SOUTH AUSTRALIA

DEPARTMENT OF MINES AND ENERGY

# OPEN FILE ENVELOPE NO. 4125

## PEL 5 AND PEL 6, PATCHAWARRA EAST BLOCK

## EROMANGA AND COOPER BASINS

WIMMA 1

TEST REPORTS

Submitted by

Delhi Petroleum Pty Ltd

1985

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# ENVELOPE 4125

**TENEMENT:** PEL 5 and PEL 6, Patchawarra East Block; Eromanga and Cooper Basins

**TENEMENT HOLDER:** Delhi Petroleum Pty Ltd (operator), Western Mining Corporation Ltd, Santos Ltd, Vamgas Ltd, and South Australian Oil and Gas Corporation Pty Ltd

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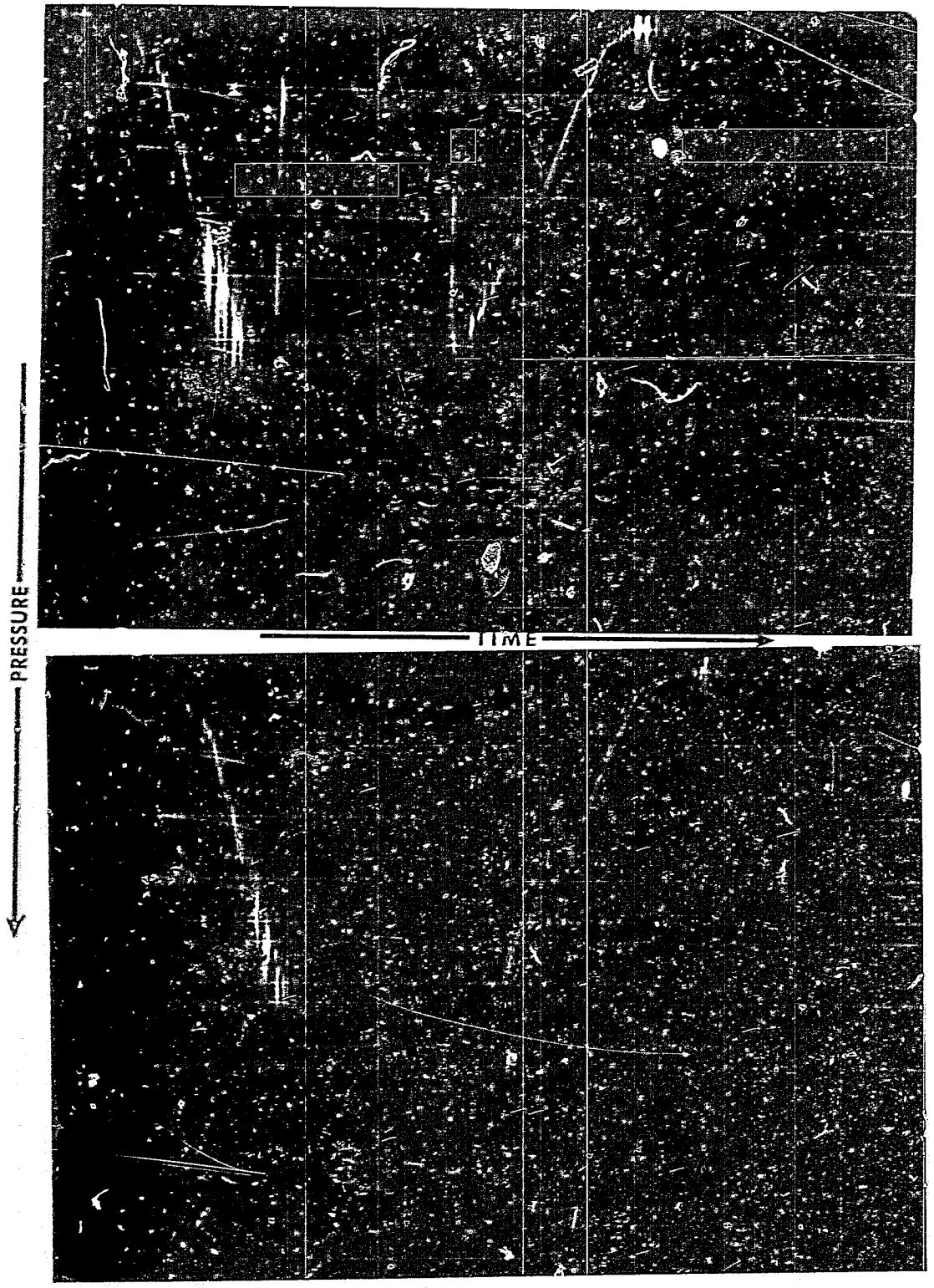
TICKET NO. 014739

026

| Tool Description | O.D. | I.D. | Length | Depth |
|---|---|---|---|---|
| DRILL PIPE | 5.00" | 4.276" | 10770.17' | |
| DRILL COLLARS | 6.50" | 2.8125" | 406.01' | |
| REVERSING SUB | 6.50" | 3.00" | 1.00' | |
| DRILL COLLARS | 6.50" | 2.8125" | 31.2' | |
| X OVER | 6.50" | 2.50" | .83' | |
| DUAL CIP VALVE | 5.00" | .87" | 4.92' | |
| HYDROSPRING TESTER | 5.00" | .75" | 5.02' | 11217.32' |
| AP RUNNING CASE | 5.00" | 2.25" | 4.14' | 11218.32' |
| HYDRAULIC JAR | 5.00" | 1.75" | 5.00' | |
| VR SAFETY JOINT | 5.00" | 1.00" | 2.78' | |
| PACKER ASSEMBLY | 7.75" | 1.75" | 6.00' | 11235.24' |
| DISTRIBUTOR | 5.00" | 1.68" | 2.00' | |
| PACKER ASSEMBLY | 7.75" | 1.75" | 6.00' | 112432.4' |
| ANCHOR PIPE SAFETY JOINT | 5.00" | 1.50" | 4.30' | |
| FLUSH JOINT ANCHOR | 5.00" | 2.50" | 36.40' | |
| BLANKED-OFF BT RUNNING CASE | 5.00" | 2.44" | 4.06' | 11284.94' |
| TOTAL DEPTH | | | | 11289.00' |




Each Horizontal Line Equal to 1000 p.s.i.

## NOMENCLATURE

| | | |
|---|---|---|
| [illegible] | [illegible] | |
| b | [illegible] | |
| D R | [illegible] | |
| El | [illegible] | |
| GD | B.T. Gauge Depth From [illegible] | |
| h | = Interval Tested | [illegible] |
| $h_1$ | = Net Pay Thickness | Feet |
| K | = Permeability | md |
| $K_1$ | = Permeability (From Net Pay Zone $h_1$) | md |
| m | = Slope Extrapolated Pressure Plot (Psi/cycle Gas) | psi/cycle |
| $OF_1$ | = Maximum Indicated Flow Rate | MCF/D |
| $OF_2$ | = Minimum Indicated Flow Rate | MCF/D |
| $OF_3$ | = Theoretical Open Flow Potential with/Damage Remo[illegible] | MCF/D |
| $OF_4$ | = Theoretical Open Flow Potential with/Damage Removed Min. | MCF/D |
| $P_s$ | = Extrapolated Static Pressure | Psig |
| $P_F$ | = Final Flow Pressure | Psig. |
| $P_{ot}$ | = Potentiometric Surface (Fresh Water *) | Feet |
| Q | = Average Adjusted Production Rate During Test | bbls/day |
| $Q_1$ | = Theoretical Production w/Damage Removed | bbls/day |
| $Q_g$ | = Measured Gas Production Rate | MCF/D |
| R | = Corrected Recovery | bbls |
| $r_w$ | = Radius of Well Bore | Feet |
| t | = Flow Time | Minutes |
| $t_o$ | = Total Flow Time | Minutes |
| T | = Temperature Rankine | °R |
| Z | = Compressibility Factor | —— |
| $\mu$ | = Viscosity Gas or Liquid | CP |
| Log | = Common Log | |

* Potentiometric Surface Referred to Rotary Table When Elevation Not Given. Fresh Water Correction [illegible]

0004

# FLUID SAMPLE DATA

Sampler Pressure _____ P.S.I.G. at Surface
Recovery: Cu. Ft. Gas _____
cc. Oil _____
cc. Water _____
cc. Mud _____
Tot. Liquid cc. _____
Gravity _____ ° API @ _____ °F.
Gas/Oil Ratio _____ cu. ft./bbl.

| | RESISTIVITY | | CHLORIDE CONTENT |
|---|---|---|---|
| Recovery Water | .27 @ 78 °F. | | ppm |
| Recovery Mud | 1.0 @ 72 °F. | | ppm |
| Recovery Mud Filtrate | 1.0 @ 72 °F. | | ppm |
| Mud Pit Sample | @ °F. | | ppm |
| Mud Pit Sample Filtrate | @ °F. | | ppm |
| Mud Weight | 9.6 vis | | sec. |

Date 8-10-81 Ticket Number 257037
Kind of D.S.T. OPEN HOLE Halliburton Location ADELAIDE
Tester BRENT HOOVER Witness OZOLINS
Drilling Contractor RICHTER DRILLING CO/RIG # 10 SM-BC-dr

## EQUIPMENT & HOLE DATA

Formation Tested Toolachee
Elevation 142' KB Ft.
Net Productive Interval 10' Ft.
All Depths Measured From Rotary Kelly Bushing
Total Depth 10505' Ft.
Main Hole/Casing Size 8 1/2"-OH-9 5/8" Casing
Drill Collar Length 343'?? I.D. 2 15/16"
Drill Pipe Length 9874' ?? I.D. 4.2 ??
Packer Depth(s) 10360-10369' Ft.
Depth Tester Valve 10343' Ft.

Cushion TYPE 1480' AMOUNT Water Ft. Depth Back Pres. Valve Surface Choke 1/2" Bottom Choke 3/4"

Recovered 1250 Feet of gas cut muddy water
Recovered 300 Feet of gas cut watery mud
Recovered 800 Feet of gas cut mud
Recovered Feet of
Recovered Feet of

Meo. From Tester Valve

Remarks Surface indications were that tool did not fully shut in on bottom. Clock on B.T. gauge 6184' was stairstepping. No second flow period recorded. DCIP valve cycled from first to second shut in position directly. Charts indicate plugging in the early part of the initial flow period.

| TEMPERATURE | Gauge No. 6185 Depth: 10347 Ft. | | Gauge No. 6184 Depth: 10502 Ft. | | Gauge No. Depth: Ft. | | TIME (00:00-24:00 hrs.) | |
|---|---|---|---|---|---|---|---|---|
| | 24 Hour Clock | | 24 Hour Clock | | Hour Clock | | Tool Opened 7:25 | |
| Est. °F. | Blanked Off NO | | Blanked Off Yes | | Blanked Off | | Opened Bypass 12:30 | |
| Actual 250 °F. | Pressures | | Pressures | | Pressures | | Reported Minutes | Computed Minutes |
| | Field | Office | Field | Office | Field | Office | | |
| Initial Hydrostatic | 4992 | 4977.5 | 5021 | 5019.6 | | | — | — |
| First Period Flow Initial | 960 | 512.5 | 1032 | 994.6 | | | 125 | |
| First Period Flow Final | 960 | 982.4 | 1032 | 1052.7 | | | 100 | |
| First Period Closed In | 1238 | 1261.2 | 1275 | 1259.7 | | | — | — |
| Second Period Flow Initial | 960 | - | 1032 | - | | | 0 | |
| Second Period Flow Final | 960 | - | 1032 | - | | | 80 | |
| Second Period Closed In | 1252 | 1260.4 | 1275 | 1303.0 | | | — | — |
| Third Period Flow Initial | | | | | | | | |
| Third Period Flow Final | | | | | | | | |
| Third Period Closed In | | | | | | | | |
| Final Hydrostatic | 4992 | 4978.6 | 5049 | 4983.1 | | | — | — |

Legal Location Sec.-Twp.-Rng.
Lease Name WIMMA
Well No. 1
Test No. 1
Tested Interval 10369'-10505'
Field Area WIMMA COOPER BASIN
County AUSTRALIA
State SOUTH AUSTRALIA
Lease Owner/Company Name DELHI/SANTOS

FORM 181-R2 - PRINTED IN U.S.A.

# FORMATION TEST DATA

LITTLE'S

Casing perfs. _____ Bottom choke 1.08" Surf. temp 65 °F Ticket No. 257037
Gas gravity 95% _____ Oil gravity _____ GOR _____
Spec. gravity _____ Chlorides _____ ppm Res. _____ @ _____ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED _____

| Date Time a.m. p.m. | Choke Size | Surface Pressure psi | Gas Rate MCF | Liquid Rate BPD | Remarks |
|---|---|---|---|---|---|
| 0010 | | | | | Made up tools |
| 0200 | | | | | Started in hole |
| 0645 | | | | | Made up head and lines |
| 0721 | | | | | Set packer 25,000# weight |
| 0725 | .78" | | | | Opened tool with a weak blow increasing |
| 0735 | .78" | | | | Increasing to good blow |
| 0800 | .78" | | | | Blow decreasing |
| 0810 | .78" | | | | Strong blow |
| 0815 | .78" | 1# | | | Strong blow |
| 0819 | .78" | 2# | | | Gas to surface |
| 0826 | .78" | 5# | | | Gas increasing |
| 0843 | .78" | 7# | | | Gas |
| 0845 | 1/2" | 7# | | | Change choke to 1/2" |
| 08[illegible] | 1/2" | 4 | | | Gas decreasing |
| 0925 | 1/2" | 4# | | | Stable flow |
| 0920 | 1/2" | 4# | | | Closed tool 11 turns to right in DCIP |
| 0945 | 1/2" | 4# | | | Tool not closed fully additional 2 turns in DCIP |
| 1005 | 1/2" | 3# | | | 1 more turn in DCIP |
| 1020 | 1/2" | 3# | | | 1 more turn in DCIP |
| 1110 | 1/2" | 3# | | | Attempted to rotate DCIP final closed position 25 turns to right. |
| 1130 | 1/2" | 2# | | | |
| 11:45 | 1/2" | 2# | | | Rotate DCIP 4 additonal turns to the right |

FORM 182-R1—PRINTED IN U.S.A.

# PRODUCTION TEST DATA

LITTLE'S

8

0006

Casing perfs. _____ Bottom choke _____ Surf. temp _____ °F Ticket No. 257037

Gas gravity _____ Oil gravity _____ GOR _____

Spec. gravity _____ Chlorides _____ ppm Res. _____ @ _____ °F

INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED _____

| Date Time a.m. p.m. | Choke Size | Surface Pressure psi | Gas Rate MCF | Liquid Rate BPD | Remarks |
|---|---|---|---|---|---|
| 12:30 | 1/2" | | | | Pulled tool loose |
| 1245 | | | | | Broke out head and surface equipment |
| 1250 | | | | | Customer requested not to reverse out |
| 1610 | | | | | Pulled out of hole with test tools |
| 1735 | | | | | Broke out and laid out tools |
| | | | | | |
| | | | | | |
| | | | | |

DELHI/SANTOS
Lease Owner/Company Name

257037
Ticket Number

0007

B.T. 6185 B.T. 6184 B.T.

Depth 10347' Depth 10502 Depth

| Time (minutes) | Log $\frac{t+t}{t}$ | PSIG Temp. Corr. | Time (minutes) | Log $\frac{t+t}{t}$ | PSIG Temp. Corr. | Time (minutes) | Log $\frac{t+t}{t}$ | PSIG Temp. Corr. |
|---|---|---|---|---|---|---|---|---|
| FIRST FLOW | | | FIRST FLOW | | | | | |
| 0 | | 512.5 | 0 | | 994.6 | | | |
| 15 | | 1012.2 | 15 | | 1038.4 | | | |
| 30 | | 966.4 | 30 | | 1020.0 | | | |
| 45 | | 971.7 | 45 | | 1027.0 | | | |
| 60 | | 975.5 | 60 | | 1030.3 | | | |
| 75 | | 975.5 | 75 | | 1030.5 | | | |
| 90 | | 976.3 | 90 | | 1032.7 | | | |
| 105 | | 976.3 | 105 | | 1038.4 | | | |
| 120 | | 982.4 | 120 | | 1044.6 | | | |
| 124.1 | | 982.4 | 125.3 | | 1052.7 | | | |
| | | | | | | | | |
| FIRST CIP | | | FIRST CIP | | | | | |
| 0 | | 982.4 | 0 | | 1052.7 | | | |
| 10 | | 1063.6 | 10 | | 1104.6 | | | |
| 20 | | 1120.7 | 20 | | 1135.7 | | | |
| 30 | | 1150.8 | 30 | | 1157.0 | | | |
| 40 | | 1177.4 | 40 | | 1176.5 | | | |
| 50 | | 1193.9 | 50 | | 1193.5 | | | |
| 60 | | 1210.4 | 60 | | 1211.9 | | | |
| 70 | | 1222.9 | 70 | | 1224.9 | | | |
| 80 | | 1236.2 | 80 | | 1238.6 | | | |
| 90 | | 1247.6 | 90 | | 1253.5 | | | |
| 101.5 | | 1261.2 | 97.4 | | 1259.7 | | | |
| | | | | | | | | |
| NO SECOND FLOW RECORDED | | | NO SECOND FLOW RECORDED | | | | | |
| | | | | | | | | |
| SECOND CIP | | | SECOND CIP | | | | | |
| 0 | | 985.9 | 0 | | 1060.8 | | | |
| 8 | | 1114.9 | 8 | | 1157.6 | | | |
| 16 | | 1155.1 | 16 | | 1194.6 | | | |
| 24 | | 1173.9 | 24 | | 1213.8 | | | |
| 32 | | 1190.4 | 32 | | 1231.6 | | | |
| 40 | | 1206.4 | 40 | | 1247.0 | | | |
| 48 | | 1221.3 | 48 | | 1261.1 | | | |
| 56 | | 1233.0 | 56 | | 1273.2 | | | |
| 64 | | 1241.8 | 64 | | 1282.4 | | | |
| 72 | | 1252.1 | 73 | | 1293.2 | | | |
| 80 | | 1260.4 | 82.5 | | 1303.0 | | | |

Remarks:

60-2860

8

TICKET NO. 257037

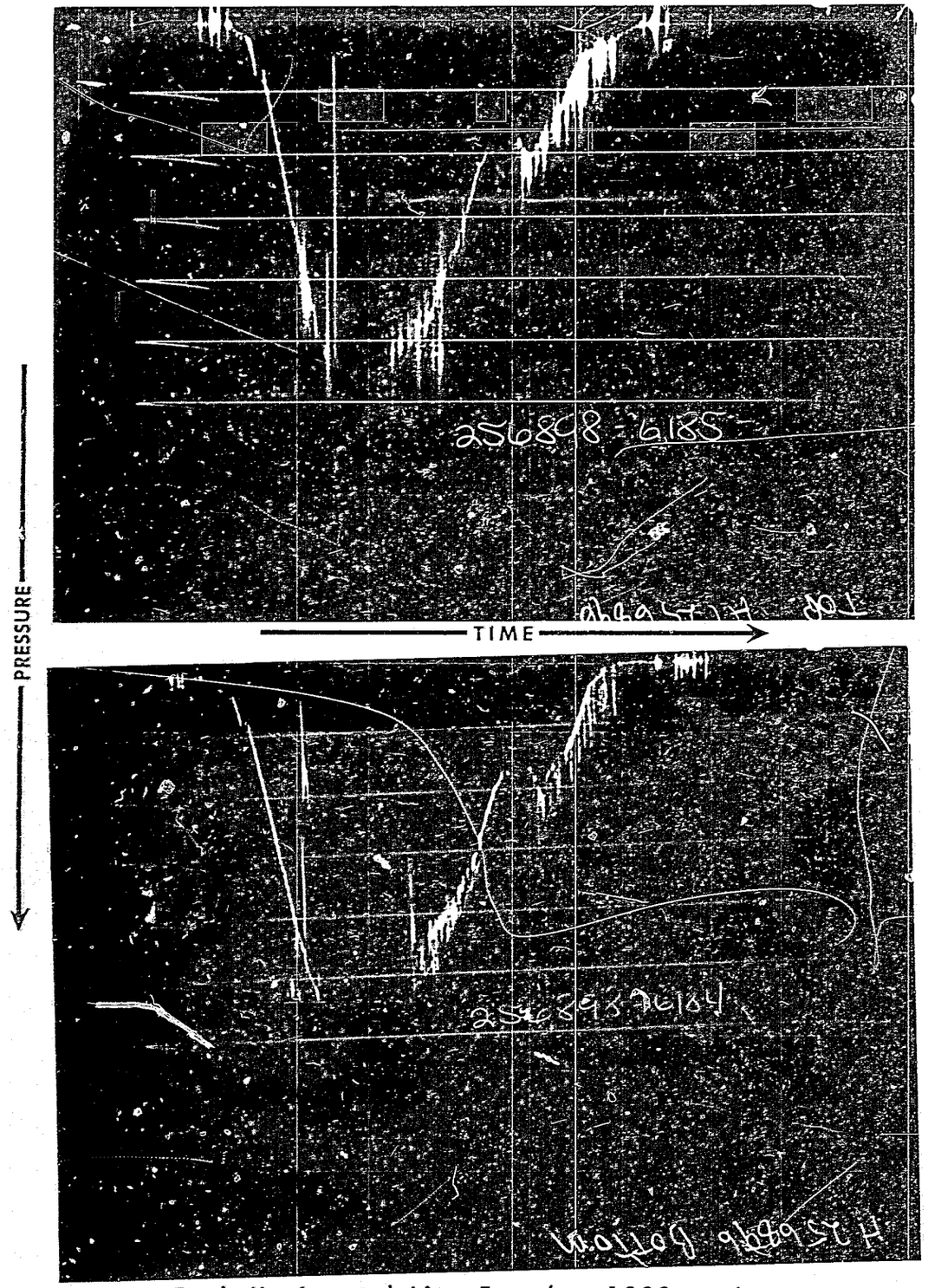
0008

| | O. D. | I. D. | LENGTH | DEPTH |
|---|---|---|---|---|
| Drill Pipe or Tubing | ? | 4.2 ?? | 9874 ?? | |
| Drill Collars | | | | |
| Reversing Sub | | | | 10240.36' |
| Water Cushion Valve | | | 343' ?? | |
| Drill Pipe | 6.5" | 2 13/16" | | |
| Drill Collars | .52" | 0.2" | 0.93' CHange over | |
| Handling Sub & Choke Assembly | 0.42" | 0.14" | 4.88' | |
| Dual CIP Valve | | | | |
| Dual CIP Sampler | 0.42" | 0.06" | 5.31' | 10340.72' |
| Hydro-Spring Tester | | | | |
| Multiple CIP Sampler | | | | |
| Extension Joint | | | | |
| AP Running Case | 0.42" | 0.25" | 4.15' | 10346.03' |
| Hydraulic Jar | 0.42" | 0.14" | 4.99' | |
| VR Safety Joint | 0.42" | 0.09 | 2.31' | |
| Pressure Equalizing Crossover | | | | |
| Packer Assembly | 0.65" | 0.25" | 6.16' | 10360' |
| Distributor | 0.42" | 0.13" | 2.0' | |
| Packer Assembly | 0.65" | 0.23" | 6.2' | 10369' |
| Flush Joint Anchor | | | | |
| Pressure Equalizing Tube | | | | |
| Blanked-Off B.T. Running Case | | | | |
| Drill Collars | 0.42" | 0.13' | 4.24' | |
| Anchor Pipe Safety Joint | 0.52" | 0.2' | 0.66' Change over | |
| | 6.5" | 2 13/16" | 93.56' Drill Collars | |
| Packer Assembly | 0.51" | 0.2" | 0.65' Change over | |
| Distributor | | | | |
| Packer Assembly | | | | |
| Anchor Pipe Safety Joint | | | | |
| Side Wall Anchor | | | | |
| Drill Collars | | | | |
| Flush Joint Anchor | 0.42" | 0.2' | 30.00' | |
| Blanked-Off B.T. Running Case | 0.42" | 0.2" | 4.05' | 10500.95' |
| Total Depth | | | | |

FORM 187-R2 – PRINTED IN U.S.A.

# EQUIPMENT DATA

LITTLE'S




Each Horizontal Line Equal to 1000 p.s.i.

## NOMENCLATURE

| | | |
|---|---|---|
| b | = Approximate Radius [illegible] | |
| b | = Approximate Radius [illegible] | |
| D.R. | = Damage Ratio | |
| El | = Elevation | Feet |
| GD | = B T Gauge Depth From Surface Reference | Feet |
| h | = Interval Tested | Feet |
| $h_1$ | = Net Pay Thickness | Feet |
| K | = Permeability | md |
| $K_1$ | = Permeability (From Net Pay Zone h) | md |
| m | = Slope Extrapolated Pressure Plot ($Psi^2$/cycle Gas) | $psi^2$/cycle |
| $OF_1$ | = Maximum Indicated Flow Rate | MCF/D |
| $OF_2$ | = Minimum Indicated Flow Rate | MCF/D |
| $OF_3$ | = Theoretical Open Flow Potential with/Damage Removed Max. | MCF/D |
| $OF_4$ | = Theoretical Open Flow Potential with/Damage Removed Min. | MCF/D |
| $P_s$ | = Extrapolated Static Pressure | Psig. |
| $P_F$ | = Final Flow Pressure | Psig. |
| $P_{ot}$ | = Potentiometric Surface (Fresh Water *) | Feet |
| Q | = Average Adjusted Production Rate During Test | bbls/day |
| $Q_1$ | = Theoretical Production w/Damage Removed | bbls/day |
| $Q_g$ | = Measured Gas Production Rate | MCF/D |
| R | = Corrected Recovery | bbls |
| $r_w$ | = Radius of Well Bore | Feet |
| t | = Flow Time | Minutes |
| $t_o$ | = Total Flow Time | Minutes |
| T | = Temperature Rankine | °R |
| Z | = Compressibility Factor | —— |
| $\mu$ | = Viscosity Gas or Liquid | CP |
| Log | = Common Log | |

* Potentiometric Surface Reference to Rotary Table When Elevation Not Given. Fresh Water Corrected to 100° F.

