[redacted]

PR83-111

LYNES

PR 83-111

OPEN FILE

DRILL STEM TEST
TECHNICAL SERVICE REPORT

[redacted]

Phone
713-790-9132

LYNES, INC.

Box 12486
Houston, TX 77017

Operator: Argonaut International Corp.
Address:

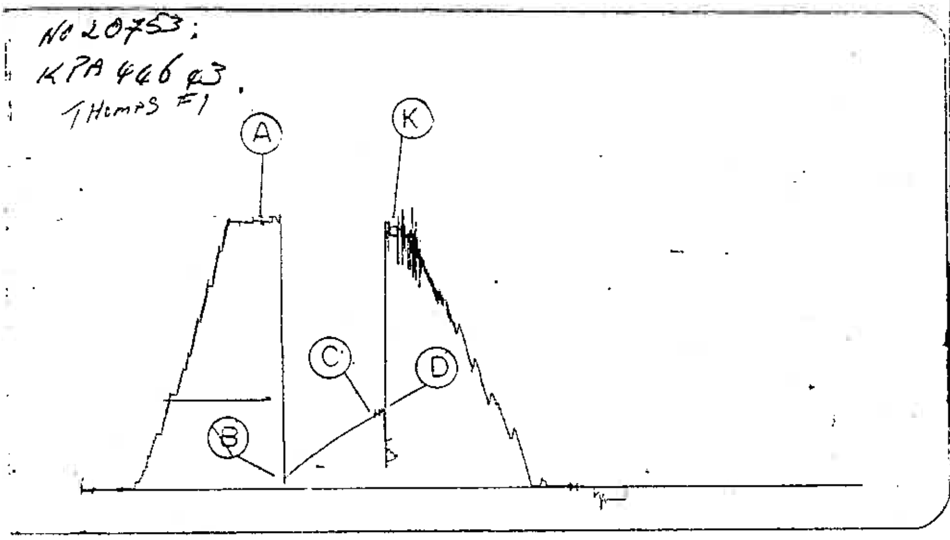
Contractor: P.D.S.
Rig No.: --
Spot: --
Sec.: --
Twp.: --
Rng.: --
Field: Wildcat
County: Northern Territory
State: Australia
Elevation: 42 M
Formation: --

Top Choke: Variable
Bottom Choke: 1"
Size Hole: 8 1/2"
Size Rat Hole: --
Size & Wt. D. P.: 4 1/2" 16.60
Size Wt. Pipe: --
I. D. of D. C.: 2 7/8"
Length of D. C.: 281'
Total Depth: 8585'
Interval Tested: 7169-7231'
Type of Test: Inflate Straddle

Flow No. 1: 220 Min.
Shut-in No. 1: 15 Min.
Flow No. 2: -- Min.
Shut-in No. 2: -- Min.
Flow No. 3: -- Min.
Shut-in No. 3: -- Min.

Bottom Hole Temp.: 236°F
Mud Weight: 9.6
Gravity: --
Viscosity: 42

Tool opened @: 4:00



Outside Recorder

PRD Make: Kuster K-3
No. 20753 Cap. 6475 @ 7179'

Press		Corrected
Initial Hydrostatic	A	3683
Final Hydrostatic	K	3606
Initial Flow	B	123
Final Initial Flow	C	986
Initial Shut-in	D	1077
Second Initial Flow	E	--
Second Final Flow	F	--
Second Shut-in	G	--
Third Initial Flow	H	--
Third Final Flow	I	--
Third Shut-in	J	--

Lynes Dist.: Australia
Our Tester: Kevin Perrin
Witnessed By: Michael Wiltshire

Well Name and No.: Thomas #1
Ticket No.: 3213
Date: 11-7-81
No. Final Copies: 5
DST No.: 2

Did Well Flow — Gas: No Oil: No Water: No

RECOVERY IN PIPE:
2368' Total fluid
1000' Drilling mud
848' Muddy water
580' Slightly gas cut water

