. + 7000 KR WIN,
U LFR
870,675 - 3.130
AVE. - 79,097

PAN AMERICAN PET. CO.
MOORE

5.5"@ 2510-TD-2540
32,500 G-KR, WIN U LFR
646,834 - 3.200
AVE - 53,902

WELL HISTORY OF OFFSET WELLS

R. 40 W

R 39 W

T 26 S

T 27 S

PAN-AMERICAN PET. CO.
LAHMEYER NO. 1

W. J. COPPINGER
KIRTZMIRE NO. 1

ASHLAND O & R CO.
HELTEMESA NO. 1

WESTERN NAT. GAS
COBB NO. 1
+936

KUHN
KIRTZMIRE NO. 1
+853 +865
+871

(NO E.L.)

ASHLAND O. & G. CO.
HELTEMESA NO. 3
+877

ASHLAND O. & G. CO
HATTRUP NO. 1

(NO E.L.)

ASHLAND O & G. CO.
HELTEMESA NO. 2
+881

PAN-AMERICAN PET. CO
HELTEMESA NO. 1
+855

HAMILTON COUNTY
STANTON COUNTY

GRAHAM-MICHAELIS
PLUMMER NO. 1
+933

GRAHAM-MICHAELIS
JACQUART NO. 1
+919

GRAHAM-MICHAELIS
EDIGER NO. 1
915

SINCLAIR O & G.
GULDNER NO. 1
+905

SINCLAIR O. & G.
VATH NO. 1
+888

PAN-AMERICAN PET. CO.
BUCKLIN
+878

GRAHAM-MICHAELIS
PLUMMER C NO. 1
932

GRAHAM-MICHAELIS
PLUMMER A NO. 1
919 +925

SINCLAIR
HELFNER NO. 1
+932

PAN-AMERICAN PET. CO.
VATH NO. 1
+891

PAN AMERICAN PET. CO.
MOORE
+884

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HUGOTON FIELD PROSPECT
HAMILTON COUNTY, KANSAS
CONTOURED ON TOP OF WINFIELD
C.I. = 20'