0010

| FLUID SAMPLE DATA | | | |
|---|---|---|---|
| Sampler Pressure | P.S.I.G. at Surface | Date 8-18-81 | Ticket Number 256898 |
| Recovery: Cu. Ft. Gas | | Kind of D.S.T. OPEN HOLE | Halliburton Location MOOMBA |
| cc. Oil | | Tester MR. GOETJENS | Witness MR. SLATER |
| cc. Water | | Drilling Contractor RICHTER RIG #10 | bc |
| cc. Mud | | | |
| Tot. Liquid cc. | | | |
| Gravity ° API @ °F. | | | |
| Gas/Oil Ratio cu. ft./bbl. | | | |

| | RESISTIVITY | CHLORIDE CONTENT |
|---|---|---|
| Recovery Water | @ °F. | ppm |
| Recovery Mud | @ °F. | ppm |
| Recovery Mud Filtrate | @ °F. | ppm |
| Mud Pit Sample | @ °F. | ppm |
| Mud Pit Sample Filtrate | @ °F. | ppm |
| Mud Weight 9.7 | vis 44 sec. | |

| EQUIPMENT & HOLE DATA | |
|---|---|
| Formation Tested | Toolachie |
| Elevation | 142' Ft. |
| Net Productive Interval | Ft. |
| All Depths Measured From | Rotary Kelly Bushing |
| Total Depth | 10632' Ft. |
| Main Hole/Casing Size | 8½" |
| Drill Collar Length | 468.62' I.D. 2 13/16" |
| Drill Pipe Length | 10076.14' I.D. 4.276" |
| Packer Depth(s) | 10573.48' - 10581.48' Ft. |
| Depth Tester Valve | 10555.58' Ft. |

Cushion TYPE WATER AMOUNT 1500 Ft. Depth Back Pres. Valve Surface Choke .5" Bottom Choke .75"

| | | | |
|---|---|---|---|
| Recovered | 140 | Feet of | Gas cut mud |
| Recovered | 1260 | Feet of | Slightly gas cut muddy water |
| Recovered | 200 | Feet of | Slightly gas cut watery mud |
| Recovered | | Feet of | |
| Recovered | | Feet of | |

Mea. From Tester Valve

Remarks Charts indicate possible partial plugging of anchor perforations during initial flow period. SEE PRODUCTION TEST DATA SHEET.

| TEMPERATURE | Gauge No. 6185 Depth: 10556.58' Ft. | | Gauge No. 6184 Depth: 10627.94' Ft. | | Gauge No. Depth: Ft. | | TIME (00:00-24:00 hrs.) | |
|---|---|---|---|---|---|---|---|---|
| | 24 Hour Clock | | 24 Hour Clock | | Hour Clock | | Tool Opened 1721 | |
| Est. °F. | Blanked Off No | | Blanked Off Yes | | Blanked Off | | | |
| Actual 266 °F. | Pressures | | Pressures | | Pressures | | Opened Bypass 2021 | |
| | Field | Office | Field | Office | Field | Office | Reported Minutes | Computed Minutes |
| Initial Hydrostatic | 5019 | 5002.8 | 5103 | 5128.1 | | | | |
| First Period Flow Initial | 427 | 449.0 | 871 | 899.4 | | | — | — |
| First Period Flow Final | 907 | 902.0 | 926 | 932.9 | | | 60 | |
| First Period Closed In | 1066.5 | 1076.3 | 1088 | 1143.4 | | | 120 | |
| Second Period Flow Initial | | | | | | | — | — |
| Second Period Flow Final | | | | | | | | |
| Second Period Closed In | | | | | | | | |
| Third Period Flow Initial | | | | | | | — | — |
| Third Period Flow Final | | | | | | | | |
| Third Period Closed In | | | | | | | | |
| Final Hydrostatic | 5019 | 5002.8 | 5103 | 5121.8 | | | — | — |
| | Hydrostatic pressures are questionable..... | | | | | | | |

Legal Location Sec. - Twp. - Rng.

Lease Name WIMMA

Well No. 1

Test No. 4

Tested Interval 10581.48' - 10632'

Field Area COOPER BASIN

County SOUTH AUSTRALIA

State AUSTRALIA

Lease Owner/Company Name SANTOS, LIMITED

8

FORM 181-R2 - PRINTED IN U.S.A.

# FORMATION TEST DATA

LITTLE'S

0011

Casing perfs. _____ Bottom choke _____ Surf. temp _____ °F Ticket No. 256898

Gas gravity _____ Oil gravity _____ GOR _____

Spec. gravity _____ Chlorides _____ ppm Res. _____ @ _____ °F

INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED _____

| Date Time a.m. p.m. | Choke Size | Surface Pressure psi | Gas Rate MCF | Liquid Rate BPD | Remarks |
|---|---|---|---|---|---|
| 1120 | | | | | Loaded clocks |
| 1230 | | | | | Made up tools |
| 1350 | | | | | Tools made up, ran in hole |
| 1700 | | | | | Made up head |
| 1709 | | | | | Packer set |
| 1721 | | | | | Tool opened with a very weak blow |
| 1726 | | | | | Moderate to stong blow |
| 1731 | | | | | " |
| 1741 | | | | | Decreasing |
| 1751 | | | | | Weak blow |
| 1801 | | | | | Nearly dead |
| 1810 | | | | | Dead |
| 1821 | | | | | Closed tool |
| 2021 | | | | | Hydrospring closed |
| 2030 | | | | | Packer pulled free, pulled out of hole |
| 2040 | | | | | Broke out head, pulled out of hole |
| ~~8-19-81~~ 0430 | | | | | Tools out and laid down |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

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# PRODUCTION TEST DATA

LITTLE'S

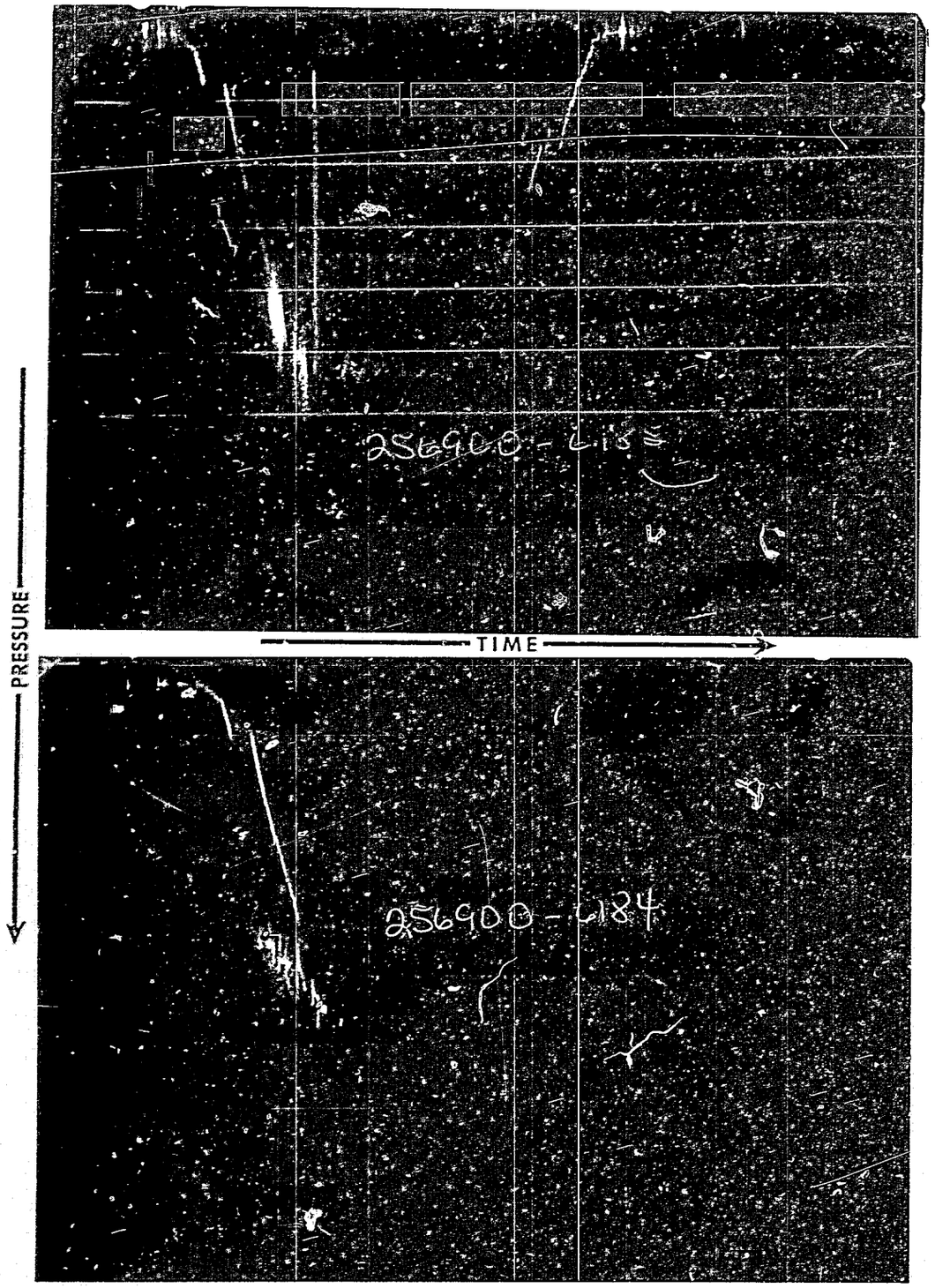
8

TICKET NO. 256898 0012

| Tool Description | O.D. | I.D. | Length | Depth |
|---|---|---|---|---|
| DRILL PIPE | 5" | 4.276" | 10076.14' | |
| DRILL COLLARS | 6.5" | 2 13/16" | 437.32' | |
| IMPACT SUB | 6" | 3" | 1' | |
| DRILL COLLARS | 6.5" | 2.4" | 31.30' | |
| X OVER | 6.25" | 2.4" | .93' | |
| DUAL CIP VALVE | 5" | .87" | 4.87' | |
| HYDROSPRING TESTER | 5" | .75" | 5.02' | 10555.58' |
| AP RUNNING CASE | 5" | 2.25" | 4.12' | 10556.58' |
| HYDRAULIC JAR | 5" | 1.75" | 5' | |
| VR SAFETY JOINT | 5" | 1" | 2.78' | |
| PACKER ASSEMBLY | 7.75" | 1.75" | 6' | 10573.48' |
| DISTRIBUTOR | 5" | 1.6" | 2' | |
| PACKER ASSEMBLY | 7.75" | 1.75" | 6' | 10581.48' |
| ANCHOR PIPE SAFETY JOINT | 5" | 1.5" | 4' | |
| X OVER | - | - | .73' | |
| DRILL COLLARS | 6.5" | 2 13/16" | 17.91' | |
| X OVER | - | - | .82' | |
| FLUSH JOINT ANCHOR | 5" | 2.37" | 22' | |
| BLANKED-OFF B.T. RUNNING CASE | 5" | 2.44" | 4.06' | 10627.94' |
| TOTAL DEPTH | | | | 10632' |

EQUIPMENT DATA SHEET

8




Each Horizontal Line Equal to 1000 p.s.i.

## NOMENCLATURE

| | | |
|---|---|---|
| b | [illegible] | |
| b | [illegible] | |
| D.R. | Damage Ratio | |
| El | = Elevation | Feet |
| GD | = B.T. Gauge Depth From Surface Reference | Feet |
| h | = Interval Tested | Feet |
| $h_1$ | = Net Pay Thickness | Feet |
| K | = Permeability | md |
| $K_1$ | = Permeability (From Net Pay Zone h) | md |
| m | = Slope Extrapolated Pressure Plot (Psi/cycle Gas) | psi/cycle |
| $OF_1$ | = Maximum Indicated Flow Rate | MCF/D |
| $OF_2$ | = Minimum Indicated Flow Rate | MCF/D |
| $OF_3$ | = Theoretical Open Flow Potential with/Damage Removed Max. | MCF/D |
| $OF_4$ | = Theoretical Open Flow Potential with/Damage Removed Min. | MCF/D |
| $P_s$ | = Extrapolated Static Pressure | Psig. |
| $P_F$ | = Final Flow Pressure | Psig. |
| $P_{ot}$ | = Potentiometric Surface (Fresh Water *) | Feet |
| Q | = Average Adjusted Production Rate During Test | bbls/day |
| $Q_1$ | = Theoretical Production w/Damage Removed | bbls/day |
| $Q_g$ | = Measured Gas Production Rate | MCF/D |
| R | = Corrected Recovery | bbls |
| $r_w$ | = Radius of Well Bore | Feet |
| t | = Flow Time | Minutes |
| $t_o$ | = Total Flow Time | Minutes |
| T | = Temperature Rankine | °R |
| Z | = Compressibility Factor | —— |
| $\mu$ | = Viscosity Gas or Liquid | CP |
| Log | = Common Log | |

* Potentiometric Surface Reference to Rotary Table When Elevation Not Given. Fresh Water Corrected to 100° F.

0014

| FLUID SAMPLE DATA | | | |
|---|---|---|---|
| Sampler Pressure | P.S.I.G. at Surface | Date 8-21-81 | Ticket Number 256900 |
| Recovery: Cu. Ft. Gas | | Kind of D.S.T. OPEN HOLE | Halliburton Location MOOMBA |
| cc. Oil | | Tester MR. GOETTENS | Witness MR. SLATER |
| cc. Water | | Drilling Contractor RICHTER RIG #10 | PW/ic |
| cc. Mud | | | |
| Tot. Liquid cc. | | | |
| Gravity ° API @ °F. | | | |
| Gas/Oil Ratio cu. ft./bbl. | | | |

| | RESISTIVITY | CHLORIDE CONTENT |
|---|---|---|
| Recovery Water | @ °F. | ppm |
| Recovery Mud | @ °F. | ppm |
| Recovery Mud Filtrate | @ °F. | ppm |
| Mud Pit Sample | @ °F. | ppm |
| Mud Pit Sample Filtrate | @ °F. | ppm |
| Mud Weight 9.4 | vis 41 | sec. |

| EQUIPMENT & HOLE DATA | |
|---|---|
| Formation Tested | Toolachee |
| Elevation | 142' Ft. |
| Net Productive Interval | - Ft. |
| All Depths Measured From | Rotary Kelly Bushing |
| Total Depth | 10,746' Ft. |
| Main Hole/Casing Size | 8 1/2" |
| Drill Collar Length | 437.32' I.D. 2 13/16" |
| Drill Pipe Length | 10,239.91' I.D. 4.276" |
| Packer Depth(s) | 10,705.94' - 10,713.94' Ft. |
| Depth Tester Valve | 10,688.04' Ft. |

Cushion TYPE: WATER AMOUNT: 1500' Ft. Depth Back Pres. Valve — Surface Choke .5" — Bottom Choke .75"

| | | | |
|---|---|---|---|
| Recovered | 1300 | Feet of | Gas cut muddy water |
| Recovered | 100 | Feet of | Gas cut watery mud |
| Recovered | 300 | Feet of | Gas cut mud |
| Recovered | | Feet of | Recovery includes water cushion. |
| Recovered | | Feet of | Gas to surface in 1 hour. |

Meas. From Tester Valve

Remarks SEE PRODUCTION TEST DATA SHEET.

**Time given and time recorded does not agree.

| TEMPERATURE | Gauge No. 6185 Depth: 10,689.04' Ft. | | Gauge No. 6184 Depth: 10,741.94' Ft. | | Gauge No. Depth: Ft. | | TIME (00:00-24:00 hrs.) | |
|---|---|---|---|---|---|---|---|---|
| | 24 Hour Clock | | 24 Hour Clock | | Hour Clock | | Tool Opened 09:17 | |
| Est. 266 °F. | Blanked Off NO | | Blanked Off YES | | Blanked Off | | Opened Bypass 13:56 | |
| Actual °F. | Pressures | | Pressures | | Pressures | | Reported | Computed |
| | Field | Office | Field | Office | Field | Office | Minutes | Minutes |
| Initial Hydrostatic | 5347 | 5350.3 | NO READINGS... | | | | | |
| First Period Flow Initial | 642 | 684.0 | CLOCK FAILURE | | | | — | — |
| First Period Flow Final | 642 | 657.2 | | | | | 93** | * |
| First Period Closed In | 4488 | 4519.4 | | | | | 186 | * |
| Second Period Flow Initial | | | | | | | — | — |
| Second Period Flow Final | | | | | | | | |
| Second Period Closed In | | | | | | | | |
| Third Period Flow Initial | | | | | | | — | — |
| Third Period Flow Final | | | | | | | | |
| Third Period Closed In | | | | | | | | |
| Final Hydrostatic | 5291 | 5280.0 | | | | | — | — |

Legal Location Sec. - Twp. - Rng.: ---

Lease Name: WIMMA — Well No.: 1 — Test No.: 6 — Tested Interval: 10,713.94' - 10,746'

Field Area: COOPER BASIN — County: --- — State: SOUTH AUSTRALIA

Lease Owner/Company Name: SANTOS, LIMITED

FORM 181-82 - PRINTED IN U.S.A.

# FORMATION TEST DATA

LITTLE'S

Casing perfs. _____ Bottom choke _____ Surf. temp _____ °F Ticket No. 256900
Gas gravity _____ Oil gravity _____ GOR _____
Spec. gravity _____ Chlorides _____ ppm Res. _____ @ _____ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED _____

| Date Time a.m. p.m. | Choke Size | Surface Pressure psi | Gas Rate MCF | Liquid Rate BPD | Remarks |
|---|---|---|---|---|---|
| 03:00 | | | | | Loaded clocks. |
| 04:00 | | | | | Made up tools. |
| 05:15 | | | | | Ran in hole. |
| 09:10 | | | | | Made up head. |
| 09:17 | | | | | Opened tool. |
| 09:18 | | | | | Closed choke. |
| 09:21 | | | | | Very weak bubble. |
| 09:37 | | | | | " |
| 09:43 | | | | | Dead. |
| 09:50 | | | | | Very weak bubble. |
| 09:51 | | | | | Weak increasing. |
| 09:52 | | | | | Strong blow - opened choke. |
| 09:53 | | | | | Strong blow. |
| 09:57 | | | | | " |
| 09:59 | | | | | " |
| 10:00 | | 3 | | | " |
| 10:07 | | 3 | | | |
| 10:17 | | 3 | | | Gas to surface. |
| 10:30 | | 3 | | | |
| 10:50 | | | | | Closed tool. |
| 13:56 | | | | | Hydrospring closed and packers released. |
| 13:58 | | | | | Broke out head and pulled out of hole. |
| 17:30 | | | | | Tools out and laid down. |
| | | | | | |
| | | | | | |
| | | | | | |

FORM 182-R1—PRINTED IN U.S.A.

# PRODUCTION TEST DATA

LITTLE'S

0016

SANTOS LIMITED
Lease Owner/Company Name

256900
Ticket Number

B.T. 6185 B.T. 6184 B.T.

Depth 10,689.04'-24 Hr. Depth 10,741.94'-24 Hr. Depth

| Time (minutes) | Log $\frac{t+t}{t}$ | PSIG Temp. Corr. | Time (minutes) | Log $\frac{t+t}{t}$ | PSIG Temp. Corr. | Time (minutes) | Log $\frac{t+t}{t}$ | PSIG Temp. Corr. |
|---|---|---|---|---|---|---|---|---|
| First Flow... | | | NO READINGS...CLOCK | | | | | |
| 0 | | 684.0 | FAILURE | | | | | |
| 15 | | 660.1 | | | | | | |
| 30 | | 660.4 | | | | | | |
| 45 | | 653.2 | | | | | | |
| 60 | | 653.2 | | | | | | |
| 75 | | 653.2 | | | | | | |
| 3/.6 | | 657.2 | | | | | | |
| | | | | | | | | |
| Initial CIP... | | | | | | | | |
| 0 | | 657.2 | | | | | | |
| 12 | | 2408.5 | | | | | | |
| 24 | | 2727.0 | | | | | | |
| 36 | | 3204.3 | | | | | | |
| 48 | | 3558.4 | | | | | | |
| 60 | | 3861.3 | | | | | | |
| 72 | | 4005.9 | | | | | | |
| 84 | | 4121.2 | | | | | | |
| 96 | | 4208.2 | | | | | | |
| 108 | | 4271.3 | | | | | | |
| 120 | | 4327.4 | | | | | | |
| 132 | | 4372.8 | | | | | | |
| 144 | | 4418.2 | | | | | | |
| 156 | | 4460.3 | | | | | | |
| 168 | | 4497.9 | | | | | | |
| 180 | | 4519.4 | | | | | | |
| 186.0 | | 4519.4 | | | | | | |

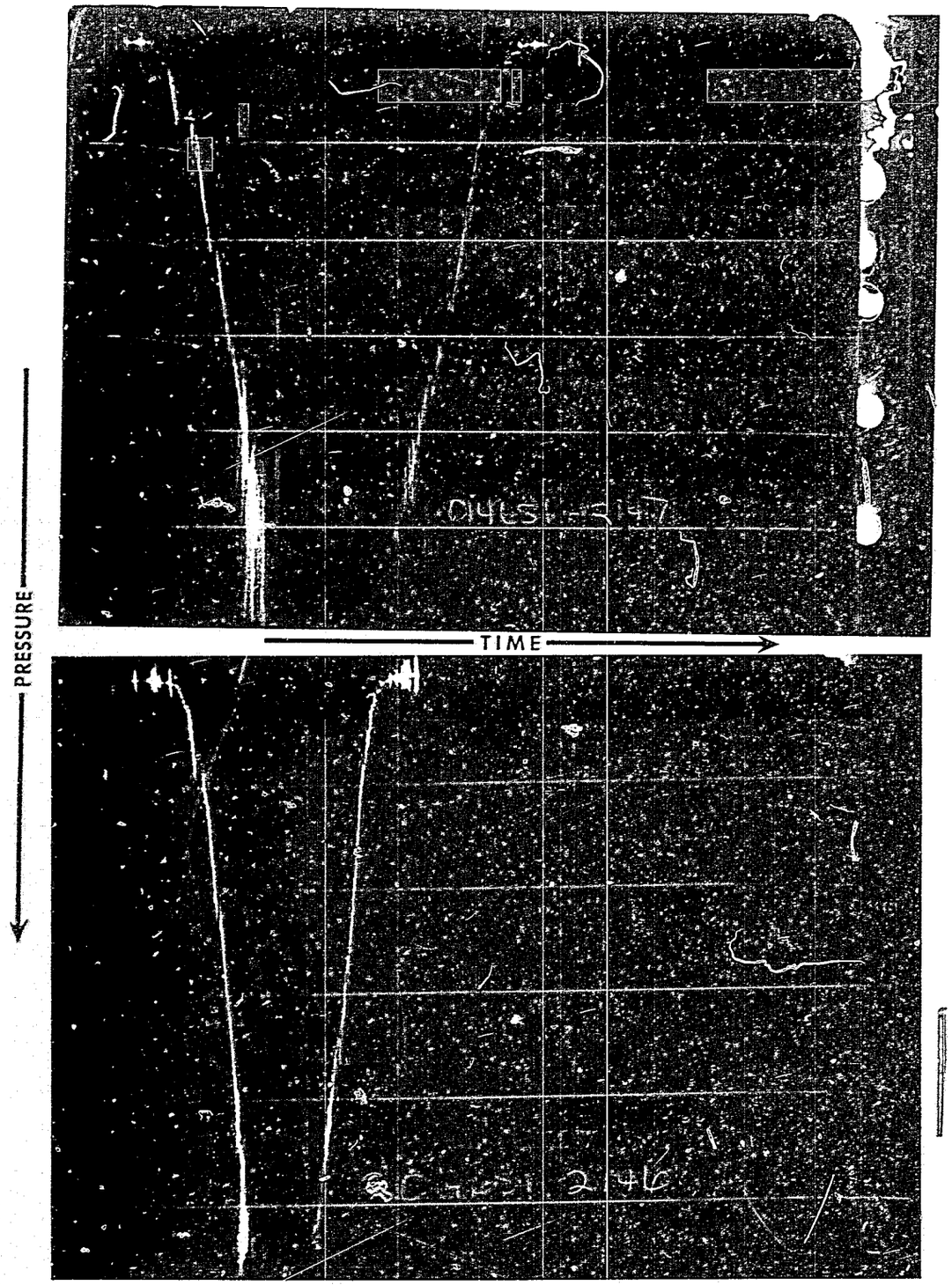
Remarks:

80-2860

TICKET NO. 256900 0017

| Tool Description | O.D. | I.D. | Length | Depth |
|---|---|---|---|---|
| Drill Pipe | 5" | 4.276" | 10,239.9' | |
| Drill Collars | 6.5" | 2 13/16" | 406.02' | |
| Impact Sub | 6" | 3" | 1' | |
| Drill Collars | 6.5" | 2 13/16" | 31.30' | |
| XO | 6.25" | 2.4" | .93' | |
| DUAL CIP valve | 5" | .87" | 4.87' | |
| Hydrospring Tester | 5" | .75" | 5.02' | 10,688.04' |
| AP Running Case | 5" | 2.25" | 4.12' | 10,689.04' |
| Hydraulic Jar | 5" | 1.75" | 5.0' | |
| VR Safety Joint | 5" | 1" | 2.78' | |
| Packer | 7.75" | 1.75" | 6.0' | 10,705.94' |
| Distributor | 5" | 1.6" | 2.0' | |
| Packer | 7.75" | 1.75" | 6.0' | 10,713.94' |
| Anchor Pipe Safety Joint | 5" | 1.5" | 4.0' | |
| Flush Joint Anchor | 5" | 2.37" | 23' | |
| Blanked Off BT Running Case | 5" | 2.44" | 4.06' | 10,741.94' |
| TOTAL DEPTH | | | | 10,746' |

EQUIPMENT DATA SHEET




Each Horizontal Line Equal to 1000 p.s.i.

## NOMENCLATURE

| | | |
|---|---|---|
| b | = Approximate Radius [illegible] | |
| b | = Approximate Radius [illegible] | |
| D.R. | = Damage Ratio | |
| El | = Elevation | Feet |
| GD | = B T Gauge Depth From Surface Reference | Feet |
| h | = Interval Tested | Feet |
| $h_1$ | = Net Pay Thickness | Feet |
| K | = Permeability | md |
| $K_1$ | = Permeability (From Net Pay Zone h) | md |
| m | = Slope Extrapolated Pressure Plot ($Psi^2$/cycle Gas) | psi/cycle |
| $OF_1$ | = Maximum Indicated Flow Rate | MCF/D |
| $OF_2$ | = Minimum Indicated Flow Rate | MCF/D |
| $OF_3$ | = Theoretical Open Flow Potential with/Damage Removed Max. | MCF/D |
| $OF_4$ | = Theoretical Open Flow Potential with/Damage Removed Min. | MCF/D |
| $P_s$ | = Extrapolated Static Pressure | Psig. |
| $P_F$ | = Final Flow Pressure | Psig. |
| $P_{ot}$ | = Potentiometric Surface (Fresh Water*) | Feet |
| Q | = Average Adjusted Production Rate During Test | bbls/day |
| $Q_1$ | = Theoretical Production w/Damage Removed | bbls/day |
| $Q_g$ | = Measured Gas Production Rate | MCF/D |
| R | = Corrected Recovery | bbls |
| $r_w$ | = Radius of Well Bore | Feet |
| t | = Flow Time | Minutes |
| $t_o$ | = Total Flow Time | Minutes |
| T | = Temperature Rankine | °R |
| Z | = Compressibility Factor | — |
| $\mu$ | = Viscosity Gas or Liquid | CP |
| Log | = Common Log | |

* Potentiometric Surface Reference to Rotary Table When Elevation Not Given. Fresh Water Corrected to 100° F.