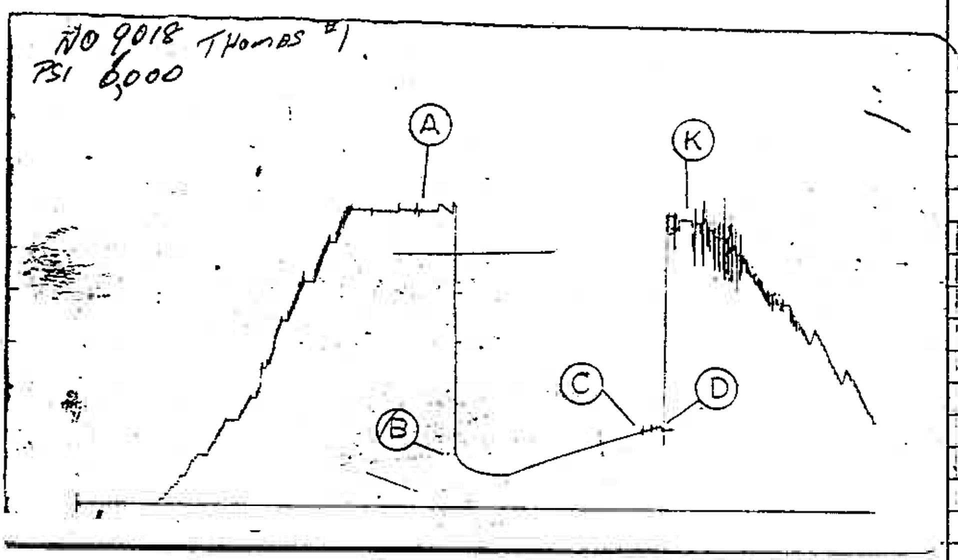
MISRUN: Tool plugged and differentially stuck.

[redacted]

LY-230

LYNES, INC.

Argonaut International Corp.	Thomas #1	2
Operator	Well Name and No	DST No.

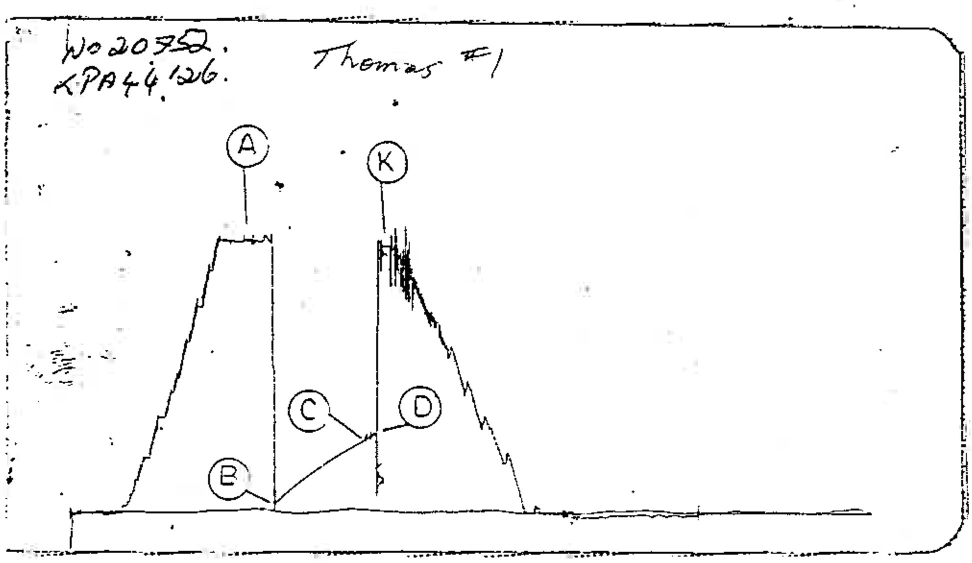


Outside Recorder

PRD Make Kuster K-3

No. 9018 Cap. 6000 @ 7179

Press		Correcte
Initial Hydrostatic	A	3750
Final Hydrostatic	K	3677
Initial Flow	B	691
Final Initial Flow	C	1020
Initial Shut-in	D	1109
Second Initial Flow	E	--
Second Final Flow	F	--
Second Shut-in	G	--
Third Initial Flow	H	--
Third Final Flow	I	--
Third Shut-in	J	--
Pressure Below Bottom Packer Bled To		