0019

| FLUID SAMPLE DATA | | | |
|---|---|---|---|
| Sampler Pressure | P.S.I.G. at Surface | Date 8-25-81 | Ticket Number 014651 |
| Recovery: Cu. Ft. Gas | | Kind of D.S.T. OPEN HOLE | Halliburton Location ADELAIDE |
| cc. Oil | | Tester MR. GOETJENS | Witness MR. SLATER |
| cc. Water | | Drilling Contractor RICHTER RIG #10 | PWbc |
| cc. Mud | | | |
| Tot. Liquid cc. | | | |
| Gravity ° API @ °F. | | | |
| Gas/Oil Ratio cu. ft./bbl. | | | |

| | RESISTIVITY | CHLORIDE CONTENT |
|---|---|---|
| Recovery Water | @ °F. | ppm |
| Recovery Mud | @ °F. | ppm |
| Recovery Mud Filtrate | @ °F. | ppm |
| Mud Pit Sample | @ °F. | ppm |
| Mud Pit Sample Filtrate | @ °F. | ppm |
| Mud Weight | vis | sec. |

| EQUIPMENT & HOLE DATA | |
|---|---|
| Formation Tested | Patchawarra |
| Elevation | 142' Ft. |
| Net Productive Interval | Ft. |
| All Depths Measured From | Rotary Kelly Bushing |
| Total Depth | 10966' Ft. |
| Main Hole/Casing Size | 8½" |
| Drill Collar Length | 406.01' I.D. 2 13/16" |
| Drill Pipe Length | 10451.46' I.D. 4.276" |
| Packer Depth(s) | 10886.19' - 10894.19' Ft. |
| Depth Tester Valve | 10868.29' Ft. |

Cushion TYPE Water AMOUNT 1500 Ft. Depth Back Pres. Valve Surface Choke .5" Bottom Choke .75"

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Meas. From Tester Valve

Remarks Gas to surface in 32 minutes. SEE PRODUCTION TEST DATA SHEET.

Unable to scribe 6000# line on both charts.

| TEMPERATURE | Gauge No. 2147 Depth: 10869.29' Ft. | Gauge No. 2146 Depth: 10961.94' Ft. | Gauge No. Depth: Ft. | TIME (00:00-24:00 hrs.) |
|---|---|---|---|---|
| | 24 Hour Clock | 48 Hour Clock | Hour Clock | Tool Opened 1333 |
| Est. °F. | Blanked Off No | Blanked Off Yes | Blanked Off | Opened Bypass 1713 |
| Actual 268 °F. | Pressures | Pressures | Pressures | Reported Minutes / Computed Minutes |

| | | Field | Office | Field | Office | | | Reported Minutes | Computed Minutes |
|---|---|---|---|---|---|---|---|---|---|
| Initial Hydrostatic | | 5233 | 5217.5 | 5315 | 5257.3 | | | — | — |
| First Period | Flow Initial | 804 | 798.4 | 808 | 809.3 | | | 70 | * |
| | Flow Final | 836 | 828.8 | 840 | 853.6 | | | 150 | * |
| | Closed In | 1167 | 1154.0 | 1177.5 | 1173.1 | | | — | — |
| Second Period | Flow Initial | | | | | | | | |
| | Flow Final | | | | | | | | |
| | Closed In | *See attached special reading sheet. | | | | | | — | — |
| Third Period | Flow Initial | | | | | | | | |
| | Flow Final | | | | | | | | |
| | Closed In | | | | | | | — | — |
| Final Hydrostatic | | 5137 | 5156.3 | 5170 | 5215.0 | | | | |

Legal Location Sec.-Twp.-Rng.

Lease Name WIMMA

Well No. 1

Test No. 7

Tested Interval 10894.19' - 10966'

Field Area COOPER BASIN

County SOUTH AUSTRALIA

State AUSTRALIA

Lease Owner/Company Name SANTOS, LIMITED

FORM 181-R2 - PRINTED IN U.S.A.

# FORMATION TEST DATA

LITTLE'S

0020

014651

Casing perfs.____ Bottom choke____ Surf. temp____ °F Ticket No.____

Gas gravity____ Oil gravity____ GOR____

Spec. gravity____ Chlorides____ ppm Res.____ @____ °F

**INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED**____

| Date 8-25-81 Time a.m. p.m. | Choke Size | Surface Pressure psi | Gas Rate MCF | Liquid Rate BPD | Remarks |
|---|---|---|---|---|---|
| 0655 | | | | | Loaded clocks |
| 0750 | | | | | Made up tools |
| 0915 | | | | | Tools made up, ran in hole |
| 1321 | | | | | Made up head |
| 1330 | | | | | Packer set |
| 1333 | | | | | Tool opened with a very weak bubble |
| 1336 | | | | | Died |
| 1353 | | | | | Very weak bubble |
| 1356 | | | | | Increasing to strong |
| 1357 | .5" | 4 | | | Strong blow |
| 1400 | | 5 | | | |
| 1401 | | 8 | | | |
| 1404 | | 10 | | | |
| 1405 | | 10 | | | Gas to surface |
| 1408 | | 9 | | | Decreasing |
| 1409 | | 8 | | | |
| 1411 | | 7 | | | |
| 1415 | | 6 | | | |
| 1418 | | 5 | | | |
| 1425 | | 4 | | | |
| 1440 | | 4 | | | |
| 1443 | | 4 | | | Closed tool |
| 1713 | | | | | Hydrospring closed, packer pulled free |
| 1725 | | | | | Broke out head, pulled out of hole |
| 2300 | | | | | Tools out and laid down |
| | | | | | |

FORM 182-R1—PRINTED IN U.S.A.

# PRODUCTION TEST DATA

LITTLE'S

SANTOS, LIMITED
Lease Owner/Company Name

014651
Ticket Number

0021

B.T. 2147 B.T. 2146 B.T.

Depth 10869.29' Depth 10961.94' Depth

FLOW

| Time (minutes) | Log $\frac{t+t_1}{t_1}$ | PSIG Temp. Corr. | Time (minutes) | Log $\frac{t+t_1}{t_1}$ | PSIG Temp. Corr. | Time (minutes) | Log $\frac{t+t_1}{t_1}$ | PSIG Temp. Corr. |
|---|---|---|---|---|---|---|---|---|
| 0 | | 798.4 | 0 | | 809.3 | | | |
| 10 | | 804.0 | 10 | | 824.4 | | | |
| 20 | | 818.5 | 20 | | 845.7 | | | |
| 30 | | 828.8 | 30 | | 852.5 | | | |
| 40 | | 828.8 | 40 | | 854.2 | | | |
| 50 | | 828.8 | 50 | | 852.3 | | | |
| 60 | | 828.8 | 60 | | 850.9 | | | |
| 70.1 | | 828.8 | 71.0 | | 853.6 | | | |
| | | | | | | | | |
| | | | | | | | | |
| CLOSED IN PRESSURE | | | | | | | | |
| 0 | | 828.8 | 0 | | 853.6 | | | |
| 15 | | 896.9 | 15 | | 920.6 | | | |
| 30 | | 945.4 | 30 | | 969.8 | | | |
| 45 | | 982.7 | 45 | | 1010.4 | | | |
| 60 | | 1016.2 | 60 | | 1043.0 | | | |
| 75 | | 1044.3 | 75 | | 1072.0 | | | |
| 90 | | 1070.8 | 90 | | 1094.8 | | | |
| 105 | | 1093.9 | 105 | | 1116.5 | | | |
| 120 | | 1114.9 | 120 | | 1136.1 | | | |
| 135 | | 1134.4 | 135 | | 1155.6 | | | |
| 150.6 | | 1154.0 | 150.0 | | 1173.1 | | | |

Remarks:

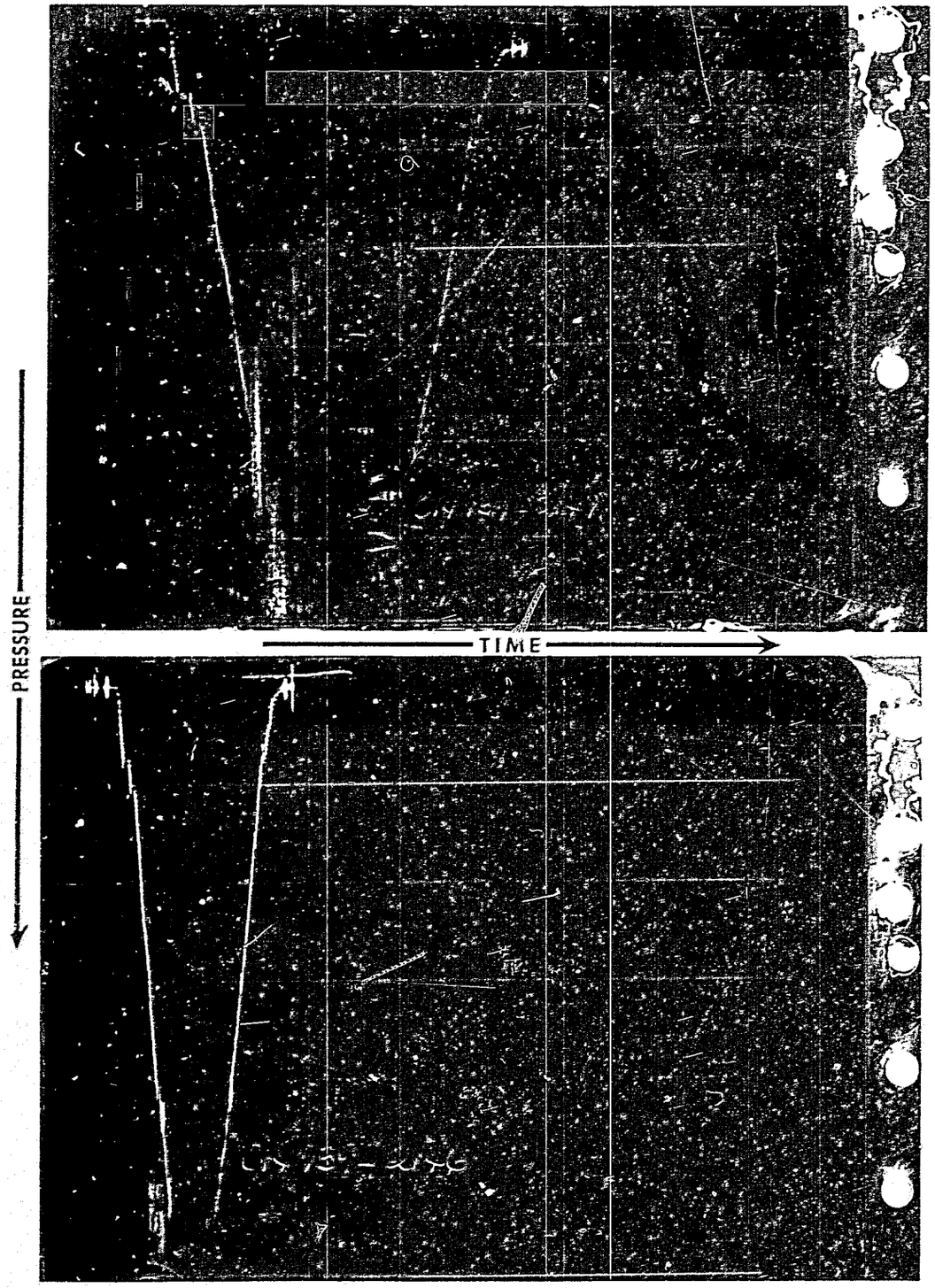
80-2860

S

TICKET NO. 014651 0022

| Tool Description | O.D. | I.D. | Length | Depth |
|---|---|---|---|---|
| DRILL PIPE | 5" | 4.276" | 10451.46' | |
| DRILL COLLARS | 6.5" | 2 13/16" | 374.71' | |
| REVERSING SUB | 6" | 3" | 1' | |
| DRILL COLLARS | 6.5" | 2 13/16" | 31.30' | |
| X OVER | 6.25" | 2.4" | .93' | |
| DUAL CIP VALVE | 5" | .87" | 4.87' | |
| HYDROSPRING TESTER | 5" | .75" | 5.02' | 10868.29' |
| AP RUNNING CASE | 5" | 2.25" | 4.12' | 10869.29' |
| HYDRAULIC JAR | 5" | 1.75" | 5' | |
| VR SAFETY JOINT | 5" | 1" | 2.78' | |
| PACKER ASSEMBLY | 7.75" | 1.75" | 6' | 10886.19' |
| DISTRIBUTOR | 5" | 1.6" | 2' | |
| PACKER ASSEMBLY | 7.75" | 1.75" | 6' | 10894.19' |
| ANCHOR PIPE SAFETY JOINT | 5" | 1.5" | 4' | |
| X OVER | 6.25" | 2.125" | .75' | |
| DRILL COLLARS | 6.5" | 2 13/16" | 31.20' | |
| X OVER | 6.25" | 2.25" | .80' | |
| FLUSH JOINT ANCHOR | 5" | 2.37" | 30' | |
| BLANKED-OFF B.T. RUNNING CASE | 5" | 2.44" | 4.06' | 10961.94' |
| TOTAL DEPTH | | | | 10966' |

EQUIPMENT DATA SHEET




Each Horizontal Line Equal to 1000 p.s.i.

## NOMENCLATURE

| | | |
|---|---|---|
| b | = Approximate Radius of Influence | [illegible] |
| b | = Approximate Radius of Influence Net Pay Zone | [illegible] |
| D.R. | = Damage Ratio | |
| El | = Elevation | Feet |
| GD | = B.T. Gauge Depth From Surface Reference | Feet |
| h | = Interval Tested | Feet |
| $h_1$ | = Net Pay Thickness | Feet |
| K | = Permeability | md |
| $K_1$ | = Permeability (From Net Pay Zone h) | md |
| m | = Slope Extrapolated Pressure Plot ($Psi^2$/cycle Gas) | psi/cycle |
| $OF_1$ | = Maximum Indicated Flow Rate | MCF/D |
| $OF_2$ | = Minimum Indicated Flow Rate | MCF/D |
| $OF_3$ | = Theoretical Open Flow Potential with/Damage Removed Max. | MCF/D |
| $OF_4$ | = Theoretical Open Flow Potential with/Damage Removed Min. | MCF/D |
| $P_s$ | = Extrapolated Static Pressure | Psig. |
| $P_F$ | = Final Flow Pressure | Psig. |
| $P_{ot}$ | = Potentiometric Surface (Fresh Water*) | Feet |
| Q | = Average Adjusted Production Rate During Test | bbls/day |
| $Q_1$ | = Theoretical Production w/Damage Removed | bbls/day |
| $Q_g$ | = Measured Gas Production Rate | MCF/D |
| R | = Corrected Recovery | bbls |
| $r_w$ | = Radius of Well Bore | Feet |
| t | = Flow Time | Minutes |
| $t_o$ | = Total Flow Time | Minutes |
| T | = Temperature Rankine | °R |
| Z | = Compressibility Factor | —— |
| $\mu$ | = Viscosity Gas or Liquid | CP |
| Log | = Common Log | |

* Potentiometric Surface Reference to Rotary Table When Elevation Not Given. Fresh Water Corrected to [illegible] °F.

0024

| FLUID SAMPLE DATA | | | |
|---|---|---|---|
| Sampler Pressure | P.S.I.G. at Surface | Date 8-29-81 | Ticket Number 014739 |
| Recovery: Cu. Ft. Gas | | Kind of D.S.T. OPEN HOLE | Halliburton Location AUSTRALIA |
| cc. Oil | | | |
| cc. Water | | Tester RED SKINNER | Witness |
| cc. Mud | | | |
| Tot. Liquid cc. | | Drilling Contractor RECTOR DRILLING COMPANY RIG #10 bj | |
| Gravity ° API @ °F. | | EQUIPMENT & HOLE DATA | |
| Gas/Oil Ratio cu. ft./bbl. | | Formation Tested Patchawarra | |
| | RESISTIVITY / CHLORIDE CONTENT | Elevation 142' Ft. | |
| Recovery Water | @ °F. ppm | Net Productive Interval - Ft. | |
| Recovery Mud | @ °F. ppm | All Depths Measured From Kelly Bushing | |
| Recovery Mud Filtrate | @ °F. ppm | Total Depth 11289.00' Ft. | |
| Mud Pit Sample | @ °F. ppm | Main Hole/Casing Size 8.50" | |
| Mud Pit Sample Filtrate | @ °F. ppm | Drill Collar Length 437.21' I.D. 2 13/16" | |
| Mud Weight 9.5 | vis sec. | Drill Pipe Length 10770.17' I.D. 4.276" | |
| | | Packer Depth(s) 11235.24'-11243.24' Ft. | |
| | | Depth Tester Valve 11217.32' Ft. | |

Cushion TYPE Water AMOUNT 1480' Ft. Depth Back Pres. Valve Surface Choke .50" Bottom Choke .75"

Recovered 1365 Feet of water cushion

Recovered 210 Feet of mud.

Recovered Feet of

Recovered Feet of

Recovered Feet of

Meas. From Tester Valve

Remarks SEE PRODUCTION TEST DATA SHEET....

UNABLE TO SCRIBE 6000# LINE ON BT #2147....

| TEMPERATURE | Gauge No. 2147 Depth: 11218.32' Ft. | | Gauge No. 2146 Depth: 11284.94' Ft. | | Gauge No. Depth: Ft. | | TIME (00:00-24:00 hrs.) | |
|---|---|---|---|---|---|---|---|---|
| Est. 268 °F. | 24 Hour Clock Blanked Off NO | | 48 Hour Clock Blanked Off YES | | Hour Clock Blanked Off | | Tool Opened 1404 | |
| Actual °F. | Pressures | | Pressures | | Pressures | | Opened Bypass 1634 | |
| | Field | Office | Field | Office | Field | Office | Reported Minutes | Computed Minutes |
| Initial Hydrostatic | | 5488.8 | 5612.2 | 5525.6 | | | | |
| First Period Flow Initial | | 671.3 | 807.1 | 794.2 | | | — | — |
| First Period Flow Final | | 682.3 | 710.6 | 720.2 | | | 75 | |
| First Period Closed In | | 3584.3 | 3592.7 | 3613.4 | | | 75 | |
| Second Period Flow Initial | | | | | | | — | — |
| Second Period Flow Final | | | | | | | | |
| Second Period Closed In | | | | | | | | |
| Third Period Flow Initial | | | | | | | — | — |
| Third Period Flow Final | | | | | | | | |
| Third Period Closed In | | | | | | | | |
| Final Hydrostatic | | 5457.1 | 5484.0 | 5514.4 | | | — | — |

Legal Location Sec.-Twp.-Rng.: WITNA

Lease Name: #1

Well No.: #8

Test No.: 11243.24' to 11289.00'

Tested Interval

Field Area: COOPER BASIN

County: SOUTH AUSTRALIA

State: AUSTRALIA

Lease Owner/Company Name: SANTOS LIMITED

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# FORMATION TEST DATA

LITTLE'S

8

Casing perfs. _____ Bottom choke _____ Surf. temp _____ °F Ticket No. 014739
Gas gravity _____ Oil gravity _____ GOR _____
Spec. gravity _____ Chlorides _____ ppm Res. _____ @ _____ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED _____

| Date Time a.m. p.m. | Choke Size | Surface Pressure psi | Gas Rate MCF | Liquid Rate BPD | Remarks |
|---|---|---|---|---|---|
| 0730 | | | | | Loaded clocks. |
| 0930 | | | | | Made up tools and started in hole. |
| 1345 | | | | | Made up control head. |
| 1400 | | | | | Set packers. |
| 1404 | | | | | Hydrospring opened with no blow. |
| 1406 | | | | | Closed flare line in. |
| 1408 | | | | | Very weak blow. |
| 1409 | | | | | " |
| 1414 | | | | | " |
| 1419 | | | | | " |
| 1421 | | | | | Well dead. |
| 1427 | | | | | Very weak blow, increasing. |
| 1429 | | | | | Moderate blow, increasing. |
| 1430 | | | | | Opened flare line with a strong blow. |
| 1434 | | | | | " |
| 1439 | | | | | " |
| 1444 | | | | | " |
| 1449 | | | | | Gas to surface, rate too small to measure. |
| 1459 | | | | | " |
| 1504 | | | | | " |
| 1514 | | | | | Closed flare line to take gas sample. |
| | | | | | |
| 1519 | | | | | Closed tool for closed in pressure. |
| 1634 | | | | | Pulled packers and closed hydrospring. |
| 2230 | | | | | Tools out and laid down. |
| | | | | | |

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# PRODUCTION TEST DATA

LITTLE'S

8

TICKET NO. 014739

026

| Tool Description | O.D. | I.D. | Length | Depth |
|---|---|---|---|---|
| DRILL PIPE | 5.00" | 4.276" | 10770.17' | |
| DRILL COLLARS | 6.50" | 2.8125" | 406.01' | |
| REVERSING SUB | 6.50" | 3.00" | 1.00' | |
| DRILL COLLARS | 6.50" | 2.8125" | 31.2' | |
| X OVER | 6.50" | 2.50" | .83' | |
| DUAL CIP VALVE | 5.00" | .87" | 4.92' | |
| HYDROSPRING TESTER | 5.00" | .75" | 5.02' | 11217.32' |
| AP RUNNING CASE | 5.00" | 2.25" | 4.14' | 11218.32' |
| HYDRAULIC JAR | 5.00" | 1.75" | 5.00' | |
| VR SAFETY JOINT | 5.00" | 1.00" | 2.78' | |
| PACKER ASSEMBLY | 7.75" | 1.75" | 6.00' | 11235.24' |
| DISTRIBUTOR | 5.00" | 1.68" | 2.00' | |
| PACKER ASSEMBLY | 7.75" | 1.75" | 6.00' | 112432.4' |
| ANCHOR PIPE SAFETY JOINT | 5.00" | 1.50" | 4.30' | |
| FLUSH JOINT ANCHOR | 5.00" | 2.50" | 36.40' | |
| BLANKED-OFF BT RUNNING CASE | 5.00" | 2.44" | 4.06' | 11284.94' |
| TOTAL DEPTH | | | | 11289.00' |

EQUIPMENT DATA SHEET

8

WIMMA NO. 1

# Organic Petrology of a suite of samples from Wimma No. 1

A report prepared for
DELHI PETROLEUM PTY. LTD.

by
Keiraville Konsultants Pty. Ltd.

Keiraville Konsultants Pty. Ltd.,
7 Dallas St.,
Keiraville, N.S.W., 2500,
Australia.

April 1985

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Copies of this report have been sent to M. Zwigulis of Delhi Petroleum Pty Ltd, in Adelaide, South Australia.

Any questions related to this study may be directed to Dr. Alan Cook of Keiraville Konsultants Pty Ltd, located in Keiraville, New South Wales.

All data and interpretations given herein are proprietary to Delhi Petroleum Pty Ltd, and are considered as highly confidential material by all Keiraville Konsultants personnel.

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WIMMA No.1

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# Organic petrology of a suite of samples from Wimma No. 1

## Introduction

Thirty three samples of ditch cuttings were examined in polished section in normally incident white light and in reflected UV/violet light fluorescence-mode. The samples include eight from the Cretaceous, eight from the Jurassic, five from the Triassic, eleven from the Permian and one from the pre-Permian sequence. The oil window is reached in the Jurassic section, but the main oil generation zone is present in the Triassic section. The Permian sequence is late mature to overmature and lies within the main gas generation zone. The cuttings samples were received washed and dried. The location of Wimma No. 1 is shown in Figure 1 (p3).

Short descriptions of the organic matter in each sample, together with vitrinite reflectance data and descriptions of rock-types, are given in Appendix 1 (pp 29-34). This report draws together the observations made on the suite of samples and develops an interpretation of the organic petrology in terms of hydrocarbon maturation, source-potential, and the thermal history of the sequence sampled at the location of Wimma No. 1.

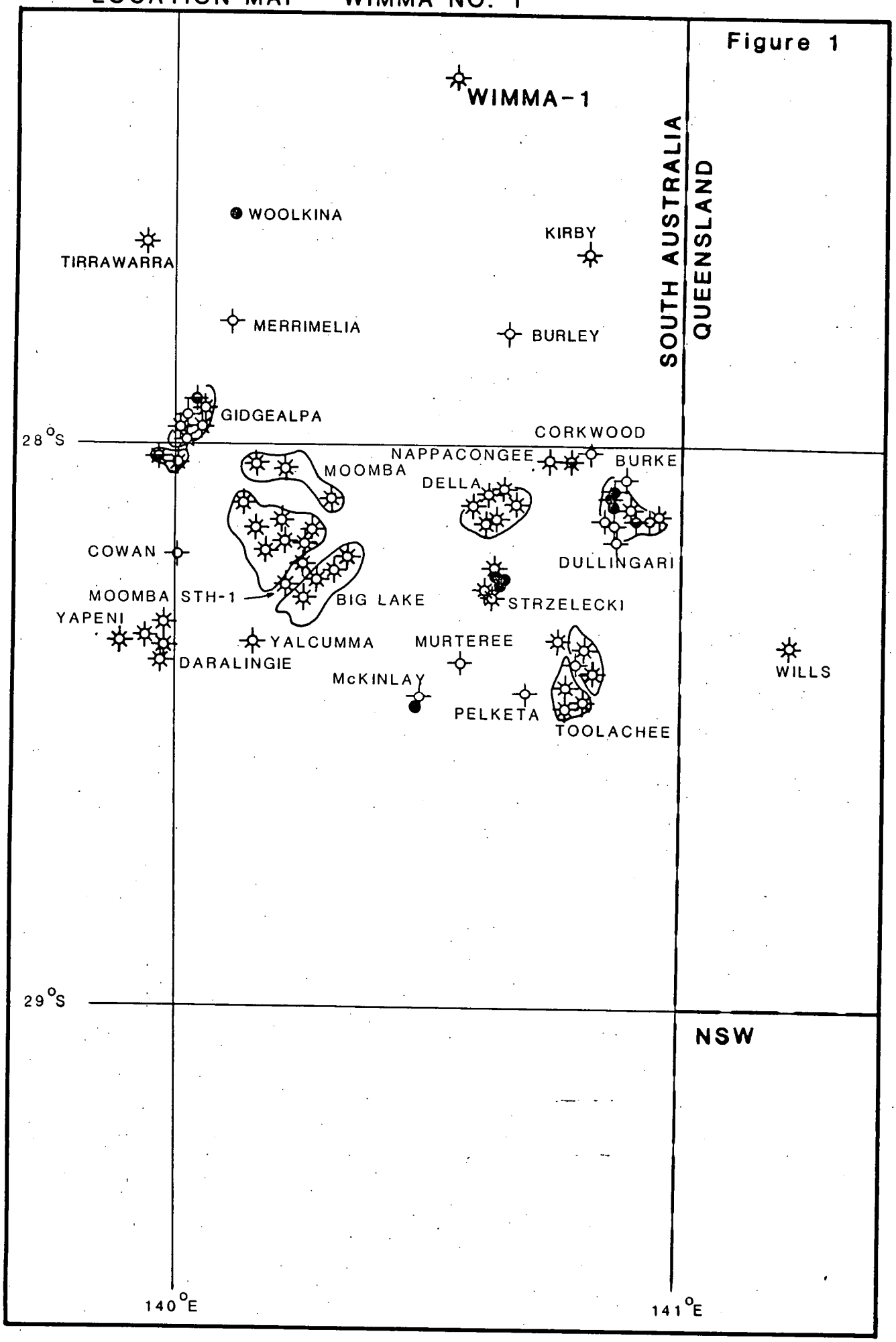
## Experimental Methods

Samples were mounted in cold-setting resin and polished "as received", so that whole-rock samples rather than concentrates of organic matter were examined. This method is preferred to the use of demineralised concentrates because of the greater ease, with whole-rock samples, of identifying first generation vitrinite and of recognising cavings. The major part of the organic matter in the Triassic sequence was identified as cavings from the Cretaceous and Jurassic sections. Minor cavings were also detected in the lower part of the Permian section.

Vitrinite reflectance measurements were made with a Leitz MPV1.1 photometer using immersion oil of refractive index 1.518 at 546 nm and spinel and garnet standards of 0.42%, 0.917% and 1.726% reflectance. Fluorescence mode observations were made on all samples and provide supplementary evidence concerning organic matter type, and exinite abundance and maturity. For fluorescence-mode, a 3mm BG 3 excitation filter was used with a TK400 dichroic mirror and a K490 barrier filter. The photographs were taken using a Leica camera mounted on an Orthoplan microscope.

# LOCATION MAP - WIMMA NO. 1





## Vitrinite Reflectance

Table 1 (p11) summarizes the depths to stated vitrinite reflectances and gives the present well temperatures at these reflectances. Table 1 also includes data from a number of other wells in the Cooper and Eromanga Basins for comparison. Reflectance gradient data are given in Table 2 (p12). The model temperatures, $T_{iso}$ and $T_{grad}$ are derived from the reflectance data and are given in Table 3 (p13-14). They are discussed in the section on Thermal History, and these data are summarized in a graphical form in Figures 3 to 5 (pp15-17).

The samples provide good control over the variation of the vitrinite reflectance as a function of depth over the section. Figure 2 (p5) shows the mean maximum reflectance and the range of reflectance attributed to each of the horizons sampled. The solid line is the most probable average trend.

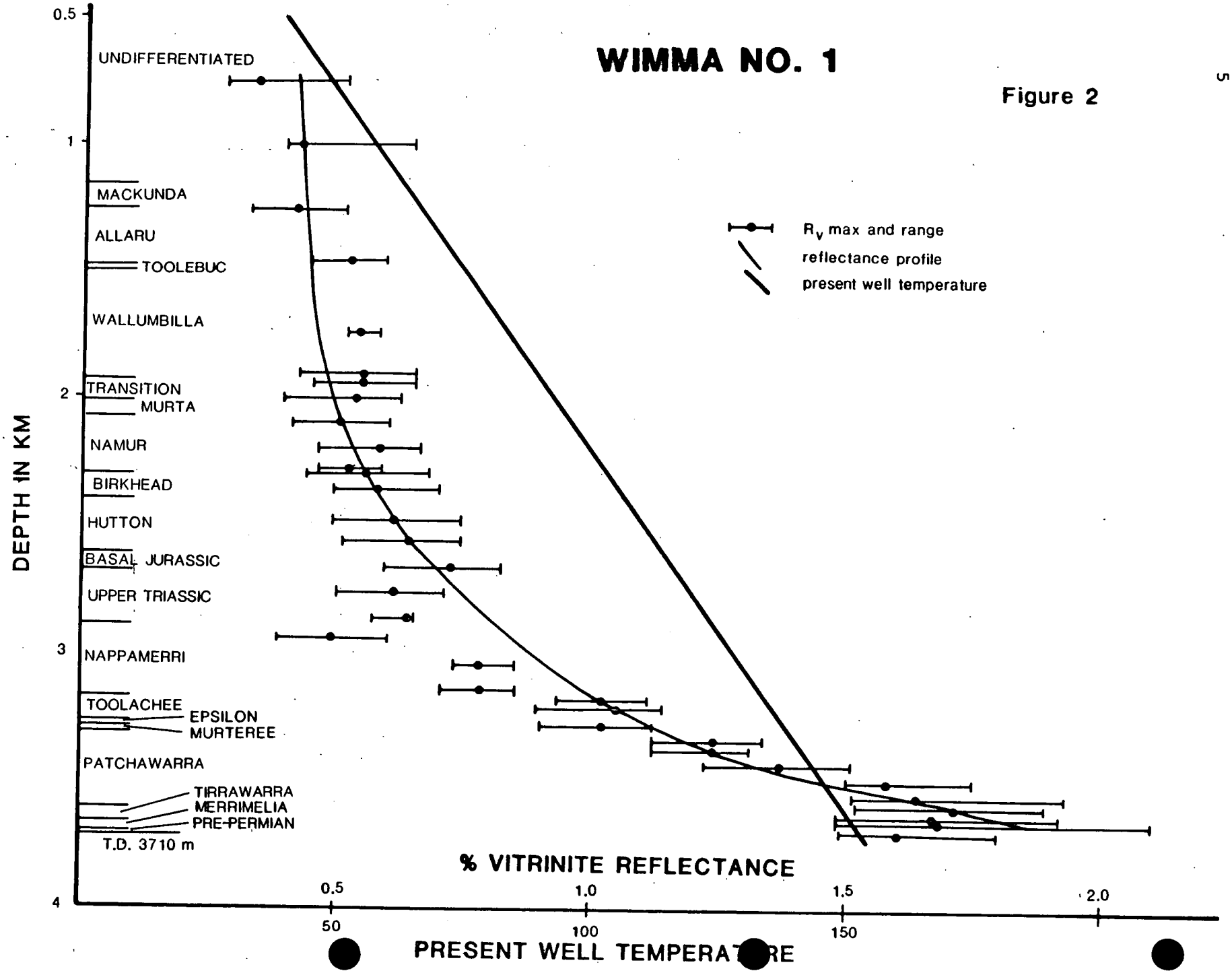
The reflectance profile in Figure 2 shows a vitrinite reflectance gradient increasing from about 0.02%/km from the top of the section sampled to about 0.20%/km at a depth of about 2000 m (6562'). A rapid increase in the curvature of the profile is seen at about 2200 m (7218'), with a transitional vitrinite reflectance gradient of 0.44%/km. The reflectance gradient rises continuously to about 2.86%/km in the deeper part of the Permian section.

The mean maximum vitrinite reflectance values in part of the Cretaceous section are slightly above the general trend and this is attributed to the type variations. The values below trend in the Triassic section may partly be due to type but are very likely to be influenced by the presence of cavings from the overlying Cretaceous Formations. The possible causes of the rapid increase in the curvature of the main profile within the Triassic/Permian are discussed in the section on Thermal History.

The vitrinite reflectance data indicate that Wimma No. 1 entered the liquids window at 2100 m (6890') (0.5% $\bar{R}_v$max) and that the base of the section sampled is well below the floor of the oil window. The main gas generation zone is entered at about 3440 m (11287') (1.3% $\bar{R}_v$max). The zone of peak oil generation is estimated to lie between 2700 m (8859') and 3020 m (9909') (depths to 0.70% and 0.90% $\bar{R}_v$max respectively). The reflectance gradient at the

# WIMMA NO. 1

Figure 2



0.5% reflectance level is low (0.20%/km). The reflectance gradients are high at the 0.7%, 0.9%, 1.1%, 1.3% and 1.5% levels (0.50%/km, 0.74%/km, 1.17%/km, 1.90%/km and 2.86%/km respectively).

The data in Table 1 and Figure 5 show that in Wimma No. 1 the oil window is reached at much greater depths than in wells from the southern Cooper Basin. However, the depths to reflectance levels are similar to data from wells in the Patchawarra Trough such as Tirrawarra North No. 1 and Woolkina No. 1.

Exinite is present in all samples from the Cretaceous, Jurassic and Triassic sequences. The upper part of the Permian section contains common exinite, whereas it is very rare or absent in the deeper part of the sequence. Exinite in dom is abundant only in the Upper Cretaecous Transition Beds and the basal Jurassic. Exinite fluorescence is intense in the Cretaceous and Jurassic and moderate to dull in the Triassic. Exinite fluorescence is dull or absent in the Permian section. The fluorescence colours and intensity are consistent with the vitrinite reflectances found.

Fluorinite is present in most of the samples from the Cretaceous section and rare in the Jurassic. No exsudatinite was observed. Weak green fluorescing oil cuts were found in samples from the Toolachee and Patchawarra Formations.

## Organic Matter Type

Cavings and recirculated cuttings generally appear to comprise a minor part of the samples except in the Triassic sequence where a substantial amount of cavings from the overlying formations was detected. The following sample descriptions are considered to relate relatively accurately to the nominated horizons.

Two samples were examined from the Undifferentiated Late Cretaceous section. The organic matter comprises sparse dom and rare coal in one sample from 754 m (2460')and common dom and sparse coal in the deeper sample from 1001 m (3270'). Sparse to common inertinite is the dominating maceral in dom followed by sparse to common exinite and rare vitrinite. Vitrite and inertinite are the microlithotypes of the coal. Exinite mainly comprises the macerals sporinite, cutinite, liptodetrinite and fluorinite. Rare resinite is present in the top sample.

Sparse dom and rare vitrite and inertite are present in the top sample from the Allaru Mudstone. Sparse inertinite predominates over exinite and vitrinite in this sample, whereas abundant exinite is the major maceral in dom in the deeper sample from 1468 m. Inertinite is sparse in this sample and vitrinite rare. Sporinite, cutinite, liptodetrinite and fluorinite are the typical exinite macerals. Additionally, sparse dinoflagellates and acritarchs were observed in the deeper sample.

Two samples were examined from the Wallumbilla Formation. One sample from 1742 m (5700') contains common dom comprising sparse exinite and inertinite and very rare vitrinite. Abundant dom was observed in the deeper sample from 1894 m (6210'). Here, abundant inertinite is the dominant maceral, followed by common to abundant exinite and rare vitrinite. Sporinite, cutinite and liptodetrinite are the major exinite macerals. Dinoflagellates and acritarchs, bitumen and resinite are in the rare to sparse categories.

Abundant dom was found in two samples from the Transition Beds. Abundant exinite and inertinite are the dominating macerals and vitrinite is in the rare category. Exinite (Plates 1 and 2) mainly comprises sporinite, cutinite and liptodetrinite. Abundant dinoflagellates were observed in one sample from 1940 m (6360') and sparse Botryococcus-derived alginite is present in the deeper sample from 2004 m (6570'). Rare resinite and fluorinite were found in both samples. The uppermost sample contains rare vitrite.

The abundance of dispersed organic matter in the four samples from the Namur Member is clearly related to the lithology. The sample from 2208 m (7240') is characterized by a claystone and siltstone lithology and contains common dom with all macerals in the sparse category. Dom is rare to sparse and restricted to the minor siltstone and claystone lithologies in samples characterized by sandstone lithologies. In all samples exinite is dominated by sporinite, cutinite and liptodetrinite. Dinoflagellates and acritarchs were observed in the samples from 2135 m (7000') and 2312 m (7580') and rare resinite and fluorinite are present in the deepest sample from 2312 m (7580'). Rare to sparse coal was observed in the two deepest samples with vitrite, inertite and vitrinertite being the main microlithotypes.

The sample from the Birkhead Formation contains rare dispersed organic matter with exinite as the dominant maceral. Exinite comprises sporinite, cutinite, liptodetrinite and dinoflagellates and acritarchs. Coal (vitrite and clarite) is sparse in this sample.

The barren sandstone lithologies of the Hutton Sandstone contain rare dom with vitrinite as the dominating maceral. Sporinite, cutinite and liptodetrinite are the typical exinite macerals in the two samples examined. Abundant coal was observed in the deeper sample - 2565 m (8410') - comprising vitrite and duroclarite.

Abundant dom and abundant coal were observed in the sample from the basal Jurassic. The dom comprises abundant exinite, common vitrinite and sparse inertinite. Sporinite, cutinite (Plates 3 and 4) and liptodetrinite are the dominant exinite macerals. Resinite/fluorinite and telalginite are in the sparse to rare categories. Vitrite is the major microlithotype in the coal (abundant), but smaller quantities of clarite, claordurite, durite and inertite are also present.

The rare dom and vitrite found in two samples from the Upper Triassic are considered to be cavings from the Jurassic sequence. The rare exinite in these samples comprises cutinite, sporinite and liptodetrinite as typical macerals. Minor occurrences of resinite, telalginite and dinoflagellates/acritarchs were also observed.

Three samples were examined from the Nappamerri Formation. In the top sample - 2937 m (9630') - the rare dom represents a cavings population from the Cretaceous sequence. The rare to sparse dom in the two deeper samples may represent a cavings population from the Jurassic sequence, but could possibly originate from the Nappamerri Formation. Inertinite and vitrinite are the dominant macerals in the dispersed organic matter. Rare sporinite, cutinite and liptodetrinite are the only exinite macerals present in this unit.

The organic matter in the Toolachee Formation is dominated by abundant coal. Clarodurite, vitrinertite (Plates 5 and 6), duroclarite, inertite and vitrite are the typical microlithotypes of the coal. A moderate to strong oil cut from vitrite and some intermediate microlithotypes was

observed. Dom is rare in the samples from 3171 m (10400') and 3275 m (10740') and is sparse to common in the third - 3208 m (10520'). Inertinite is the dominant maceral in dom, followed by vitrinite and exinite. Exinite is rare in dom and the occurrence of sparse to common, dull orange fluorescing sporinite, cutinite qand liptodetrinite is mainly restricted to coal. Yellowish fluorescing liptodetrinite in the deepest sample is attributed to cavings.

Six samples were examined from the Patchawarra Formation. Major coal and abundant dispersed organic matter was found in all samples. Abundant inertinite is the dominant maceral in dom. Vitrinite is common overall and exinite is rare to very rare. No exinite fluorescence was noted in this sequence. The coal is dominated by inertite-rich vitrinertite, but generally vitrinite is the major maceral in coal. Vitrinertite, vitrite and inertite, in this order, are the typical microlithotypes of coal. However, the shaly coal lithologies are dominated by inertite with very minor quantities of duroclarite. A very weak oil cut from vitrinite was observed in the two uppermost samples.

Organic matter in one sample from the Tirrawarra Sandstone is characterized by abundant coal and dom. The dom comprises abundant inertinite and sparse to common vitrinite. No exinite was observed in this sample. The coal is also dominated by inertinite with inertinite-rich vitrinertite, inertite and vitrite as the typical microlithotypes. The reflectances measured suggest that most, or all, of the organic matter in this sample represents cavings from the Patchawarra.

One sample from the Merrimelia Formation contains major coal and abundant dom. As in the Tirrawarra Sandstone vitrinertite, inertite and vitrite are the typical microlithotypes of the coal, but some clarodurite was also observed. Abundant inertinite and vitrinite are dominant in dispersed organic matter with exinite in the rare category. Exinite in dom and coal comprises dull orange to faint brown fluorescing sporinite and cutinite and yellow to faint brown fluorescing bituminite. However, the reflectances found suggest that the organic matter in this sample should be attributed to cavings which are probably from the Patchawarra Formation.

Abundant dom and major coal were observed in the sample from the Pre-Permian sequence. Both coal and dom are inertinite-rich. Vitrinertite and inertite are the related microlithotypes of the coal. Most of the coal is likely to be cavings from the top of the Patchawarra Formation and is probably the same population as that found in the samles from the Tirrawarra Sandstone and the Merrimelia Formation. The dom comprises abundant inertinite, sparse vitrinite and rare exinite and also represents cavings. No exinite fluorescence was observed.

## Thermal History

Observed and calculated data relating to the thermal history of Wimma No. 1 are given in Figures 2, 3, 4 and 5 (pp5, 15-17) and Tables 1, 2 and 3 (p11-14) together with data from some other wells in the southern Cooper Basin. The Mesozoic reflectance gradient is very low to high in Wimma No. 1. The lower limit of the Mesozoic reflectance gradient in Wimma No. 1 is comparable with that for such sections as Nappacoongee No. 2 and Yapeni No. 1 and is significantly lower than the lower limits of the Mesozoic gradient for wells such as Moomba South No. 1 and Toolachee No. 9. The Permian reflectance gradient of Wimma No. 1 is very high (Tables 1 and 3) and is comparable with that in Moomba XXVII.

The reflectance profile for Wimma No. 1 is suggestive of sedimentation under a high geothermal gradient in the Permian. The sharp curvature in the reflectance profile in the Triassic and Lower Jurassic sections is indicative of the rapid decline during the early Mesozoic of the magnitude of a Permian thermal event. This rapid decline is reflected in the very low reflectance gradients in the Cretaceous section indicating that the influence of the Permian thermal regime ceased during the Late Jurassic.

The depth-present day temperature relationships at different reflectance levels are given in Table 1 and Figure 4. Temperatures for Wimma No. 1 are moderate at any given reflectance level for the wells in Table 1 and Figure 4. High temperatures (such as 140°C) are reached at much greater depths in Wimma No. 1 than in wells from the southern Cooper Basin such as Corkwood No. 1 and Big Lake No. 1. The present-day geothermal gradient at Wimma No. 1 is in the lower part of the range for wells from

Table 1

Present-day temperatures at various reflectance levels

| Well Name | 0.5% $R_v$ Depth m | 0.5% $R_v$ Temp. °C | 0.7% $R_v$ Depth m | 0.7% $R_v$ Temp. °C | 0.9% $R_v$ Depth m | 0.9% $R_v$ Temp. °C | 1.1% $R_v$ Depth m | 1.1% $R_v$ Temp. °C |
|---|---|---|---|---|---|---|---|---|
| Wimma-1 | 2100 | 90 | 2700 | 110 | 3020 | 121 | 3260 | 129 |
| Moomba South-1 | 1300 | 73 | 1950 | 100 | 2300 | 115 | - | - |
| Moomba XXVII | 1200 | 65 | 1700 | 85 | 2000 | 95 | 2150 | 105 |
| Yapeni-1 | 1750[1] | 89 | 1950 | 97 | 2150 | 106 | - | - |
| | (1750[2] | 89 | -† | -†) | 2150 | 106 | - | - |
| Corkwood-1 | 1400 | 98 | 1750 | 116 | 1900 | 128 | 2050 | 135 |
| Napacoongee-2 | 1200 | 80 | 1550 | 98 | 1750 | 108 | 1900 | 115 |
| Murteree-1 | 1650 | 93 | 1900 | 104 | 2050 | 115 | - | - |
| Toolachee-9 | 1300 | 83 | 1700 | 102 | 1900 | 112 | 2100 | 121 |
| Pelketa-1 | 1550 | 88 | 1750 | 97 | 1950 | 106 | - | - |
| Big Lake-1 | 1650 | 112 | 1800 | 120 | 1950 | 128 | 2050 | 134 |
| Dullingari-11 | 840 | 64 | 1450 | 97 | - | - | - | - |
| Della-1 | 850 | 54 | 1650 | 86 | 1850 | 94 | 2000 | 100 |

[1] Most probable reflectance profile

[2] Alternative reflectance profile

† Occurs at break in profile

Table 2

Reflectance gradient data

| Well Name | Temp.Grad. °C/km | Mesozoic Refl.Grad. $\%R_v$/km | Permian Refl.Grad $\%R_v$/km |
|---|---|---|---|
| Wimma-1 | 36 | 0.02-0.83 | 1.04-2.86 |
| Moomba South-1 | 41 | 0.23-0.96 | 3.03[3] |
| Moomba XXVII | 38 | 0.15-0.72 | 1.20-3.83 |
| Yapeni-1 | 40 | 0.09-0.92[1] | 1.14 |
| | | (0.09-0.43)[2] | (0.41-0.65) |
| Corkwood-1 | 57 | 0.25-1.06 | 1.18-1.73 |
| Nappacoongee-2 | 51 | 0.08-0.03 | 0.60 |
| Murteree-1 | 45 | 0.13-0.66 | 0.90-1.21 |
| Toolachee-9 | 48 | 0.23-0.78 | 1.00 |
| Pelketa-1 | 45 | ?-0.79 | 0.93 |
| Big Lake-1 | 55 | 1.20-1.65 | 2.30 |
| Dullingari-11 | 55 | 0.24-0.50 | - |
| Della-1 | 40 | 0.10-1.21 | 1.42 |

[1] Most probable reflectance profile

[2] Alternative reflectance profile

[3] Insufficient data to determine accurately the shape of the profile within the Permian section

Table 3

Present well temperatures compared with isothermal and gradthermal model temperatures

| Depth m | Vitrinite Reflectance % $\bar{R}_v$max | Vitrinite Reflectance gradient $\bar{R}_v$max%/km | Present Well Temperature °C | Calculated Temperature Isothermal °C | Calculated Temperature Gradthermal °C |
|---|---|---|---|---|---|
| WIMMA-1 | | | | | |
| 2100 | 0.50 | 0.20 | 90 | - | - |
| 2700 | 0.70 | 0.50 | 110 | 44 | 64 |
| 3020 | 0.90 | 0.74 | 121 | 62 | 92 |
| 3260 | 1.10 | 1.17 | 129 | 70 | 105 |
| 3440 | 1.30 | 1.90 | 134 | 76 | 114 |
| 3530 | 1.50 | 2.86 | 137 | 83 | 125 |
| 3590 | 1.70 | 2.86 | 140 | 90 | 136 |
| MOOMBA SOUTH-1 | | | | | |
| 1300 | 0.50 | 0.26 | 73 | - | - |
| 1950 | 0.70 | 0.38 | 100 | 55 | 88 |
| 2300 | 0.90 | 0.96 | 115 | 66 | 106 |
| MOOMBA XXVII | | | | | |
| 1200 | 0.50 | 0.34 | 65 | - | - |
| 1700 | 0.70 | 0.49 | 85 | 60 | 96 |
| 2000 | 0.90 | 0.68 | 95 | 70 | 112 |
| 2150 | 1.10 | 0.95 | 105 | 70 | 112 |
| YAPENI-1 | | | | | |
| 1750[1] | 0.50 | 0.71 | 89 | - | - |
| (1750)[2] | | (0.32) | (89) | (-) | (-) |
| 1950[1] | 0.70 | 0.97 | 97 | 42 | 67 |
| (-)[2]† | | (-) | (-) | (-) | (-) |
| 2150[1] | 0.90 | 1.11 | 106 | 58 | 93 |
| (2150)[2] | | (0.60) | (106) | (58) | (93) |
| CORKWOOD-1 | | | | | |
| 1400 | 0.50 | 0.51 | 98 | - | - |
| 1750 | 0.70 | 0.80 | 116 | 50 | 80 |
| 1900 | 0.90 | 1.22 | 128 | 62 | 99 |
| 2050 | 1.10 | 1.66 | 135 | 65 | 104 |

Table 3 continued

| Depth m | Vitrinite Reflectance % $\bar{R}_v$max | Vitrinite reflectance gradient $\bar{R}_v$max%/km | Present Well Temperature °C | Calculated Temperature Isothermal °C | Calculated Temperature Gradthermal °C |
|---|---|---|---|---|---|
| NAPPACOONGEE-2 | | | | | |
| 1200 | 0.50 | 0.41 | 80 | - | - |
| 1550 | 0.70 | 0.70 | 98 | 55 | 88 |
| 1750 | 0.90 | 1.16 | 108 | 70 | 112 |
| 1900 | 1.10 | 1.46 | 115 | 70 | 112 |
| MURTEREE-1 | | | | | |
| 1650 | 0.50 | 0.65 | 93 | - | - |
| 1900 | 0.70 | 1.04 | 104 | 40 | 64 |
| 2050 | 0.90 | 1.25 | 115 | 60 | 96 |
| TOOLACHEE-9 | | | | | |
| 1300 | 0.50 | 0.36 | 83 | - | - |
| 1700 | 0.70 | 0.72 | 102 | 54 | 86 |
| 1900 | 0.90 | 0.94 | 112 | 60 | 96 |
| 2100 | 1.10 | 0.94 | 121 | 65 | 104 |
| PELKETA-1 | | | | | |
| 1550 | 0.50 | 0.90 | 88 | - | - |
| 1750 | 0.70 | 0.98 | 97 | 52 | 83 |
| 1950 | 0.90 | 0.98 | 106 | 60 | 96 |
| BIG LAKE-1 | | | | | |
| 1650 | 0.50 | 1.19 | 112 | - | - |
| 1800 | 0.70 | 1.54 | 120 | 62 | 99 |
| 1950 | 0.90 | 1.54 | 128 | 74 | 118 |
| 2050 | 1.10 | 1.63 | 136 | 78 | 125 |
| DELLA-1 | | | | | |
| 850 | 0.50 | 0.18 | 54 | - | - |
| 1650 | 0.70 | 0.50 | 86 | 56 | 90 |
| 1850 | 0.90 | 1.27 | 94 | 65 | 104 |
| 2000 | 1.10 | 1.42 | 100 | 70 | 112 |