PRD Make Kuster K-3

No 20752 Cap. 6400 @ 7179

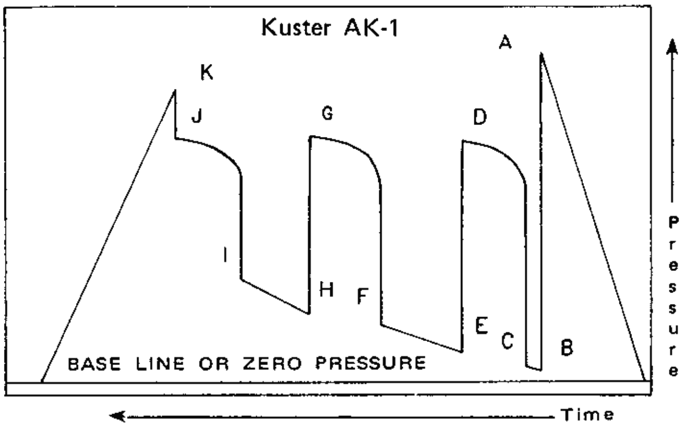
Press		Correcte
Initial Hydrostatic	A	3683
Final Hydrostatic	K	3608
Initial Flow	B	104
Final Initial Flow	C	994
Initial Shut-in	D	1088
Second Initial Flow	E	--
Second Final Flow	F	--
Second Shut-in	G	--
Third Initial Flow	H	--
Third Final Flow	I	--
Third Shut-in	J	--
Pressure Below Bottom Packer Bled To		

LY-232

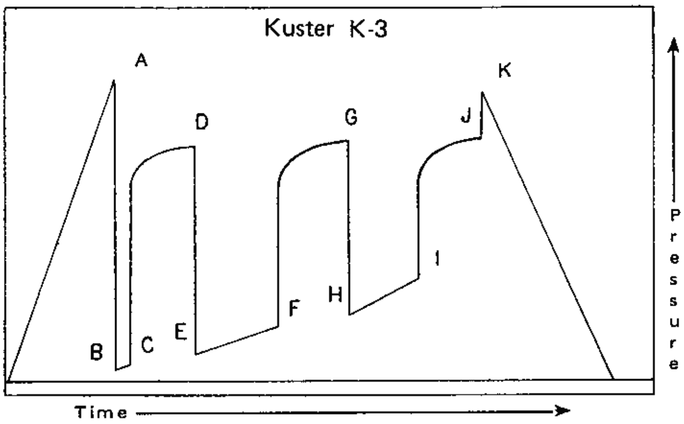
GUIDE TO INTERPRETATION AND IDENTIFICATION OF LYNES DRILL STEM TEST PRESSURE CHARTS

In making any interpretation, our employees will give Customer the benefit of their best judgment as to the correct interpretation. Nevertheless, since all interpretations are opinions based on inferences from electrical, mechanical or other measurements, we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not be liable or responsible, except in the case of gross or wilful negligence on our part, for any loss, costs, damages or expenses incurred or sustained by Customer resulting from any interpretation made by any of our agents or employees.

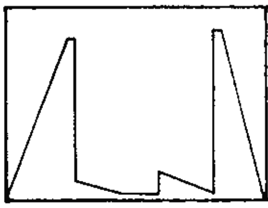
AK-1 recorders. Read from right to left.



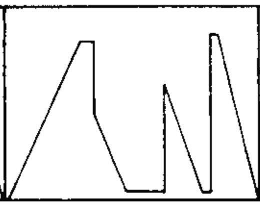
K-3 recorders. Read from left to right.



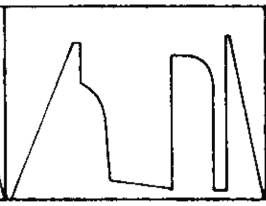
A — Initial Hydrostatic
B — First Initial Flow
C — First Final Flow
D — Initial Shut-in
E — Second Initial Flow
F — Second Final Flow
G — Second Shut-in
H — Third Initial Flow
I — Third Final Flow
J — Third Shut-in
K — Final Hydrostatic



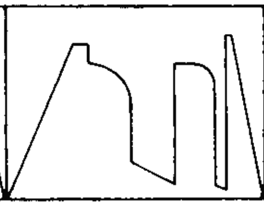
Very low permeability. Usually only mud recovered from interval tested. Virtually no permeability.