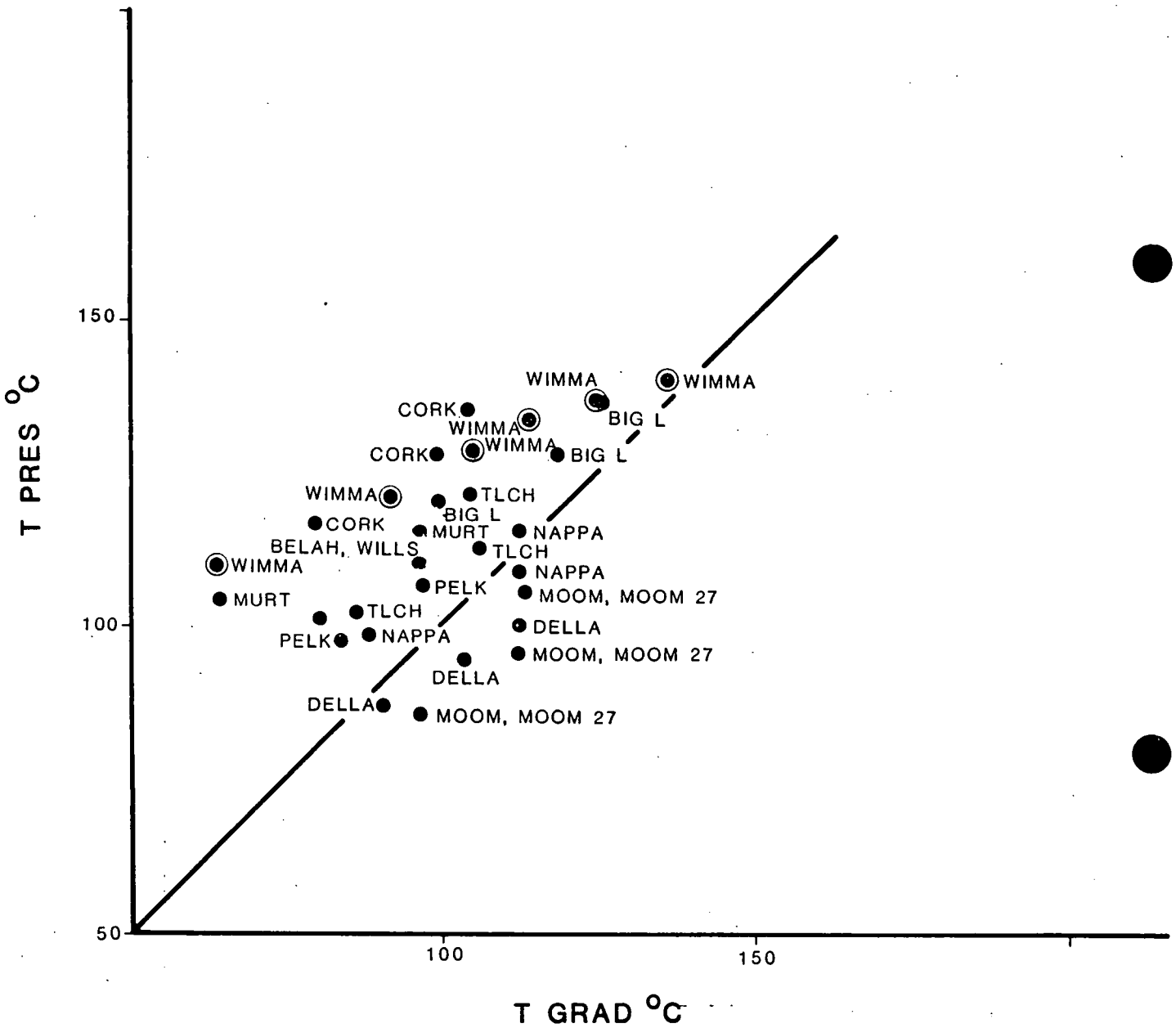
[1] Most probable reflectance profile

[2] Alternative profile

† Occurs at break in profile

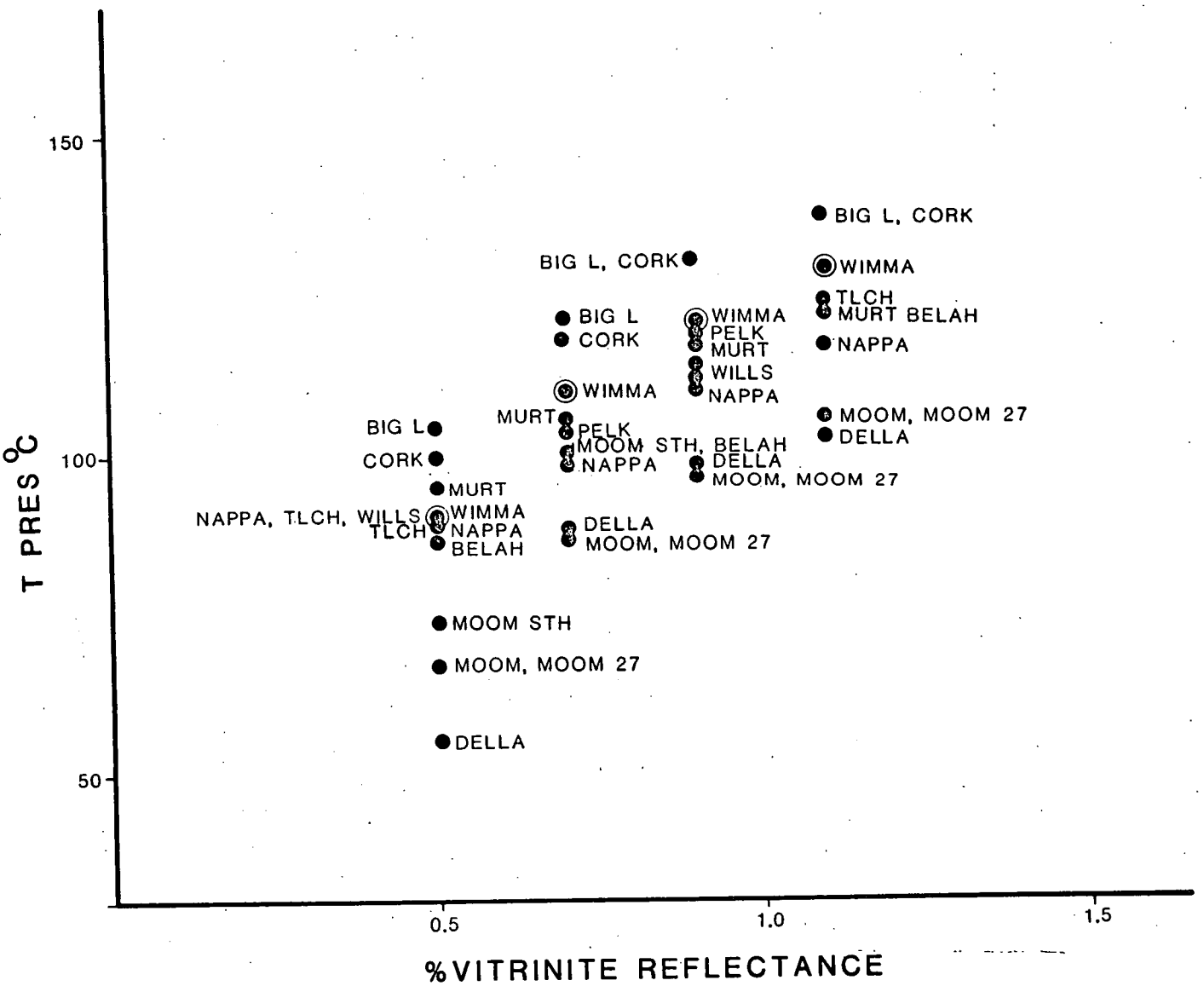
WIMMA NO. 1

FIGURE 3



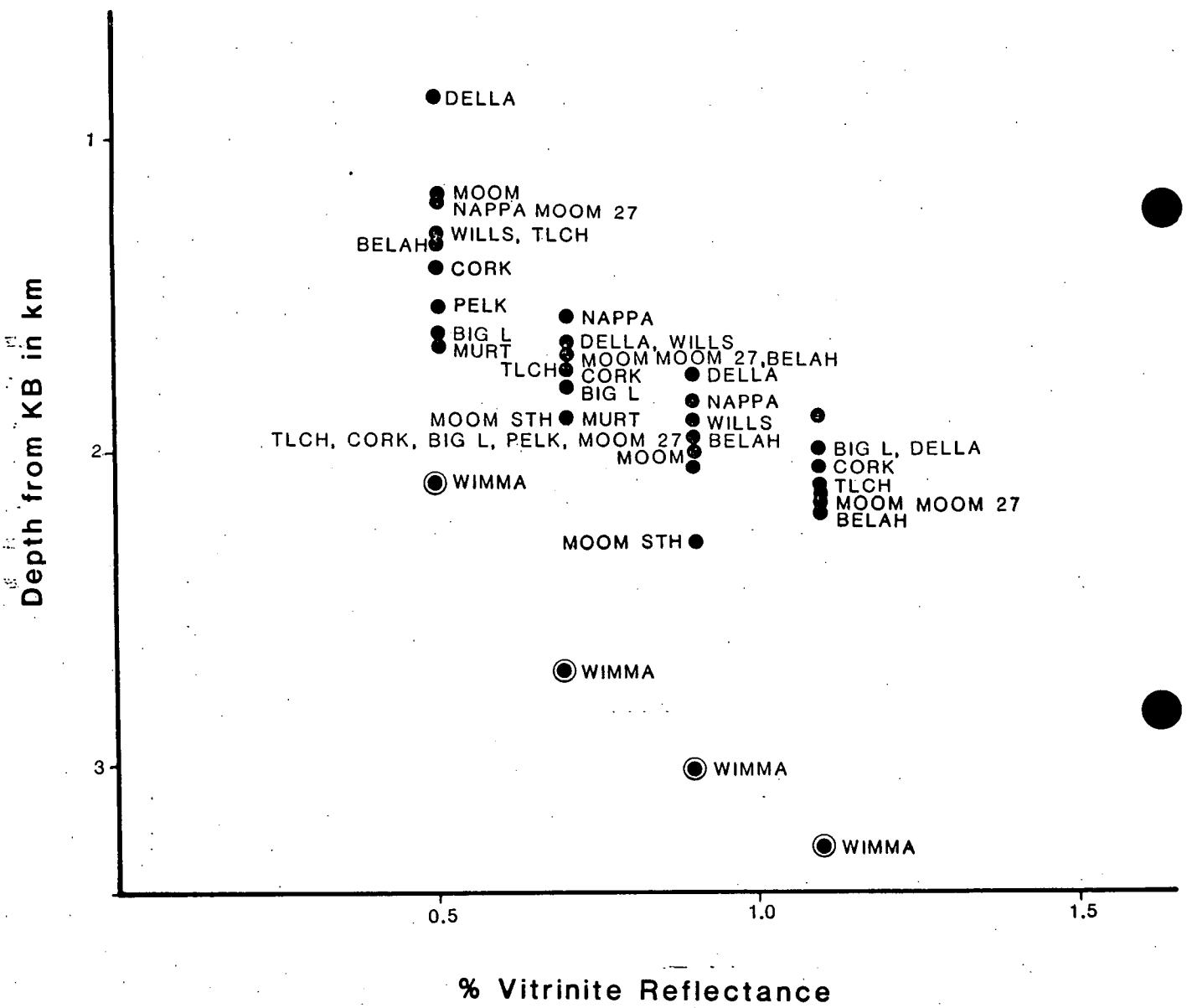
# WIMMA NO. 1

FIGURE 4



WIMMA NO. 1

Figure 5



the Cooper Basin but is still above the world sedimentary basin average (Table 2).

The plot of $T_{pres}$ vs $T_{grad}$ (Figure 3 and Table 3) shows Wimma No. 1 lying in the upper left hand side of the field and the tie line tends to converge strongly towards the $T_{pres} = T_{grad}$ line at greater depths. This indicates that the present-day temperatures are nearer equilibrium with the lower part of the sequence as compared with the upper part. The relationship $T_{pres} >> T_{grad}$ in the upper part of the section confirms the rapid decrease in the influence of the Permian thermal event, but also suggests a second thermal event in the Late Tertiary to Recent.

The maturation data are indicative of a high heat flow during the Permian. The reflectance gradients in the Permian suggest that early coalification was rapid and was significant by the end of the Triassic period. The lower part of the Permian may have already been in the peak zone of oil generation during the Late Jurassic. During the Cretaceous, these lower Permian units probably moved into the zone of gas generation. Oil generation in the lower Mesozoic section should have commenced in the Late Cretaceous to Tertiary times. At present most of the Jurassic section, the entire Triassic section and the upper part of the Permian section are within the zone of oil generation. The Cretaceous section is immature to marginally mature and the lower part of the Permian is over mature for oil but is within the catagenic gas window.

## Source Potential and Hydrocarbon Generation

Source potential and the probable hydrocarbon generation characteristics of the major units are summarized in Table 4 (p19). Except for the Winton and Mackunda Formations, the Cretaceous section is sufficently thermally mature to generate liquid hydrocarbons. The dom in the marginally mature to mature Cretaceous section is generally exinite rich and shows a fair to good source potential probably resulting in the generation of minor liquid hydrocarbons from the early phase of generation. Generally, the mature Jurassic section does not contain sufficient organic matter for generating significant amounts of liquid hydrocarbons. However, coal is abundant in the Hutton Sandstone and basal Jurassic and exinite

Table 4 Summary of source potential and hydrocarbon generation

| UNIT/ FORMATION | SOURCE POTENTIAL TYPICAL | SOURCE POTENTIAL WIMMA-1 | MATURATION LEVEL | PROBABLE RESULTANT HYDROCARBON GENERATION/ MIGRATION |
|---|---|---|---|---|
| WINTON/ MACKUNDA | FAIR TO GOOD | POOR TO GOOD | IMMATURE | MINOR BIOGENIC METHANE |
| OODNADATTA/ ALLARU | FAIR TO POOR | FAIR TO GOOD | IMMATURE TO MARGINALLY MATURE | SOME HYDROCARBONS FROM THE EARLY PHASE OF GENERATION |
| WALLUMBILLA/ TRANSITION | FAIR | GOOD | MARGINALLY MATURE TO MATURE | SOME HYDROCARBONS FROM THE EARLY PHASE OF GENERATION |
| MURTA | GOOD | N.A. | N.A. | N.A. |
| NAMUR | POOR TO FAIR | POOR TO FAIR | MARGINALLY MATURE | MINOR OIL |
| BIRKHEAD | FAIR TO GOOD | POOR TO FAIR | EARLY MATURE | MINOR HYDROCARBONS |
| HUTTON | POOR TO FAIR | POOR BUT COAL ABUNDANT | EARLY MATURE | MINOR HYDROCARBONS |
| BASAL JURASSIC | | GOOD BUT COAL ABUNDANT | MATURE | SOME LIQUID HYDROCARBONS |
| UPPER TRIASSIC/ NAPPAMERRI | POOR | POOR | MATURE | NEGLIGIBLE HYDROCARBONS |
| TOOLACHEE | GOOD BUT COAL ABUNDANT | GOOD BUT COAL ABUNDANT | MATURE TO LATE MATURE | SIGNIFICANT OIL AND CONDENSATE |
| EPSILON/ MURTEREE | GOOD TO VERY GOOD | N.A. | N.A. | N.A. |
| PATCHAWARRA | GOOD | GOOD BUT COAL MAJOR | LATE MATURE TO OVER-MATURE | LIGHT OIL, CONDENSATE AND GAS |
| TIRRAWARRA | | FAIR TO GOOD BUT COAL ABUNDANT | OVERMATURE | GAS |
| MERRIMELIA | | GOOD BUT COAL MAJOR | OVERMATURE | GAS |
| PRE-PERMIAN | | GOOD | OVERMATURE | GAS |

N.A. - not applicable, not sampled in Wimma No. 1

rich dom is present in the basal Jurassic. The source potential for this unit is assessed to be good. The Triassic sequence contains very little organic matter and hydrocarbons generated from this section are likely to be negligible.

The Permian section is rich in coal and dom, both dominated by inertinite. The source potential of the Toolachee Formation is considered to be good with significant resultant hydrocarbon generation. Weak green oil cuts were observed in the Toolachee and Patchawarra Formations. The rest of the Permian section also shows a good source potential, but maturation levels are late mature to overmature. Some light oil and condensate, but more significant amounts of gas have probably been generated from this sequence. All of the Permian sequence is likely to have generated oil during earlier phases of its maturation. The early oil could be flushed by the later generation of abundant catagenic methane.

## Conclusions

Wimma No. 1 penetrated a section which is immature down to the middle of the Allaru Mudstone. The rest of the Cretaceous section is marginally mature to mature. Although a substantial amount of exinite rich organic matter is present, it is likely that only minor hydrocarbons have been generated from this section due to the relatively low maturation levels. The Jurassic section lies within the zone of oil generation and the basal Jurassic has a good source potential. The Triassic section lies within the peak zone of oil generation, but has a poor source potential according to the low organic matter content. The top of the Permian section is mature to late mature, coal rich and contains abundant dispersed organic matter. This section has good potential for oil, condensate and gas. Oil cut was noted during examination of samples from the Toolachee and Patchawarra Formations. The major part of the Permian section is overmature for oil generation, but the abundance of organic matter suggests that this section has been a good source for gas. Depths to any given reflectance level for Wimma No. 1 are significantly greater than those found for wells from the southern Cooper Basin, but correspond to those from the Patchawarra Trough. However, the reflectance levels reached near T.D. in Wimma are much greater than those typical for the Patchawarra Trough.

# PLATES

The Plates have been printed from photomicrographs using 35 mm transparencies. All the photomicrographs were taken using oil immersion, except where indicated. Objectives having nominal magnifications of 20, 32, 50 or 125 are available. This is indicated by the field width given in the Plate captions. Polarized light was not used for the photographs. This results in a loss of contrast in the photographs of carbonates but has little or no effect on the appearance of the organic matter. The photographs are oriented towards the exinite group of macerals, for which fluorescence mode is essential. Matching pairs of reflected light and fluorescence-mode photographs are in close registration, the plane-slip and dichroic illuminators being in the same illuminator housing.

## CAPTIONS

V - vitrinite

E - exinite

S - sporinite

C - cutinite

A - alginite

I - inertinite

O - oil

M - mineral matter

R.L. - Reflected white light

Fl. - fluorescence-mode

TRANSITION BEDS

Plate 1 Ctgs 2004 m

Sporinite, alginite and vitrinite in siltstone.

$\bar{R}_v$max 0.53%. Fl., field width 0.34 mm

Plate 2. Ctgs 2004 m

As for Plate 1, but in reflected light.

$\bar{R}_v$max 0.53%. R.L., field width 0.34 mm

A
S

A
S
V

BASAL JURASSIC

Plate 3. Ctgs 2656 m

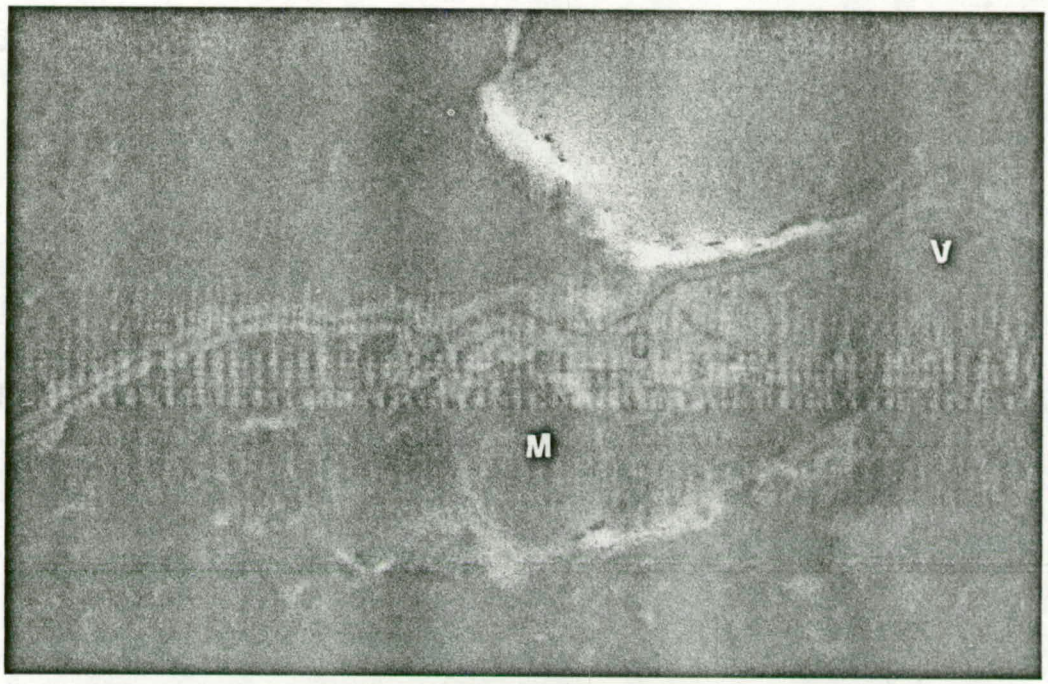
Cutinite and vitrinite in siltstone.

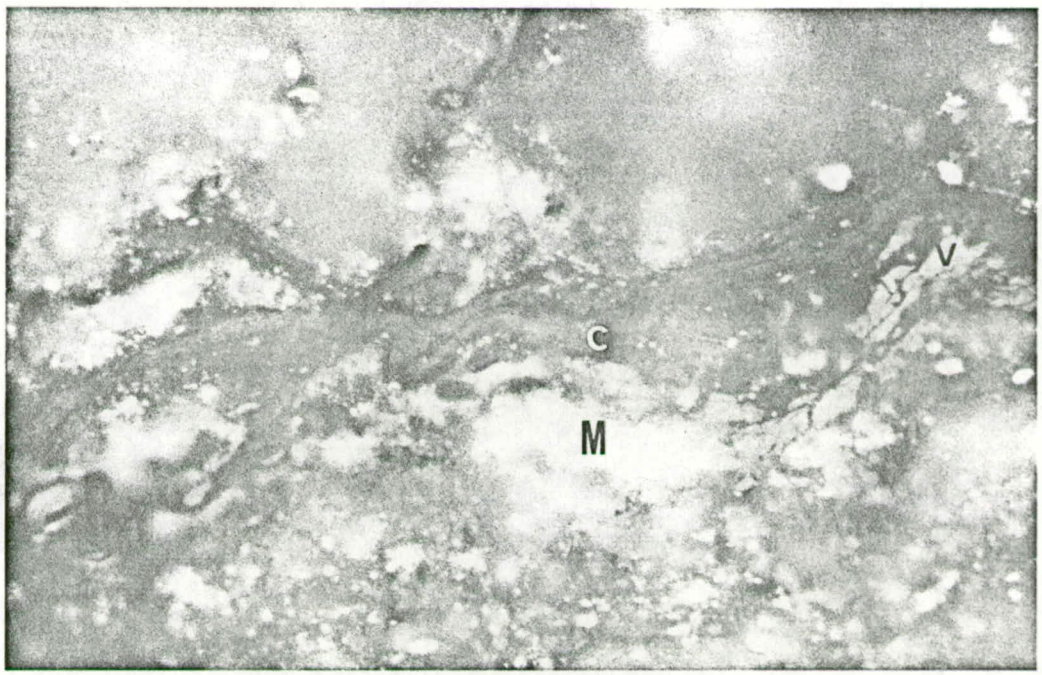
$\bar{R}_v$max 0.64%. Fl., field width 0.34 mm

Plate 4. Ctgs 2656 m

As for Plate 3, but in reflected light.

$\bar{R}_v$max 0.64%. R.L., field width 0.34 mm


V
M


V
C
M

TOOLACHEE FORMATION

Plate 5. Ctgs 3171 m

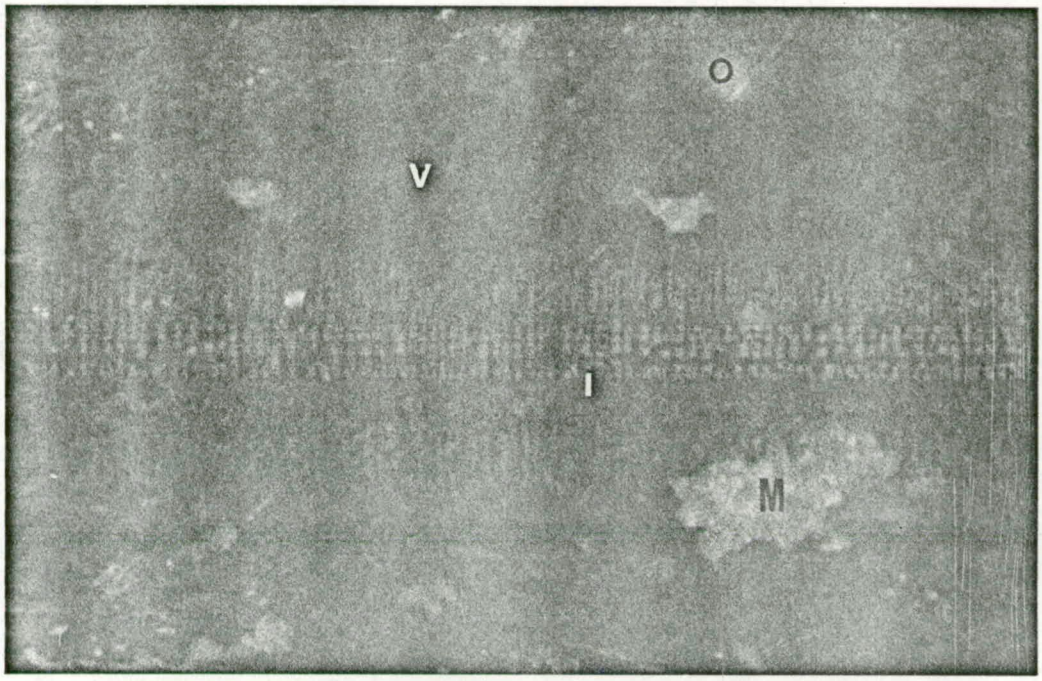
Vitrinertite showing oil cut. Note brightly fluorescing irregular to oval areas are mineral matter presumably impregnated with diffuse fluorescing bitumens. Vitrinite shows weak brown fluorescence.

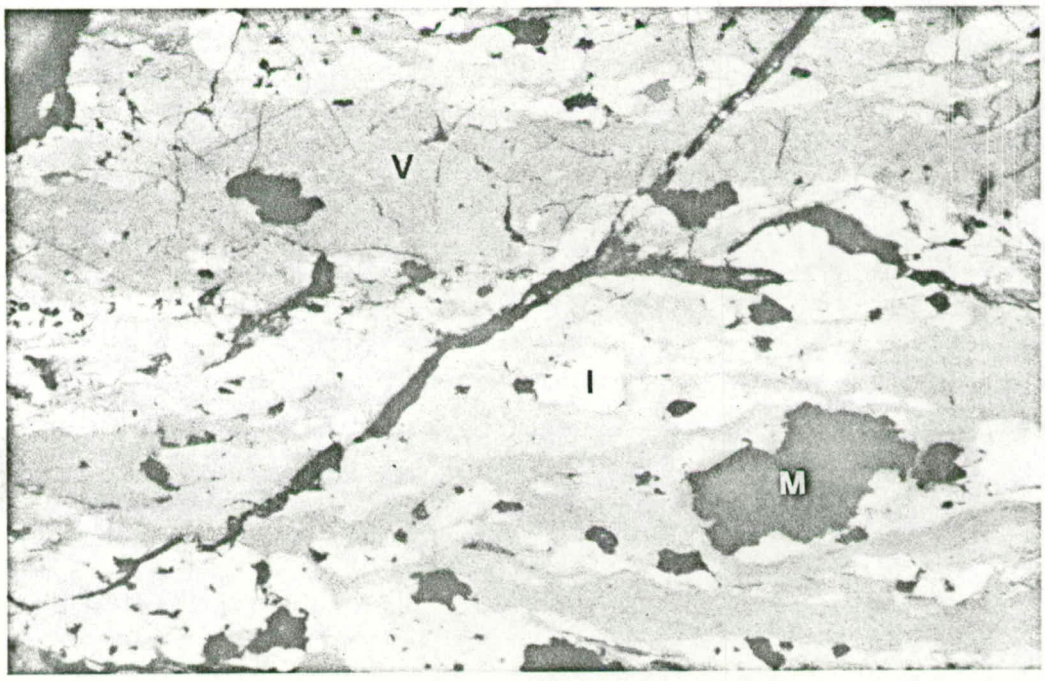
$\bar{R}_v$max 1.02%. Fl., field width 0.34 mm

Plate 6. Ctgs 3171 m

As for Plate 5, but in reflected light. Some of the mineral matter shows internal reflections.

$\bar{R}_v$max 1.02%. R.L., field width 0.34 mm


O
V
I
M


V
I
M

WIMMA NO. 1

| K.K. No. | Depth (m) | $\bar{R}_v$max | Range | N | Exinite Fluorescence (Remarks) |
|---|---|---|---|---|---|
| | | | | | Undifferentiated |
| 17518 | 754 Ctgs | 0.33 | 0.27-0.51 | 18 | Sparse sporinite, greenish yellow to orange yellow, sparse liptodetrinite, greenish yellow to yellow, sparse cutinite, greenish yellow to yellow, rare resinite, orange, rare fluorinite, bright green. (Claystone>siltstone>>sandstone>shaly coal>carbonate> coal. Rare coal, vitrite. D.o.m. sparse I>E>V. Inertinite sparse, exinite sparse, vitrinite rare. Pyrite rare.) |
| 17519 | 1001 Ctgs | 0.42 | 0.39-0.64 | 25 | Common cutinite, greenish yellow to yellow, common liptodetrinite yellow to orange yellow, sparse to common sporinite, yellow to orange yellow, sparse fluorinite, bright green. (Claystone>siltstone>coal> sandstone>shaly coal=carbonate. Coal common, vitrite> inertite>durite>duroclarite. Coal is rich in fluorinite. D.o.m. common I>E>V. Inertinite and exinite common. Vitrinite rare to sparse. Pyrite and marcasite sparse.) |
| | | | | | Mackunda Formation 1159m (3798') |
| | | | | | Allaru Mudstone 1261m (4136') |
| 17520 | 1266 Ctgs | 0.41 | 0.32-0.51 | 25 | Sparse sporinite and cutinite, greenish yellow to orange yellow, sparse liptodetrinite, greenish yellow to yellow, rare fluorinite, bright green. (Claystone> siltstone>shaly coal=sandstone>coal>carbonate. Coal rare, vitrite>inertite. D.o.m. sparse, I>E>V. Inertinite rare to sparse, exinite rare to sparse, vitrinite rare. Pyrite common.) |
| 17521 | 1468 Ctgs | 0.52 | 0.44-0.59 | 8 | Common sporinite, yellow to yellow orange, common cutinite, greenish yellow to yellow, common liptodetrinite, greenish yellow to yellow orange, sparse dinoflagellates/ acritarchs, greenish yellow, rare fluorinite, medium green. (Claystone>>>siltstone>carbonate. D.o.m. abundant, E>I>V. Exinite abundant, inertinite sparse, vitrinite rare. Forams present in claystone. Strong mineral matter fluorescence. Pyrite abundant.) |
| | | | | | Toolebuc Formation 1486m (4876') |
| | | | | | Wallumbilla Formation 1505m (4938') |
| 17522 | 1742 Ctgs | 0.54 | 0.52-0.58 | 3 | Sparse sporinite, yellow to orange, sparse liptodetrinite, greenish yellow to yellow orange, rare cutinite, greenish yellow to yellow, rare dinoflagellates/ acritarchs, greenish yellow to orange, rare bitumen, yellow. (Claystone>>>siltstone>carbonate. D.o.m. common, E>I>V. Exinite sparse, inertinite sparse, vitrinite very rare. Medium mineral matter fluorescence. Pyrite abundant.) |

WIMMA NO. 1

| K.K. No. | Depth (m) | $\bar{R}_v$max | Range | N | Exinite Fluorescence (Remarks) |
|---|---|---|---|---|---|
| 17523 | 1894 Ctgs | 0.55 | 0.42-0.65 | 10 | Common sporinite, greenish yellow to orange, common cutinite, greenish yellow to yellow orange, sparse dinoflagellates/acritarchs, greenish yellow, sparse liptodetrinite, yellow to orange, rare resinite, orange, rare bitumen, yellow. (Claystone>>>siltstone. D.o.m. abundant, I>E>V. Inertinite abundant, exinite common to abundant, vitrinite rare. Pyrite abundant.) |
| | | | | | Transition Beds 1937m (6335') |
| 17524 | 1940 Ctgs | 0.54 | 0.45-0.65 | 14 | Abundant cutinite, greenish yellow, yellow to orange, abundant sporinite and dinoflagellates, greenish yellow to yellow orange, abundant liptodetrinite, greenish yellow, yellow to orange, rare resinite, yellow to orange, rare fluorinite, medium green. (Claystone> siltstone>sandstone>carbonate>coal. Coal rare, vitrite. D.o.m. abundant, E>I>V. Exinite abundant, inertinite abundant, vitrinite rare. Pyrite abundant.) |
| 17525 | 2004 Ctgs | 0.53 | 0.39-0.62 | 14 | Abundant cutinite, greenish yellow, yellow to dull orange, abundant sporinite, yellow to orange, abundant liptodetrinite, greenish yellow to yellow orange, sparse Botryococcus- derived alginite A, bright yellow, rare resinite, yellow to orange, rare fluorinite, medium green. (Siltstone>>claystone>shaly coal. D.o.m. abundant, E>I>V. Exinite abundant, inertinite abundant, vitrinite rare. Pyrite and marcasite sparse, rare iron oxides.) |
| | | | | | Murta Member 2013m (6604') |
| | | | | | Namur Member 2069m (6787') |
| 17526 | 2135 Ctgs | 0.50 | 0.41-0.60 | 18 | Rare sporinite and cutinite, yellow to orange, rare liptodetrinite, greenish yellow to yellow orange, rare dinoflagellates/acritarchs, greenish yellow. (Sandstone>>siltstone>claystone>carbonate>shaly coal. D.o.m. sparse, I>E>V. Inertinite sparse, exinite and vitrinite rare. Pyrite and marcasite sparse. |
| 17527 | 2208 Ctgs | 0.58 | 0.46-0.66 | 27 | Sparse sporinite, yellow orange to orange, sparse cutinite, yellow to orange, sparse liptodetrinite, greenish yellow to orange. (Claystone>siltstone> sandstone>carbonate. D.o.m. common, V>E>I. Vitrinite, exinite and inertinite sparse. Pyrite and marcasite sparse.) |
| 17528 | 2278 Ctgs | 0.52 | 0.46-0.59 | 11 | Rare sporinite, yellow to yellow orange, rare cutinite, greenish yellow to yellow, rare liptodetrinite, greenish yellow to yellow. (Sandstone>>>siltstone> claystone>coal. Coal rare, vitrite>vitrinertite. D.o.m. rare E=V=I. Exinite, vitrinite and inertinite rare. Pyrite rare.) |

WIMMA NO. 1

| K.K. No. | Depth (m) | $\bar{R}_v$max | Range | N | Exinite Fluorescence (Remarks) |
|---|---|---|---|---|---|
| 17529 | 2312 Ctgs | 0.55 | 0.44-0.68 | 26 | Rare sporinite, yellow to orange, rare cutinite and liptodetrinite, greenish yellow to yellow orange, rare dinoflagellates/acritarchs, greenish yellow, rare resinite, yellow orange, rare fluorinite in shaly coal, medium green. (Sandstone>>claystone>siltstone> coal>shaly coal. Coal sparse, vitrite>inertite. D.o.m. rare, V>I>E. Vitrinite, inertinite and exinite rare. Pyrite and marcasite rare. Iron oxides common as cement.) |
| | | | | | Birkhead Formation 2303m (7556') |
| 17530 | 2364 Ctgs | 0.58 | 0.49-0.70 | 24 | Rare sporinite and cutinite, yellow to orange, rare liptodetrinite, yellow to orange, rare dinoflagellates/ acritarchs greenish yellow to yellow. (Siltstone>>> sandstone>claystone>coal>shaly coal. Coal sparse, vitrite>inertite. D.o.m. rare E>V>I. Exinite, vitrinite and inertinite rare. Mineral matter fluorescence, yellow orange. Pyrite sparse.) |
| | | | | | Hutton Sandstone 2406m (7895') |
| 17531 | 2489 Ctgs | 0.61 | 0.49-0.74 | 10 | Rare sporinite and cutinite, yellow to orange, rare liptodetrinite, greenish yellow to yellow. (Sandstone>>> siltstone>claystone>shaly coal. D.o.m. rare, V>E>I. Vitrinite, exinite and inertinite rare. Pyrite and marcasite common.) |
| 17532 | 2565 Ctgs | 0.64 | 0.51-0.74 | 26 | Sparse sporinite and liptodetrinite, yellow to yellow orange, sparse cutinite, greenish yellow, yellow to orange. (Sandstone>>>coal>claystone>carbonate>siltstone> shaly coal. Coal abundant, vitrite>duroclarite. D.o.m. rare, V>I>E. Vitrinite rare, inertinite rare. Pyrite sparse.) |
| | | | | | Basal Jurassic 2612m (8571') |
| 17533 | 2656 Ctgs | 0.72 | 0.59-0.82 | 27 | Abundant sporinite, yellow to orange, abundant cutinite, greenish yellow, yellow to orange, common liptodetrinite, yellow to orange, sparse resinite/fluorinite, greenish yellow to orange, rare telalginite, bright yellow. (Siltstone>claystone>coal>sandstone>shaly coal. Abundant coal, vitrite>clarite>clarodurite>durite= inertite. D.o.m. abundant, E>V>I. Exinite abundant, vitrinite common, inertinite sparse. Pyrite and marcasite sparse to common. |
| | | | | | UPPER TRIASSIC 2687m (8814') |
| 17534 | 2763 Ctgs | 0.61 cavings | 0.50-0.71 | 18 | Rare sporinite and liptodetrinite, yellow to orange, rare cutinite, greenish yellow to yellow orange, rare resinite, yellow to orange. (Claystone>sandstone> siltstone>carbonate>shaly coal. D.o.m. rare, I>E>V. Inertinite, exinite and vitrinite rare. Coal and d.o.m. probably present only as cavings. Pyrite sparse to common. Abundant iron oxides.) |

WIMMA NO. 1

| K.K. No. | Depth (m) | $\bar{R}_v$max | Range | N | Exinite Fluorescence (Remarks) |
|---|---|---|---|---|---|
| 17535 | 2861 Ctgs | 0.64 Cavings | 0.57-0.65 | 14 | Rare cutinite and liptodetrinite, greenish yellow to yellow orange, rare sporinite, yellow to orange, rare dinoflagellates/acritarchs, greenish yellow, rare telalginite, dull yellow. (Sandstone>>>claystone>siltstone> coal>carbonate, rare coal, vitrite. D.o.m. rare, E>V>I. Exinite rare, vitrinite rare, inertinite rare. Coal and d.o.m. probably present only as cavings. Abundant iron oxides.) |
| | | | | | Nappamerri Formation 2890m (9480') |
| 17536 | 2937 Ctgs | 0.49* | 0.38-0.60 | 4 | Rare cutinite, greenish yellow to yellow, rare sporinite, yellow to orange. (Sandstone>siltstone>claystone> carbonate. D.o.m. rare, I>V>E. Inertinite, vitrinite and exinite rare. Pyrite sparse. D.o.m. and coal present only as cavings. Iron oxides common.) |
| * Cavings from Cretaceous Formation | | | | | |
| 17537 | 3031 Ctgs | 0.78 | 0.73-0.85 | 6 | Rare sporinite, yellow orange, rare cutinite, yellow to orange, rare liptodetrinite yellow to orange. (Siltstone>sandstone>carbonate>claystone. D.o.m. rare, V>I>E. D.o.m. may represent a cavings population but may be from Nappamerri. Vitrinite, inertinite and exinite rare. Pyrite sparse. Iron oxides common.) |
| 17538 | 3138 Ctgs | 0.78 | 0.70-0.85 | 10 | Rare sporinite, yellow orange to orange, rare cutinite, yellow to orange. (Siltstone>claystone>carbonate> sandstone. D.o.m. sparse, I>V>E. Inertinite and vitrinite sparse, exinite rare. D.o.m. may be from Nappamerri but may be cavings. Pyrite and marcasite sparse. Sparse iron oxides.) |
| | | | | | Toolachee Formation 3169m (10398') |
| 17539 | 3171 Ctgs | 1.02 | 0.93-1.11 | 29 | Common sporinite and cutinite, dull orange, common liptodetrinite, dull orange, rare resinite, orange. (Coal>shaly coal=claystone>carbonate. Abundant coal, clarodurite>vitrinertite>duroclarite>inertite>durite. Common moderate green oil cut from cracks in coal, intermediate microlithotypes as well as vitrite. Mineral matter in coal fluoresces strongly, yellow orange to orange. D.o.m. rare, I>V>E. Inertinite rare, vitrinite rare, exinite rare.) |
| 17540 | 3208 Ctgs | 1.05 | 0.89-1.14 | 28 | Common sporinite and cutinite, dull orange, sparse to common liptodetrinite, dull orange. (Coal>shaly coal> claystone=siltstone. Abundant coal, clarodurite> vitrinertite>duroclarite>inertite>vitrite. Strong oil cut is observed in vitrinite. D.o.m. sparse to common, I>V>E. Weak green oil cut from cracks in coal. Inertinite sparse to common, vitrinite sparse, exinite rare. Rare pyrite. |

WIMMA NO. 1

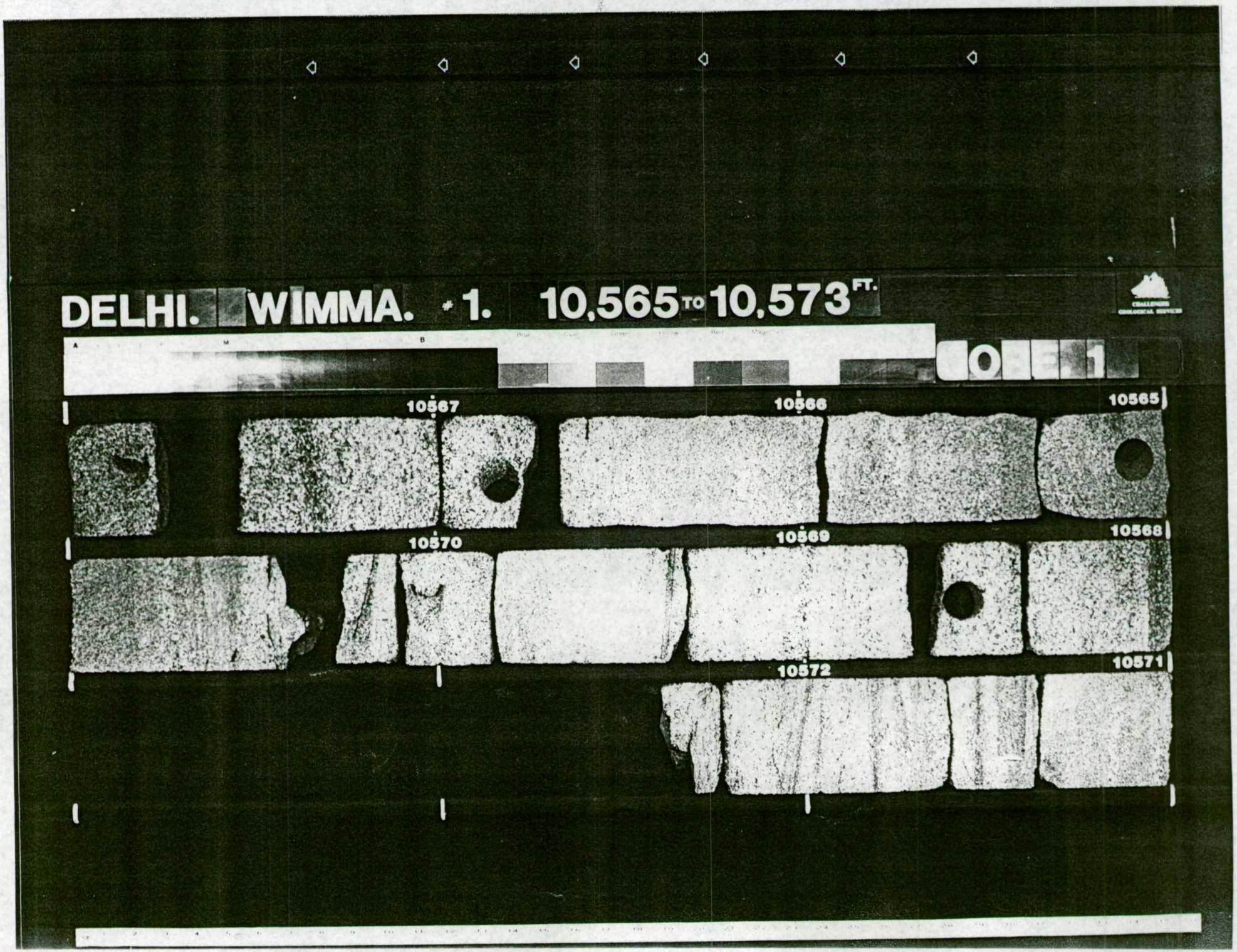
| K.K. No. | Depth (m) | $\bar{R}_v$max | Range | N | Exinite Fluorescence (Remarks) |
|---|---|---|---|---|---|
| 17541 | 3275 Ctgs | 1.02 | 0.90-1.12 | 20 | Rare sporinite, dull orange, rare cutinite, orange to dull orange, rare liptodetrinite, yellow to orange. (Calcareous siltstone>sandstone>claystone>coal>carbonate> shaly coal. Coal abundant. Inertinite rich. Vitrinertite> clarodurite>vitrite. D.o.m. rare, I>V>E. Inertinite rare, vitrinite rare, exinite rare. Rare shaly coal, inertinite rich. Yellowish fluorescing exinites are probably cavings. Marcasite and pyrite sparse.) |
| | | | | | Epsilon Formation 3276m (10748') |
| | | | | | Murteree Shale 3282m (10768') |
| | | | | | Patchawarra Formation 3313m (10871') |
| 17542 | 3333 Ctgs | 1.24 | 1.12-1.34 | 23 | No exinite fluorescence. (Coal>shaly coal>siltstone= claystone. Abundant coal. Inertinite rich but V>I>E. Vitrinertite>inertite>vitrite. D.o.m. abundant. I>V>E. Inertinite abundant, vitrinite sparse, exinite rare. Weak oil cuts observed in vitrinite. Mineral matter in shaly coal fluorescence, orange to dull orange. Siderite present. Pyrite and marcasite rare.) |
| 17543 | 3370 Ctgs | 1.24 | 1.12-1.31 | 23 | No exinite fluorescence. (Coal>siltstone>claystone> sandstone>shaly coal>carbonate. Abundant coal. Inertinite rich. Vitrinertite>vitrite>inertite. D.o.m. abundant, I>V>E. Inertinite abundant, vitrinite sparse, exinite rare. Mineral matter fluorescence yellow orange to dull orange. Very weak oil cuts in vitrinite. Pyrite rare.) |
| 17544 | 3431 Ctgs | 1.37 | 1.22-1.51 | 20 | No exinite fluorescence. (Siltstone>coal>shaly coal> carbonate=claystone>sandstone. Abundant coal. Inertinite rich. Vitrinertite (I)>vitrinertite (V)>vitrite. D.o.m. abundant, I>V>E. Inertinite abundant, vitrinite sparse exinite rare. Mineral matter fluorescence, yellow orange to dull orange. Pyrite and marcasite rare.) |
| 17545 | 3495 Ctgs | 1.58 | 1.50-1.75 | 22 | No exinite fluorescence. (Siltstone>coal>claystone> carbonate>shaly coal. Abundant coal. Inertinite and vitrinite rich. Vitrinertite (I)>vitrite>inertite> vitrinertite (V). D.o.m. abundant, I>V>E. Inertinite and vitrinite abundant, exinite rare. Marcasite sparse.) |
| 17546 | 3565 Ctgs | 1.64 | 1.51-1.93 | 13 | No exinite fluorescence. (Siltstone>shaly coal>coal> claystone>carbonate. Coal abundant. Vitrinite and inertinite rich. Vitrite>vitrinertite (I)>vitrinertite (V)>inertite. D.o.m. abundant, I>V>E. Inertinite abundant, vitrinite abundant, exinite very rare. Marcasite rare to sparse.) |

WIMMA NO. 1

| K.K. No. | Depth (m) | $\bar{R}_v$ max | Range | N | Exinite Fluorescence (Remarks) |
|---|---|---|---|---|---|
| 17547 | 3607 Ctgs | 1.71 | 1.52-1.89 | 25 | No exinite fluorescence. (Coal>siltstone>shaly coal> claystone>carbonate=sandstone. Coal abundant. Vitrinertite (I)>vitrite>vitrinertite (V)>inertite. D.o.m. abundant, I>V. Inertinite abundant, vitrinite abundant, no exinite found. 1.41% reflectance recorded for desmocollinite — ?cavings. Mineral matter fluorescence, yellow orange to bright orange. Rare marcasite.) |
| | | | | | Tirrawarra Sandstone 3615m (11859') |
| 17548 | 3655 Ctgs | 1.67 | 1.48-1.91 | 29 | No exinite fluorescence. (Siltstone>>claystone> coal>sandstone>carbonate>shaly coal. Coal common to abundant. Vitrinertite (I)=inertinite=vitrite. D.o.m. abundant, I>V. Inertinite abundant, vitrinite sparse to common, no exinite found. Mineral matter fluorescence, orange to medium orange. Pyrite and marcasite common.) |
| | | | | | Merrimelia 3657m (11998') |
| 17549 | 3668 Ctgs | 1.68 | 1.48-2.09 | 25 | Rare sporinite and cutinite, dull orange to faint brown. Faint bituminite, yellow to faint brown. (Coal>siltstone>sandstone>claystone>shaly coal=carbonate. Abundant coal. Vitrinertite (I)>vitrinertite (V)> inertite>vitrinite=clarodurite. Some exinite fluorescence in coal may be from cavings population. D.o.m. abundant, I>V>E. Wide range of reflectance is due to cavings. The very high readings indicate that vitrinite reflectances near the base of the Tirrawarra are probably 1.85% to 2.09%. Inertinite abundant, vitrinite abundant, exinite rare. Mineral matter fluorescence, medium orange to bright orange. Pyrite sparse to common. Siderite rare.) |
| | | | | | PRE-PERMIAN 3698m (12132') |
| 17550 | 3699 Ctgs | 1.60 | 1.49-1.80 | 25 | No exinite fluorescence. (Siltstone>coal>sandstone> carbonate>claystone>shaly coal. (Coal abundant. Inertinite rich. Vitrinertite (I)>inertite>vitrinertite (V). D.o.m. abundant, I>V>E. Inertinite abundant, vitrinite sparse, exinite very rare. Most of coal appears to be cavings from the top of the Patchawarra. Mineral matter fluorescence dull orange to medium orange. Marcasite sparse.) |
| | | | | | T.D. 3710m (12172') |

ABUNDANCE TERMS FOR VISUAL ESTIMATES BY VOLUME

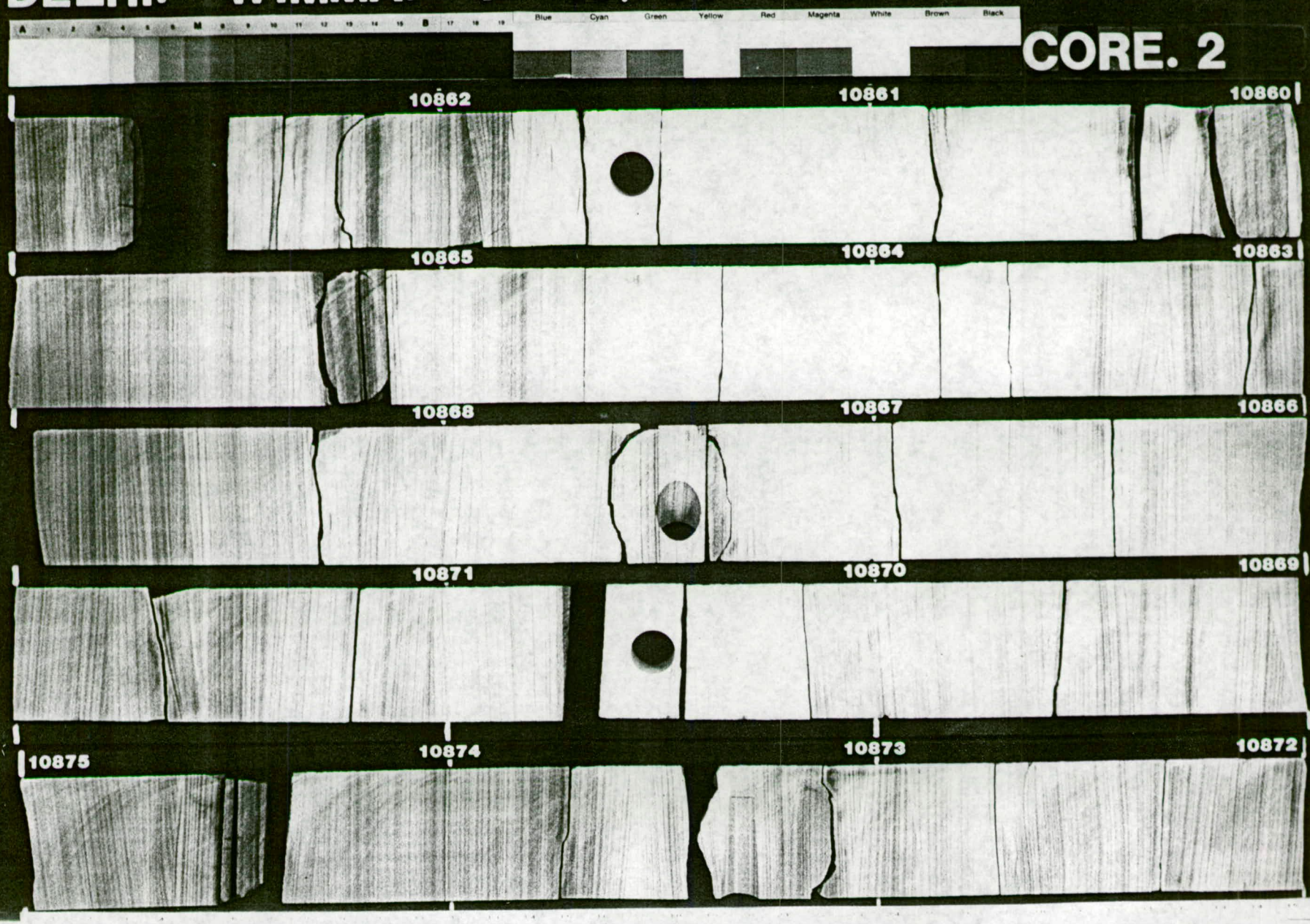
| | |
|---|---|
| ABUNDANT | 2%< x <10% |
| COMMON | 0.5%< x <2.0% |
| SPARSE | 0.1%< x <0.5% |
| RARE | <0.1% |


DELHI. WIMMA. #1. 10,565 TO 10,573 FT.
CHALLENGER GEOLOGICAL SERVICES
BOX 1
10567
10566
10565
10570
10569
10568
10572
10571

0063

# DELHI. WIMMA. #1. 10,860 TO 10,875 FT.

CHALLENGER GEOLOGICAL SERVICES



4175-1

# CORE LAB Grapholog

**CORE LABORATORIES, INC.**

COMPANY DELHI PETROLEUM PTY. LTD.
WELL WIMMA NO. 1
FIELD PATCHAWARRA EAST FARMOUT
COUNTY COOPER BASIN STATE SOUTH AUSTRALIA
LOCATION LAT. 27°21'10" S ELEVATION G.L. 120.6"
LONG. 140°33'16"E K.B. 142.0"

DATE LOGGED 2nd JULY 1981 - 7th SEPTEMBER 1981
CREW CHIEF LYNN MORGAN FILE NO. F1770
DRILL FLUID SPUD MUD 0 to 2500 FT.
MCL Nº - 2500 to 12160 FT.