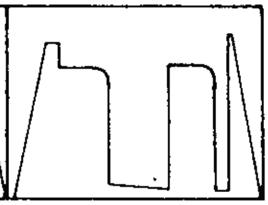
Slightly higher permeability. Again usually mud recovered.



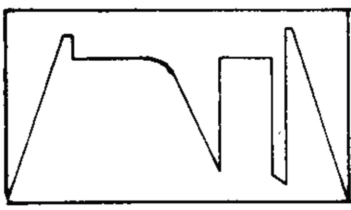
Slightly higher permeability. Small recovery, less than 200 ft).



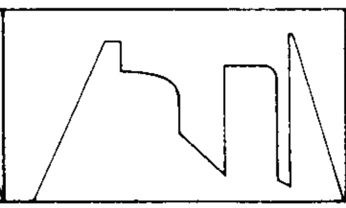
Average permeability. Final and initial shut-ins differ by 50 psi.



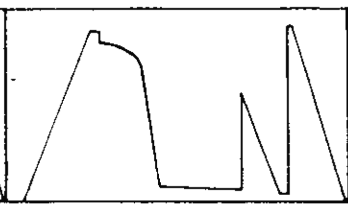
Average permeability. Strong damage effect. High shut-in pressure, low flow pressure.



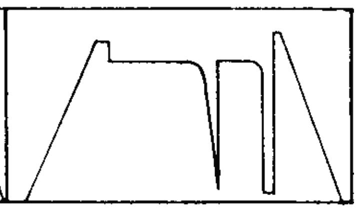
Excelent permeability where final flow final shut-in pressure.



High permeability where ISIP and FSIP are within 10 psi.



Deep well bore invasion or damage. Final shut-in higher than the initial shut-in.



Tight hole chamber tester. Permeability very difficult to interpret unless the recovery is less than chamber length. Flow pressure builds up rapidly if recovery is large, similar to a shut-in.

NOMENCLATURE (Definition of Symbols)

Q	= average production rate during test, bbls./day
Q_g	= measured gas production rate during test, MCF/day
k	= permeability, md
h	= net pay thickness, ft. (when unknown, test interval is chosen)
μ	= fluid viscosity, centipoise
Z	= compressibility factor
T_f	= reservoir temperature, ° Rankine
m	= slope of final SIP buildup plot, psig/cycle (psig²/cycle for gas)
b	= approximate radius of investigation, feet
r_w	= wellbore radius, feet
t_o	= total flowing time, minutes
P_o	= Extrapolated maximum reservoir pressure, psig
P_f	= final flowing pressure, psig
P.I.	= productivity index, bbls./day/psi
P.I.$_t$	= theoretical productivity index with damage removed, bbl./day/psi
D.R.	= damage ratio
E.D.R.	= estimated damage ratio
AOF	= absolute open flow potential, MCF/D
AOF$_t$	= theoretical absolute open flow if damage were removed
$\bar{Z}$	= subsea depth
W	= water gradient based on salinity
H_w	= potentiometric surface

INTERPRETATION CALCULATIONS (OIL/WATER)

AVERAGE PRODUCTION RATE DURING TEST

$$Q = \frac{1440\,(\text{drill collar capacity} \times \text{recovery} + \text{drill pipe capac.} \times \text{recovery})}{\text{initial flow time} + \text{final flow time}}$$

$$= \frac{1440\,[(\quad)(\quad) + (\quad)(\quad)]}{(\quad) + (\quad)}$$

$$= \frac{1440\,(.0145 \text{ or } .0073)(\quad)}{(\quad)}$$

= .... bbls./day

Mud Expansion = — .... ft. (Drill Collar Conversion Is Considered)

FLUID PROPERTIES — Estimated Bottom Hole Temperature °

API Gravity @ 60° F ....° Specific Gravity @ 60° F. Est. Viscosity .... cp

TRANSMISSIBILITY

$$\frac{kh}{\mu} = \frac{162.6Q}{m} = \frac{162.6\,(\quad)}{(\quad)}$$ = ... md.-ft/cp

IN SITU CAPACITY

kh = ( )( )= .... md.-ft.

AVERAGE EFFECTIVE PERMEABILITY — Estimated Pay Thickness Ft / Actual Pay Thickness Ft.

$$k = \frac{(\quad)}{(\quad)}$$ = ... md.