UEPTH LOGGED FROM 30 TO 12160 FT.

CL 78 Grapholog Head Revision

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees assume no responsibility and make no representations as to the productivity, proper operation, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

## LEGEND

### ABBREVIATIONS

NB = NEW BIT
NCB = NEW CORE BIT
CO = CIRCULATED OUT
DST = DRILL STEM TEST
LAT = LOGGED AFTER TRIP
TG = TRIP GAS
NO = NO RETURNS
DC = DIRECTIONAL SURVEY
DC = DEPTH CORRECTION
DEPTHS CORRESPOND TO DRILL PIPE MEASUREMENTS
2250M MEANS BOREHOLE

RESISTIVITY, OHM-METERS
Rm = MUD
Rmc = MUD CAKE
Rmf = MUD FILTRATE

MUD DATA
CK = CAKE THICKNESS 32nds
V = VISCOSITY API SECONDS
F = FILTRATE API CC'S
W = WEIGHT
S = SALINITY, ppm Cl

### LITHOLOGY

SAND, SALT, COAL, CLAY, DOLOMITE, CONG, ANHYDRITE OR GYPSUM, SHALE, CHERT, LIMESTONE, OOLITE, SILTSTONE

## DRILLING RATE

MIN/FT ☒
FT/HR ☐

## HYDROCARBON ANALYSIS

CHROMATOGRAPHIC — Drilling Mud Gas
Methane — 1 — Butane — 4
Ethane — 2 — Pentane — 5
Propane — 3 — Hexane — 6

Calibration:
1% Methane = 5000
1% Ethane = 5000
1% Propane = 5000
1% Butane = 5000

OIL SHOW

HOT WIRE — Drilling Mud Gas ____ Drill Cuttings Gas ____
Calibration: 1% Methane = 20 UNITS

## REMARKS

FORMATION DESCRIPTION, MUD DATA, DRILL STEM TESTS, etc.

Well spudded 2/7/81
Rig Rel 4/8/81
Hit ODG 3AM
7/4
24 hours
615'
2.4.E

MOB 5-12,000 kilos
RPM 120

DB 1°

MOB 5-12000 kilos
RPM 120

DB 2°

MOB 5-15000 kilos
RPM 120

13 3/8" casing set at 603'
NB 2
2/8/81
Date
12:1
DB 0°
Out
CK at 615'
4D90
Unknown
2/8/81
MOB 5-30-40 kg
RPM 140

2.7.81
7.7.81

0-30' Spud mud

30'-90' SANDSTONE: clear-white-orange-yellow, very coarse-fine, predom coarse-medium, angular-sub round, poorly sorted grains.

90'-120' Interbedded sandstone and clay. SANDSTONE: As above, but predom white-clear, very fine, sub ang-sub round, well sorted, grades to siltstone ip, white argill matrix, some orange staining, friable-mod firm. CLAY: red-yellow-green-brown-white-grey, soft-minor gummy, stem ip, grades to siltstone ip, non calc.

120'-270' Siltstone with minor sandstone and clay. SILTSTONE: green, soft-slightly firm, stem ip, non calc. SANDSTONE: As above CLAY: As above

MUD DATA
Spud mud

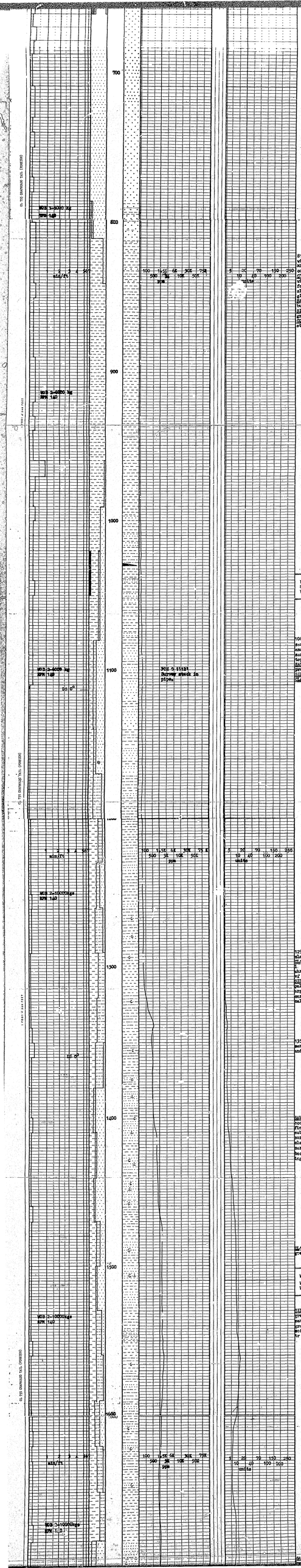
270'-300' Sandstone, with minor clay and siltstone. SANDSTONE: white-dominantly clear, unconsol, very coarse-coarse, occ medium, sub round, mod well sorted, very friable, slight argill matrix. SILTSTONE: As above. CLAY: As above.

300'-615' Clay with occ interbedded sandstone. CLAY: As above, but dominant light grey-grey-brown, very gummy, soft, non-calc. SANDSTONE: As above.

615'-619' Sandstone with minor interbedded siltstone and minor clay near the base since final between 630' and 663'. SANDSTONE: vis-clr, unconsol-v-v-coarse, mod sort, subrnd-rnd, tr ang sm, tr pyr, inferred f ppb. CLAYSTONE: gy-lt bn, v sft, grad to Blkish, v gummy, stem ip. SILTSTONE: cream-lt gy, grad to Gryst ip, soft, chky, mott speckly, occ pyr. Indlignitic, m, v sft, grad to Peat.

MUD DATA
V = 40
VR = 30
W = 40
Spud Mud.

CL 755 GRAPHOLOG TITLE (FORCED)




810'-1060' Claystone, with minor sandstone, minor siltstone and coal at base.
CLAYSTONE: as above, with sec lithics and feldspars, minor py, sl carb, becoming sl glauc near base.
SANDSTONE: as above, but dominant med-crs.
SILTSTONE: lt brown-grey, soft, aren, blocky
COAL: dk brown-black, striated, soft-firm.

MUD DATA
Water + Native clays
WT 9 VL 40+
VIS 30 pH 7

1060'-1290' Interbedded sandstone, siltstone and claystone, with sandstone dominant at top
SANDSTONE: as above, predom white-clear.
SILTSTONE: as above.
CLAYSTONE: as above.

1290'-1350' Interbedded claystone and siltstone
CLAYSTONE: pale green-lt brown, soft, sl gummy, abtmend green lithics, w/ carb material.
SILTSTONE: lt brown-pale green/grey-lt grey, argill ip, sandy ip, sl carb, soft-med firm, non calc, glauc ip.

1350'-2400' Interbedded sandstone, claystone, and siltstone.

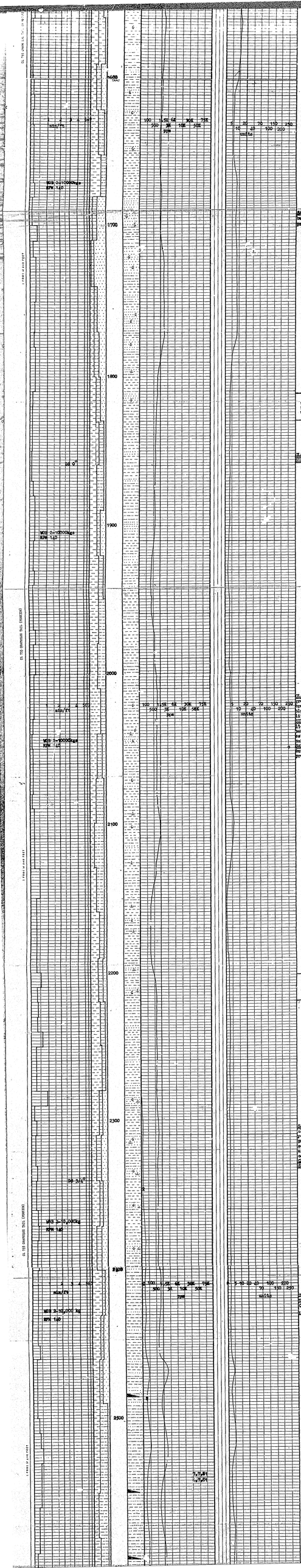
SANDSTONE: white-clear, sec red-yellow, vw, fine-med, predom fine, sub ang-sub round, mod sorted, calc cmt ip, clay mtx ip, glauc, carb ip, tight, foc becomes very fine grading to siltstone.

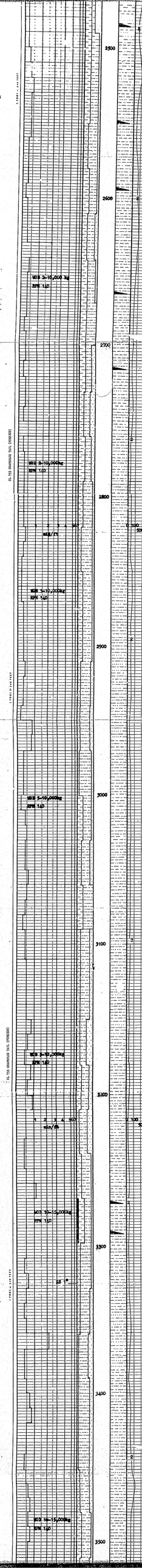
CLAYSTONE: as above, also grey-green.

MUD DATA
Water + Native clays
WT 9 VL 40+
VIS 30 pH 7

SILTSTONE: lt brown-grey brown, carb, blocky, sandy ip, sec carb lamin, grades to vf sst ip, soft-med firm, non calc, sr glauc.

SANDSTONE: as above, sl carb, glauc.


CL 715 SHANDOR TAIL (CONTIN)
1 FOOT = 100 FEET
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
MUD DATA
Water + Native clays
WT 9 VL 40+
VIS 30 pH 7
MUD DATA
W=9.1 pH=7
V=33 Sand=1/4%
WL=10 Cl2=10,000
SANDSTONE:As above, but more glauc, predom fine grained.
CLAYSTONE:As above
SILTSTONE:As above
CLAYSTONE:lt grey-lt grey green-lt brown-brown,soft-med firm, blocky,sl carb,occ white siltstone,non-calc,crum lt
SILTSTONE:grey-lt grey-lt brown,predom lt grey, sandy lp grading to vf set, calc lp,glauc lp, carb lp,soft-firm.
SANDSTONE:As above, but becoming more vf, predom non-calc, occ lp.
SANDSTONE:predom white-clear,with minor red-yellow-lt brown,vf-med, predom fine,sr-sp,mod sorted, calc cmt lp, argill mtx lp, glauc, carb,pelgite
CLAYSTONE:As above.
SILTSTONE:As above.
2400'-2490'
Interbedded Sandstone, Claystone and Siltstone.
Lithologies as above.
MUD DATA
Water + Native clays
WT 9 VL 40+
VIS 30 pH 7
MWD 2-10,000 Kgs
RPM 140
DO 3/4°
MWD 2-10,000 Kgs
RPM 140
DO 0°
MWD 2-10,000 Kgs
RPM 140
MWD 2-10,000 Kgs
RPM 140
MWD 2-10,000 Kgs
RPM 140
MIN/FT
WATER
GAS
PPM
7,7,81
4,7,81




MUD DATA
W=9.1 pH=7
Vis=33 Sand=3/4%
WL=40 Cl=10,000

2490-2790'
Interbedded Siltstone and Claystone with minor Sandstone; trace Coal.

SANDSTONE: vb,vf-fg, sft-frm,sbd w std, subang,colo cmt,arg mx, scme lithics & folds, tr carb mat,ooc glauc, v p vis por.
SILTSTONE: gn-ooc lt bn, grad to Clyst,aren ip, sft,blky,glauc,sl carb ip,ooc lithics & folds, mar pyr.
CLAYSTONE: lt gr-gy gn, sft,grad to Slst,sl carb,blky,sl glauc ip.
COAL: blk,rft-frm,ooc sub conc frac,ooc vitrin.

2790'-3022'
Siltstone wit minor Claystone and Sandstone.

Lithologies as above.

MUD DATA
W=9.1 pH=7
Vis=33 Sand=3/4%
WL=40+ Cl=10000

SILTSTONE: as above + dom gn-gy-bn.
CLAYSTONE: as above + dom bn,ooc frm,carb lam

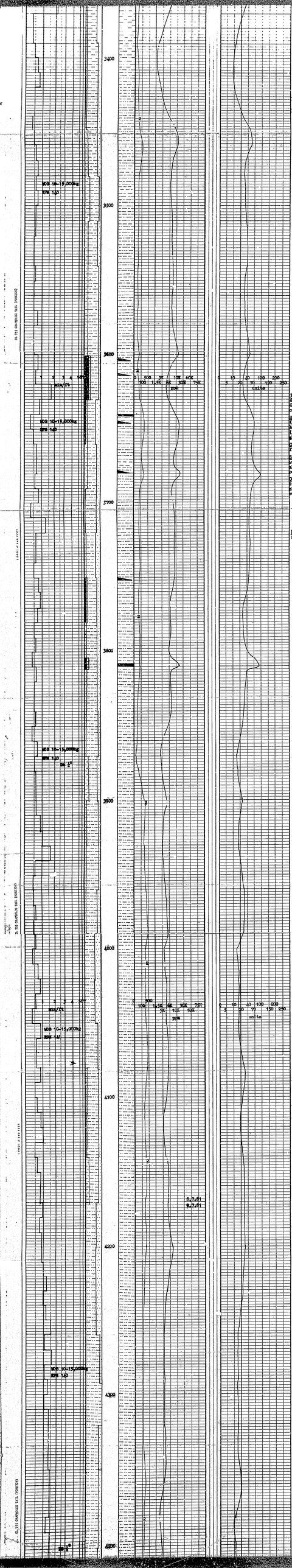
3022'-3600'
Siltstone with minor Claystone and Sandstone.

Lithologies as above.

CLAYSTONE: boc dom gy.

MUD DATA
W=9.3 Sand=tr
Vis=37 Cl=11,200
WL=39 Temp=43c
pH=8.5

SILTSTONE: as above + ooc carb lams.
CLAYSTONE: as above + ooc crm,ooc frm.




MUD DATA
W=9.3 Cal=11,200
Vis=37 Sand=tr
WL=39 Temp=42°
pH=8.5

SILTSTONE: as above + coa carb lams.

CLAYSTONE: as above + coa crs,coa frm.

3600'-3800'
Siltstone with minor Claystone and Sandstone and minor Coal.

SILTSTONE: 2 types: (1)med-dk gy-bn,frm, blky,carb,arg. (2)lt gy-gn,frm,blky, glauc,grad to vfg Sndst

CLAYSTONE: lt gy,sft-cod frm.

SANDSTONE: vf-fg,sft wh, w std,subang-subrnd, sl-mod calc,glauc,tite por,kaol,no flu.

COAL: blk,frm,blky,arg. @ 3620' & 3810' approx. plus small seams throut.

LIMESTONE: trace:lt tan frm,brittle,microxtln.

MUD DATA
W=9.3 Cal=11,200
Vis=37 Sand=tr
WL=39 Temp=42°
pH=8.5

3800'-4440'
Siltstone with minor Sandstone; trace Claystone and Coal.

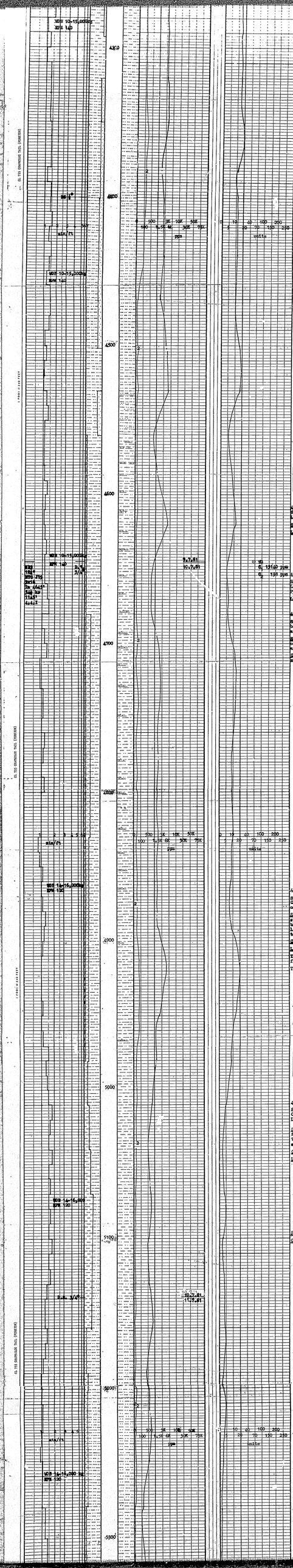
SILTSTONE: as above + carb lams.

SANDSTONE: as above.

CLAYSTONE: as above.

COAL: as above.

MUD DATA
W=9.3 Cal=11,200
Vis=37 Sand=tr
WL=39 Temp=42°
pH=8.5




4400'-4590'

Siltstone with minor Sandstone.

SILTSTONE: gy-ocr lt gy, sft,occ blky,sl calc tr pyr

SANDSTONE: as above.

ALTERATE: calcitite, vfg-med bd,ftr,mom Inocerumus frags.TRACE.

MUD DATA

| | |
|---|---|
| WT=9.3 | Cal=12,500 |
| Vis=42 | Sd=1/4 |
| WL=17 | Temp=53° |
| pH=9 | |

4590'-4645'

Siltstone with minor limestone.

SILTSTONE: as above.

LIMESTONE: as above.

4645'-4680'

Siltstone with minor limestone and trace Pyrite.

Lithologies as above.

4680'-4890'

Siltstone with interbedded Claystone; minor Limestone.

SILTSTONE: med cy,uniform,sl calc,fm,blky, arg,rare carb mat.

CLAYSTONE: lt-med cy, arg.

4890'-4960'

Siltstone with minor Claystone and Limestone;trace Pyrite.

SILTSTONE: gred to dkgy,dk gy-bk,sft-fm lp, blky,calc,abund carb Lam giving mottled tex,arg mt.

CLAYSTONE: as above.

LIMESTONE: as above.

Trace: Inocerumus frags.

Trace: Pyrite.

MUD DATA

| | |
|---|---|
| WT=9.3 | Cal=12,500 |
| Vis=42 | Sd=1/4 |
| WL=17 | Temp=53° |
| pH=9 | |

4960'-5340'

Siltstone with minor Claystone and trace Limestone; trace pyr.

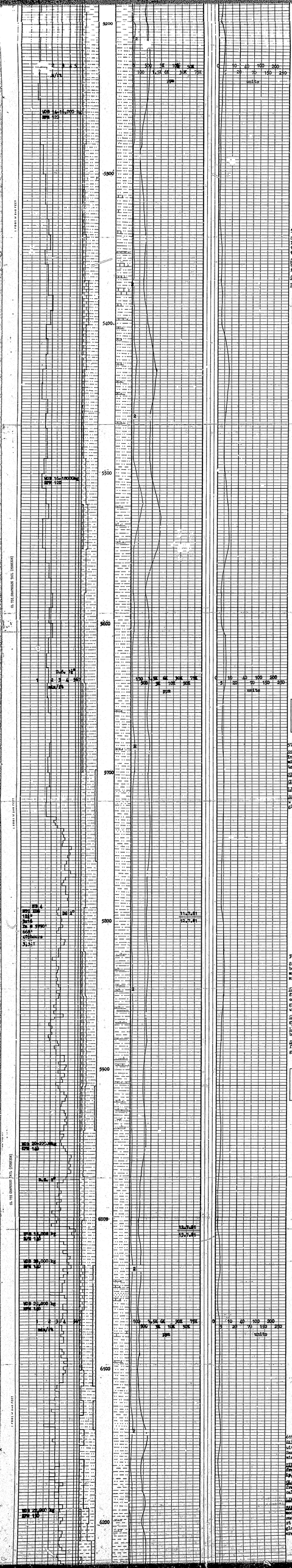
SILTSTONE: med gy,uniform tex,mod-v.hd,sl calc, arg,grad to Clyst.

CLAYSTONE: as above.

LIMESTONE: as above.

SILTSTONE: bec v arg.

CLAYSTONE: v gumy.




5301'-5730'

Siltstone with minor Interbedded Claystone; trace-minor Limestone; trace Pyrite.

SILTSTONE: as above; bn dkbr gy,blky,mbfirm.

CLAYSTONE: as above.

LIMESTONE: as above.

| MUD DATA | |
|---|---|
| W=9.3 | Cal=12,500 |
| Vis=42 | Sand=1/4% |
| WL=7 | Temp=73° |
| pH=9 | |

5730'-5790'

Siltstone with minor Interbedded Claystone, minor Sandstone and trace Limestone.

SILTSTONE: as above.

CLAYSTONE: as above.

LIMESTONE: as above.

SANDSTONE: off wh,vfg, v'sti,sl calc,fri-firm, glauconitic.

| MUD DATA | |
|---|---|
| W=9.4 | PH=10 |
| Vis=40 | YP=15 |
| WL=14 | Sodstr |
| pH=9.0 | Cal=13,200 |

5790'-6190'

Siltstone and interbedded Claystone with minor Limestone and minor Sandstone.

SILTSTONE: med gy,mfi-firm,blky-occ subblky, calc,grad to Clyst,occ grad to lt gy vfg ss, with minor glauc gns.

CLAYSTONE: med gy,mfi, gmmy.

LIMESTONE: lt tan-lt bn, hd,cal,lithic.

SANDSTONE: lt gy,vfg-fg,sbrd-rd,calc mat, glauc,vvr.

| MUD DATA | |
|---|---|
| W=9.3 | PH=5 |
| Vis=40 | YP=24 |
| WL=12.5 | Sodstr |
| pH=9.0 | Cal=14,000 |

6190'-6296'

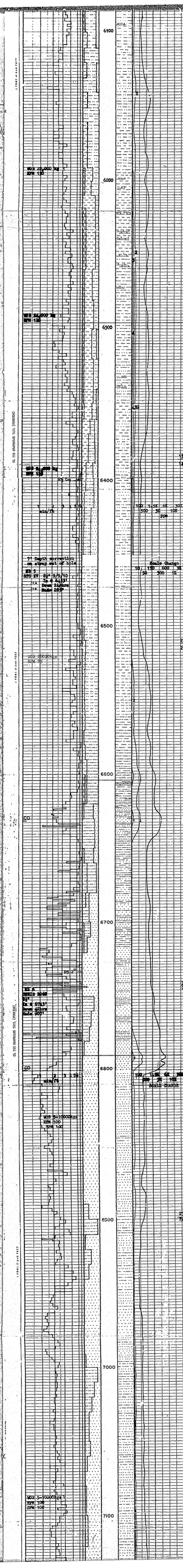
Siltstone and Claystone with some interbedded Sandstone (10-20%) and minor Limestone.

SILTSTONE: occ dk gy, fmg,blky,grad to Clyst lp,non-calc.

CLAYSTONE: med dk gy, fmg,blky,gmmy lp,non-calc-sl calc lp.

LIMESTONE: ambrown.

SANDSTONE: wh-lt gy,vfg-mod v std,subang-sub rnd,arg mx,grd to Sltst lp,calc mt lp,occ glauc,lithic,no Flm,mineral calcite fln only.




6190'-6296'
Siltstone and Claystone with some interbedded Sandstone (10-20%) and minor Limestone.
SILTSTONE:lt-gy-occ dk gy, firm,blky,grnd to clyst, lp,non-calc.
CLAYSTONE:lt-occ dk gy, firm,blky,gummy lp,non-calc-sl calc lp.
LIMESTONE:as above.
SANDSTONE:sub-lt gy,vfg, mod v std,subang-sub rnd,ary sx,grnd to slst lp,calc cmt lp,occ glauc,tite,no flu,mineral -calcite fin only.

MUD DATA
WT=9.2 Sal=tr
Vis=38 Chl=14000
WL=11 Temp=63°
pH=9.0

6296'-6450'
Siltstone and Claystone with some interbedded Sandstone and minor Limestone.
SILTSTONE:as above
CLAYSTONE:as above
LIMESTONE:as above
SANDSTONE:sub-lt gy,vfg, mod v std,subang-sub rnd,ary sx,grnd to slst lp,calc cmt lp, some glauc grn,tite no flu (minor calcite fin.)

6450'-6500'Interbedded and interlaminated light gray,quartzitic, sandstone,light-med grey brown argill slst; both blocky,soft-firm, sl-mod calc lp,aren lp, no carb and organic material,tr py, abnd white litics.light grey variety grades to vf friable sst.

6500'-6604' Siltstone with interbedded claystone.
SILTSTONE:as above, predom light grey type, grades to claystone, and becomes sulfiac. brown type-micaceous.
CLAYSTONE:white-pale gray-occ dark gray, dispersive to very soft, tr py.

MUD DATA
WT=9.1 Sal=tr
Vis=38 Chl=20K
WL=9.5 Temp=65°
pH=9.0

6604'-6623' Siltstone with interbedded claystone and limestone.
SILTSTONE:lt-dk gy and lt brn,as above,frm - hd,pred calc.
CLAYSTONE:lt-dk gy,occ buff,as above.
LIMESTONE:lt-dk brn, pred m brn,hd,subcomp frm,sty,stem 1/p,foil in parts.
6623'-6642'Silt with interbedded sandstone and minor clayst.
SILTSTONE:as above.
SANDSTONE:sub-slty,vf-m occ crse,mod std,sa-sr, pred lse fn-m grn,aggs of finer grn,fri w/occ wtz,calc cmt 1/p,grdng to sdy silst,tight to p por and infrared fair por 1/p.
CLAYSTONE:as above.
6642'-6682'Silt with interbedded clayst and minor sand;lt,sil cn sh.
6682'- 6792' Sandst with interbedded siltst and claystone.
SANDSTONE:sub-vf-coc f, mod std,sr,fri,tr-abun kao to occ silty stst,calc cmt 1/p, rare tr carb flake and lithic,tight por.
SILTSTONE:as above.
CLAYSTONE:as above.
6792'-6799'Interbedded siltstone and sandstone.
SILTSTONE:lt-dk brn & gy,slty-sdstr,sft,frm, tighly.sim 1/p.
SANDSTONE:clr-wh,vf-coc grn,pred lse f qtz w/ frosting.infrm kao stx cmt in finer aggs, tight-infrared f por 1/p.

Rasmr top 6790'.

6799'-6810'
SANDSTONE:sub-slty,vf-coc f, aggs are sub s r sst, sa,fri,tr-abun kao to occ silty stst,calc cmt 1/p,tr carb flake and lithic,tight por.
SILTSTONE:lt-dk brn & gy,slty-sdstr,sft,frm, tighly.sim 1/p.
SANDSTONE:clr-wh,vf-coc grn,pred lse f qtz w/ frosting.infrm kao stx cmt in finer aggs, tight-infrared f por 1/p.

6810'-6894'
SANDSTONE:clear, as above,predom fine-med loose quartz,no fluor.