PRODUCTIVITY INDEX

$$PI = \frac{Q}{P_o - P_f} = \frac{(\quad)}{(\quad) - (\quad)}$$ = ... bbl./day-psi

DAMAGE RATIO

$$D.R. = \frac{0.183\,(P_o - P_f)}{m} = \frac{0.183\,[(\quad) - (\quad)]}{(\quad)}$$ = ...

PRODUCTIVITY INDEX WITH DAMAGE REMOVED

P.I.$_t$ = P.I × D.R. = ( ) ( ) = ... bbl./day-psi

APPROXIMATE RADIUS OF INVESTIGATION

$b = \sqrt{kt_o} = \sqrt{(\quad)(\quad)}$ = ... ft.

Drawdown Factor $= \frac{\text{I.S.I.P.} - \text{F.S.I.P.}}{\text{I.S.I.P.}} \times 100 = \frac{(\quad) - (\quad)}{(\quad)} \times 100$ = ...% (4% to 5% is considered serious or substantial)

Potentiometric Surface $= H_w = \bar{Z} + \frac{P_o}{W}$ h_w = ... + $\frac{(\quad)}{(\quad)}$ = + ... ± .... ft

INTERPRETATION CALCULATIONS (GAS)

$R(T_f)$ = ... °

ESTIMATED GAS PROPERTIES — Estimated Bottom Hole Temperature °

Gravity @ 60° F .... Viscosity (Res.) .... cp Compressibility Factor (Z) ....

TRANSMISSIBILITY — Measured D.S.T Gas Rate = ...mcf/d.

$$\frac{kh}{\mu} = \frac{1637\,Q_g\,ZT_f}{m} \quad \frac{1637\,(\quad)(\quad)(\quad)}{(\quad)}$$ = ... md.-ft./cp.

IN SITU CAPACITY

kh = ( ) ( ) = ...md.-ft.

AVERAGE EFFECTIVE PERMEABILITY — Estimated Pay Thickness Ft / Actual Pay Thickness Ft.

$$k = \frac{(\quad)}{(\quad)}$$ = ... md.

APPROXIMATE RADIUS OF INVESTIGATION

$b = 0.02\sqrt{kt_oP_o} = 0.02\sqrt{(\quad)(\quad)(\quad)}$ = ... ft.

ACTUAL CAPACITY

$$kh = \frac{3270\,Q_g\,\mu\,Z\,T_f\,\log(0.472\frac{b}{r_w})}{P_o^2 - P_f^2} = \frac{3270\,(\quad)(\quad)(\quad)(\quad)(\quad)}{(\quad) - (\quad)}$$ = ...md.-ft.

ESTIMATED DAMAGE RATIO

$$E.D.R = \frac{(P_o^2 - P_f^2)}{m\,(\log T_o + 2.65)}$$

E.D.R. = ...

ESTIMATED RANGE OF AOF POTENTIAL

$$\text{Max. AOF} = \frac{Q_g P_o^2}{P_o^2 - P_f^2} = \frac{(\quad)(\quad)}{[(\quad) - (\quad)]} = \frac{(\quad)}{(\quad)}$$ = ... MCF/D

$$\text{Min. AOF} = \frac{Q_g P_o}{\sqrt{P_o^2 - P_f^2}} = \frac{(\quad)(\quad)}{\sqrt{[(\quad) - (\quad)]}} = \frac{(\quad)}{(\quad)}$$ = ... MCF/D

ESTIMATED RANGE OF AOF POTENTIAL DAMAGE REMOVED

Max. AOF$_t$ = (Max AOF) (D.R.) = ( ) ( ) = ... MCF/D

Min AOF$_t$ = (Min AOF) (D.R.) = ( ) ( ) = ... MCF/D

Drawdown Factor $= \frac{\text{ISIP} - \text{FSIP}}{\text{ISIP}} \times 100 = \frac{(\quad) - (\quad)}{(\quad)} \times 100$ = ... % (4% to 5% is considered serious or substantial)

Potentiometric Surface $= H_w = \bar{Z} + \frac{P_o}{W}$ H_w = ______ + $\frac{(\quad)}{(\quad)}$ = + ... ± .... ft