MUD DATA
WT 9.3 VIS 37
WL 7.5 pH 9
FO 2/32 Solids trace

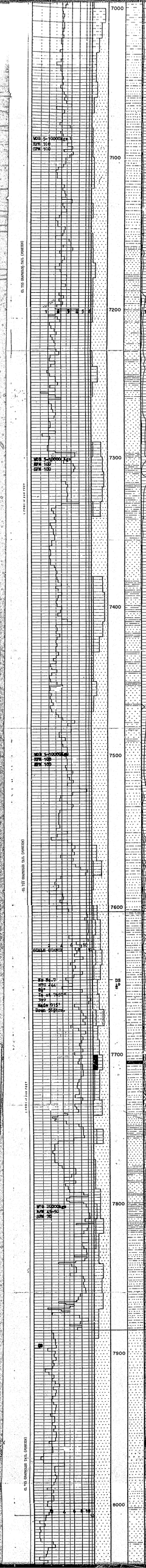
6894'-6948'Interbedded sandstone and siltstone
SANDSTONE:lt-clear, predom clear,becoming off white-clear-lt brown,fine-med, ang-sub round.predom ang,poor-med sorted,sil cmt lp but proton loose, inferred poor-mod porosity
SILTSTONE:white-lt brown grey-dark brown,sty, very lp; carb lp,sandy lp grading to vf sst, sec argill in grey slst grading to silty clay soft to sod firm,blocky.

6948'-6980'Sandstone with minor siltstone.
SANDSTONE:clear-off white,fine-med,predom fine,sub rounded but predom ang-subang, very clean grains with no apparent sil,inferred mod porosity,no fluor.
SILTSTONE:as above.

6980'-7106'Interbedded siltst and sandstone.
SILTSTONE:Buff-lt brn, lt-occ dk gy sa,tr carb mtrl 1/p,grds to vf ss
SANDSTONE:clr-wh,vf-c ss,ber grd vf to mid dle of interval,pr std sa-sr,fri-frm,sil cmt 1/p,tr kao stx,p por, ben ins lse f-m with depth,poor-fair por.

MUD DATA
Wt 9.2 Vis 38
WL 7.4 pH 9.5
FO 2/32 Sal tr

7106'-7297'Sandstone with interbedded siltstone.
SANDSTONE:sub-slty,vf-coc m ben crs towards the base,pred vf-f,p, pred m std,sr-occ f,lse




SANDSTONE:brn-lt brn, lt-occ dk gy sa,kr carb matrl 1/5,qtz to vf sa

SANDSTONE:clr-wh,vf-c sa,bec prnd vf to middle of interval,p-g sfc sa-sr,fri-frm,sil cnt 1/5,tr kao stn,p por, loc inc lse f-m with depth,poor-fair por.

| MUD DATA | |
|---|---|
| Wt 9.2 | Vis 38 |
| WL 7.4 | pH 9.5 |
| FC 2/32 | Sol tr |

7106'-7297'Sandstone with interbedded siltstone.

SANDSTONE:wh-clr,vf-c sa a bec crs towards the base,prnd vf-f,p-prnd s std,sa-occ rnd to frt in vf aggs,tr sil cnt & tr kao stn, p por in aggsp-infered fair por for lse grns,also occ lt brn vf,dirty arg mtx,siderite/iron staining, mic,tr carb matrl,gds to siltst.

SILTSTONE:lt-occ dk gy lt brn,blky,frm,tr-abundant carb matrl,arg-highly arg,mic & fp, occ weath fold & lithics.

7297'-7476'Interbedded sandstone,siltstone & occasc claystone.

SANDSTONE:clr-wh,vf-f occ m rarely crs,sa. SILTSTONE:prnd lt pink ish brown,quartzose, soft-frm,blocky,trace carb material and lith ics,also in parts gds to vf sandstone,also lt-dk grey-brown,highly arg,gds to claystone. CLAYSTONE:med-dk gy, subplatie - blocky, frm-mod hd,micaceous,tr-abundant carb material.

7476'-7684'Sandstone with interbedded siltstones.

SANDSTONE:wh-clr,f-occ crs,predominantly medium,becoming fine towards the base,sp-subrd,poor-mod std,proc loose,friable where tr sil cnt,poor to pred infered red porosity.

SILTSTONE:lt-med brn and occ dk gy,blocky-occ subfissile,soft-mod firm,mic,arg,carb specks and lmn,white lithics.

| MUD DATA | |
|---|---|
| Wt 9.3 | Vis 37 |
| WL 9.4 | pH 9.0 |
| FC 2/32 | Sol tr |

7684'-7732'Interbedded sandstone and siltstone with minor claystone and traces of coal.

SANDSTONE:white-clear-lt brown, vf-med, predom f, sp-subrnd,predom subang,poor-mod sorted, occ-bnd kaol mtx, lt brown argill mtx 1p, occ calc cnt,fri-hard,,occ carb specks, tight porosity,dull orange mineral fluor. also; from 7690' SANDSTONE:light grey-clear,vf-f,occ med,sa-sr, poor sorted,comm kaol mtx,occ calc cnt, silty 1p,tr-comm carb flecks and weak folds, tight porosity,tr dull orange mineral fluor. SILTSTONE:light grey-light grey brown-brown-dark brown,soft-mod hard,blocky-occ subfiss, argill 1p,mic,carb flecks and laminae, white lithics,some red-brown flecks,sawn 1p grading to vf sst. CLAYSTONE:brown-light to very dark grey,soft-firm,blocky-subfiss, laminated 1p,carb-very carb,grades to argill coal 1p.

SHOW 305:1: grey vf sst in the interval 7720'-7730'has very dull yellow green fluor with no cut.

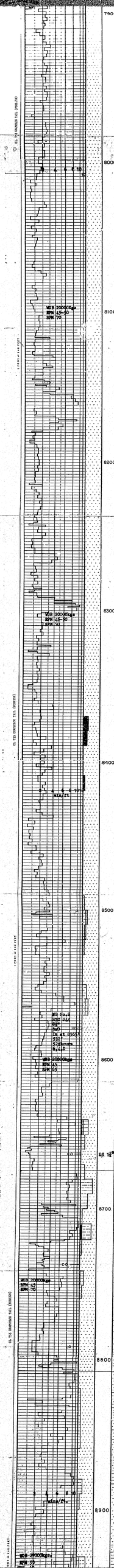
| MUD DATA | |
|---|---|
| Wt 9.2 | VIS 39 |
| WL 8.0 | pH 9.5 |
| FC 2/32 | Solids Tr |

7732'-7799'Sandstone with minor interbedded siltstone and claystone. SANDSTONE:white-clear, vf-f,predom vf,occ m-crs,poor-mod sorted, sa-sr,comm kaol mtx, calc cnt 1p,mic 1p, grades to siltstone,also light brown,argill as above. SILTSTONE:light-dark grey brown as above. CLAYSTONE:brown-grey as above,also light green,soft,disperive.

7799'-7884'Interbedded sandstone & siltstone with minor claystone at the top. SANDSTONE:mod ly mica with arg mtx 1/5. SILTSTONE:lt grey-lt grn-dk grey brn sa,hig ly arg 1/5,gds to vf sst, also lt brn,hi'ly micaceous,arg,blky,gds to clyst. CLAYSTONE:lt brn,soft, gummy,disperive.

| MUD DATA | |
|---|---|
| WT 9.2 | VIS 40 |
| WL 8.0 | pH 9.5 |
| FC 2/32 | Sol tr |

7884'-
Sandstone with minor interbedded siltstone and minor coal.
SANDSTONE:white-clear-lt brown,fine- v crs, pred med-crs,alternately predom cus grain size,poorly sorted std,sa-sr,comm kaol mtx,




MUD DATA
Wt 9.2 Vis 40
WL 8.0 pH 9.5
FC 2/32 Sol tr

7884'-
Sandstone with minor interbedded siltstone and minor coal.
SANDSTONE:white-clear-lt brown,fine- v crs,poorl sed-crs,alternately precis coarse grain size,poorly-mod std,sub-rg,occ angular,predom loose qtz;qtz are frt to coc hard,trace-abundant kao cta i/p,to-mod calc,finer and argil i/p,tight-inferred fair-gd porosity. Trace dull orange mineral fluorescence.
SILTSTONE:light-med brn lt-med grey brn,firm, blocky to coc subfrag, carb,mic,white lithic argil i/p.
COAL:black,subvitreous, blocky,conc fracture, brittle,hard.

7906'-7990'
SANDSTONE:as above but dominantly sed grn with calc cmt where aggs.

7990'-8040'
SANDSTONE:as above but dominantly fine grain with less calc cmt where aggregates.

MUD DATA
Wt 9.3 Vis 38
WL 8 pH 9.0
FC 2/32 Sol tr.

8040'-8250'
SANDSTONE:as above but med -vcoarse grain, dominantly crs grn.

8250'-8510'
SANDSTONE:as above but dom a grn,only tr-sl calc cmt bec silic where aggs,dom uncons as above but percentage fine-med grn aggs incr.

MUD DATA
Wt 9.2 Vis 38
WL 7.5 pH 9.5
FC 2/32 Sol tr

8510'-8634'Sandstone with minor interbedded siltstone and claystone.
SANDSTONE:white-clear-lt lt brown,vf-crs,sub-rg,occ ang,poor-mod sorted,dominantly uncon with interbedded aggregated sands,aggs friable -coc hard,kaol stg,sil and tr calc cmt,poor to in ferred porosity,occ tr dull orange fluor with slow pale silky crush cut.
SILTSTONE:lt-med brown, arag,sl,blocky-subfrag, occ lithics and carb specks,poor-calc.
CLAYSTONE:dk brown, blocky-subfriag,v carb sp grades to slst i;p,v mic mic,rare lithics.

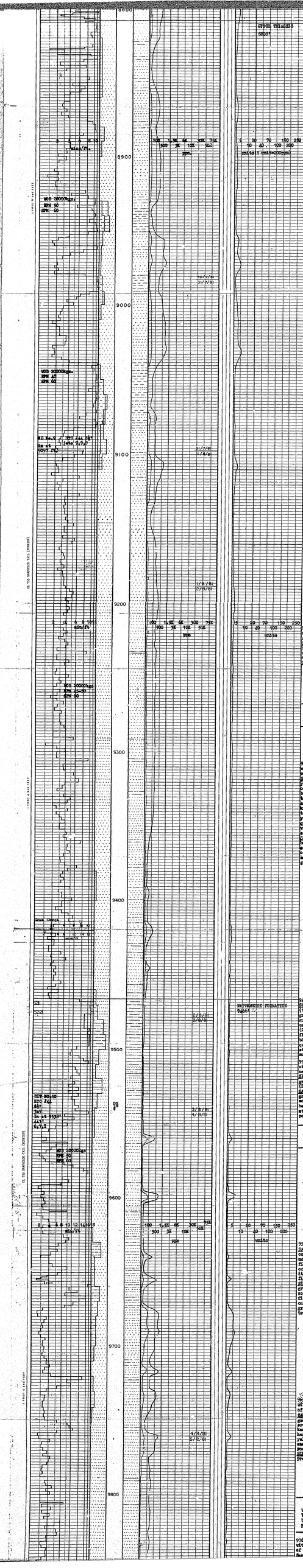
8634'-8640'
SANDSTONE:as above, med-crs,inferred good porosity.
8640'-8671'Sandstone, with interbeds of siltstone and minor claystone,also tr coal at top of section.
SANDSTONE:as above,but more lt brown,f,sgrs, becoming predom uncons with depth no fluor.
SILTSTONE:lt-med grey-brown,mass cut flecks and laminae, as above
CLAYSTONE:brown-dk brown,blocky,subfriag i;p, firm,carb i;p,mic mic, occ lithics.

8671'-8696'Siltstone with minor interbedded sandstone.
SILTSTONE:as above, silt,occ carb flecks and laminae.
SANDSTONE:as above,but dom lt brown-white, sucr,tight,tr fluor, pale orange-yellow, pin point-patchy,v weak crush cut.

8696'-8776'Interbedded sandstone and siltstone.
SANDSTONE:white-lt ten f sgrs,becoming uncons sed i;p,no-ev,well sorted friable-v hard i;p,sgrs stg,minor carb flecks, no fluor,occ trdull-yellow,patchy,fluor with v sl crush cut.
SILTSTONE:lt tan-yellow brown,firm,arag i;p, subfriag i;p.
8776'-8798'
SANDSTONE:as above,no fluor.

8798'-8900'Sandstone with minor interbedded siltstone.
SANDSTONE:clean-trans, med,and sized grns, well sorted,silica cmt, hard,quart luster,angrns, poor porosity,no fluor.
SILTSTONE:dk grey,firm sub fissile-fissile, sub-calc,very finely micaceous;also siltstone lt grey,soft-firm,mass

8900'-8920'Sandstone.
SANDSTONE:as above




8788'-8900' Sandstone with minor interbedded siltstone.

SANDSTONE: clear-translucent, mod clear grns, well sorted, silica cmt, hard; some loose, angular; poor porosity, no fluor.

SILTSTONE: dk grey, firm sub fissile-blocky, sog-calc, very finely micaceous; siltstone lt grey, soft-firm, massive.

8900'-8930' Sandstone.
SANDSTONE: as above.

8930'-9110' Sandstone with minor interbedded siltstone and claystone.

SANDSTONE: clear-white fr-med grns, mostly fr well sorted, sil cmt, hard, some loose, ang to sub grns, poor porosity no fluor.

CLAYSTONE: light red, soft-firm, sil sub-fiss sec-calc, sil micaceous, a dispersive clay, strongly colouring mud returns.

SILTSTONE: lt grey-lt brown, blocky sec sub fiss, sod sec; gsnly in part grdg to v.fn.sst.

9110'-9200' Sandstone.

SANDSTONE: white-clear, fn to crs grns, poor sorting; loose grns sub ang to angular grns mainly, sil cmt hard, overall poor porosity, no fluorescence.

9200'-9304' Sandstone, with trace interbeds of siltstone.
SANDSTONE: as above, dominant f-med, aggregated, subround, slightly poor visual porosity.
SILTSTONE: as above.

| MUD DATA | |
|---|---|
| WT 9.2 | VIS 40 |
| WL 7.5 | pH 8.5 |
| FC 2/32 | Solids tr |

9304'-9466' Sandstone, with minor interbeds of siltstone.
SANDSTONE: white-pale yellow-light grey, vf-med crs, predom f-med becoming vf-f ggs towards base, mod sorted, sa-sr, firm-very hard, kaol mix and silic cmt, tr carb material ip, tr yellow-pink loose crs quartz, slgtl-sec poor visual porosity in sed sst, no fluor.
SILTSTONE: light grey-brown-grey brown, blocky, soft-firm, argill ip, sec altered feldsp, vr carb specks and laminae, grades to vf sst ip.

9466'-9506' Sandstone.
SILTSTONE: two types; (1) light grey-tr dark grey, firm-hard, sec f laminate texture, tr carb.
(2) dominant red brown, firm-hard, brittle ip, blocky, sec f-crs loose quartz, dispersive-strong colouring of mud returns.

9506'-9588' Siltstone, with interbedded sandstone.
SILTSTONE: (1) as above, grades to claystone ip.
(2) Agrabaea
SANDSTONE: white-light grey, vf-f-med, sa-sr, mod well sorted, mod hard, silic cmt; argill mix ip, poor-v poor porosity, no fluor.

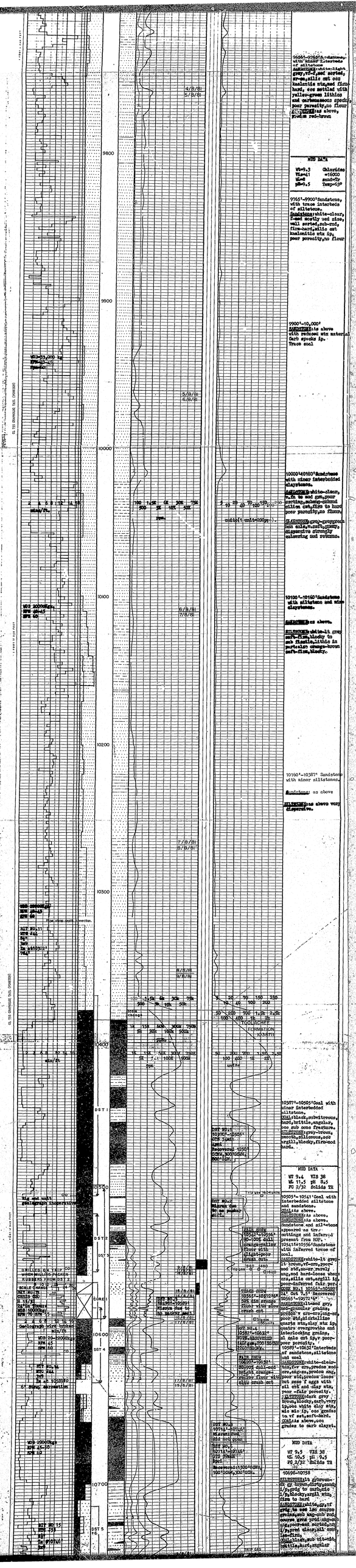
| MUD DATA | |
|---|---|
| WT 9.4 | VIS 40 |
| WL 9 | pH 9.5 |
| FC 2/32 | Solids tr |

9588'-9656' Sandstone.
SANDSTONE: white-clear sec pale yellow, f-med, mod-well sorted, sa-sr, firm-hard, silic cmt sec so xln, poor porosity, dull orange min fluor.
SILTSTONE: predom light grey sec red-dk brown, soft-firm, blky-sub fissile, argill, sec carbonaceous specks ip, grading to vf sst, trace pyrite and lithic.

9656'-9765' Sandstone, with minor interbeds of siltstone
SANDSTONE: white-light grey, vf-f, mod sorted, sr-sa, silic cmt sec kaolinitic ctg, mod hard, sec mottled with yellow-green lithics and carbonaceous specks, poor porosity, no fluor
SILTSTONE: as above, predom red-brown

| MUD DATA | |
|---|---|
| Wt=9.3 | Chlorides |
| Vis=41 | =16000 |
| WL=6 | sand=Tr |
| pH=9.5 | Temp=63° |

9765'-9900' Sandstone, with trace interbeds of siltstone.
Sandstone: white-clear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DST 1
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CORE 1
DRILLING & TEST
WHEN DRILLING ABOVE
RUBBERS FROM DST 2
SCALE CHANGE
MUD DATA
WT 9.4 VIS 38
WL 11.5 pH 8.5
FO 2/32 Solids TR
MUD DATA
WT 9.5 VIS 38
WL 10.5 pH 9.5
FO 2/32 Solids TR
TOOL REF
FORMATION
10358'TD
Sig and water co
geologist incorporation
DST NO.1
10520'-10556'
STR 5 min
Last
Recovered 1250'
DST NO.2
10556'-10561'
STR 5 min
Recovered 1250'
DST NO.3
10561'-10572'6R
STR 5 min
Recovered 1250'
DST NO.4
10572'-10587'
STR 5 min
Recovered 1500'
DST NO.5
10587'-10597'
STR 5 min
Recovered 1500'
DST NO.6
10597'-10605'
STR 5 min
Recovered 1250'
DST NO.7
10605'-10620'
STR 5 min
Recovered 1250'
DST NO.8
10620'-10641'
STR 5 min
Recovered 1250'
DST NO.9
10641'-10647'
STR 5 min
Recovered 1500'
DST NO.10
10647'-10658'
STR 5 min
Recovered 1500'
DST NO.11
10658'-10716'
STR 5 min
Recovered 1500'
DST NO.12
10716'-10716'
STR 5 min
Recovered
DST NO.13
10716'-10716'
STR 5 min
Recovered
DST NO.14
10716'-10716'
STR 5 min
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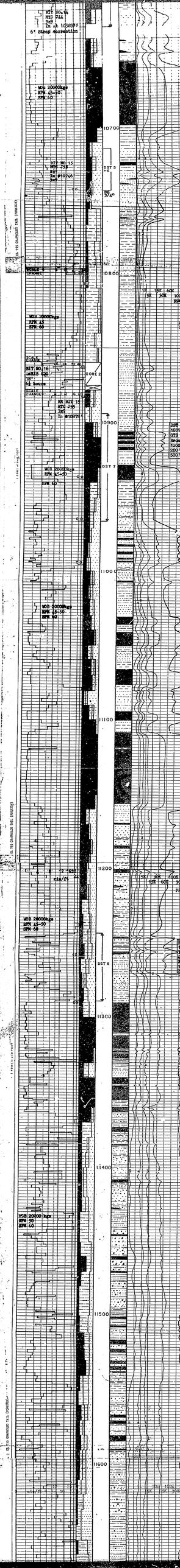
BIT NO.14
SIZE 9 1/2
TYPE
In at 10580ft
6ft Stump abrasion
MUD 2000cps
WTR 42-50
SPM 60
10700
DST 5
BIT NO.15
SIZE 9 1/2
TYPE
In at 10716
BIT 5/2
SCALE CHANGE
10800
MUD 2000cps
WTR 42
SPM 60
SCALE CHANGE
BIT NO.16
SIZE 9 1/2
TYPE
In at 10875
CORE 2
SCALE CHANGE
BIT NO.17
SIZE 9 1/2
TYPE
In at 10875
10900
MUD 2000cps
WTR 42-50
SPM 60
DST 7
11000
MUD 2000cps
WTR 42-50
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11200
DST 8
11300
MUD 2000cps
WTR 42-50
SPM 60
11400
MUD 20100 kgs
WTR 50
SPM 60
11500
11600
BIT NO.8
SIZE 8 1/2
TYPE
In at 10716
Mineral Dwl.
Hit hot spot
BIT NO.9
SIZE 8 1/2
TYPE PDC
Spot
Recovered 11300'-10700'
10700'-10716'
TRIC GAS
1620 units
NORTHERN CHALK
10750'
PATCHAMASKA FORMATION
10850
TRIP GAS
3000 units
BIT NO.9
SIZE 8 1/2
TYPE
Recovered
12000'-10966'
10966'-10875'
BIT NO.9
SIZE 8 1/2
TYPE
Recovered
11300'-10700'
10700'-10716'
BIT NO.9
SIZE 8 1/2
TYPE
112135
112391
STD 45M
Stuck
1363BOCN
310-GCN
POOR SHOW
11250'-11290'
30% porosity
spotted dim
fluor
fly
with slow
crush cut
POOR SHOW
11290'-11390'
30% porosity
spotted dim
fluor
fly
with slow
crush cut
TRIP GAS
1620 units
TRIP GAS
3000 units
TRIP GAS
1900 units
TRIP GAS
1000 units
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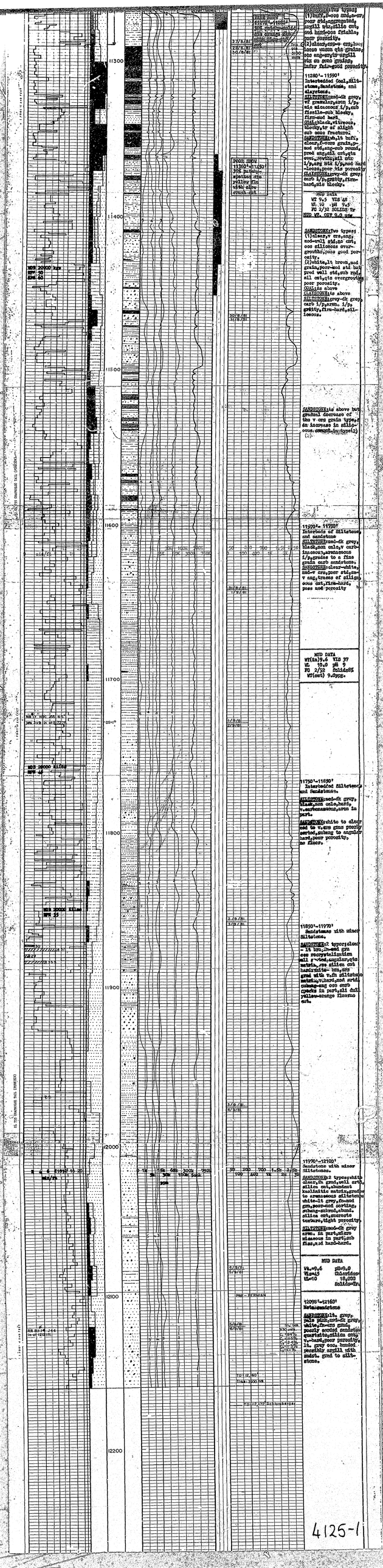
100 400 1K 2K
50 200 700 1.5K 2.5K
100 400 1K 2K
50 200 700 1.5K 2.5K
100 400 1K 2K


11300
11400
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11800
11900
12000
12100
12200
WOB 20000 lbs
RPM 60
SPM 60
WOB 20000 KLBS
RPM 55
WOB 20000 KLBS
RPM 55
RR-BH-24-244
TD:12,160 ft
TD: 12,160
TIME: 2000 HR
TD: 12,122 Schlumberger
PRE-PERMIAN
MUD DATA
WT 9.5 VIS 48
WL 10 pH 9.0
FC 2/32 SOLIDS 7%
MUD WT. OFF 9.0 ppg
MUD DATA
WT(in)9.6 VIS 37
WL 10.0 pH 9
FC 2/32 Solids8%
WT(out) 9.0ppg.
MUD DATA
Wt.=9.6 pH=9.0
Vis=45 Chlorides=
WL=10 18,000
Solids=8%
11500'-11600'
Interbeds of Siltstone, and sandstone
SILTSTONE:med-dk gray, black,non calc,v carb inconcr,arenaceous f/p,grades to a fine grain carb sandstone.
SANDSTONE:clear-white, med-v crs,poor sta,s-v ang,traces of siliceous cmt,firm-hard, poss mod porosity
11750'-11850'
Interbedded Siltstone and Sandstone.
SILTSTONE:med-dk gray, black,non calc,hard, v.arenaceous,mica in part
SANDSTONE:white to clear med to v.crs grns poorly sorted,subang to angular hard,poor porosity, no fluor.
11850'-11970'
Sandstone with minor Siltstone.
SANDSTONE:2 types;clear - lt brn,fr-med grn ces recrystallization cell r-wed,angular,qtz matrix,rec silica cmt hardness- hrn,crs grns with v.fn siltstone matrix,v.hard,mod srtd, orange-org ces ces cracks in part,oil dull yellow-orange fluoro set.
11970'-12100'
Sandstone with minor Siltstones.
SANDSTONE:2 types;white clear,fr-med, well srtd, silica cmt,abundant kaolinitic matrix,grade to arenaceous siltstone, white-lt grey,fr-med grn,poor-mod sorting, subang-subrnd,abund. silica cmt,massive texture,tight porosity.
SILTSTONE:mod-dk grey crse. in part,micaceous in part,sub flat,v.hd hard-hard.
12095'-12160'
Metasandstone
SANDSTONE:lt. grey, pale pink,med grey, white,fr-crs grns, poorly sorted sandstone, quartz,silica cmt, v-hard,poor porosity, lt. grey ces, humid possibly argill with match. grad to siltstone.
4125-1

4-25-2

**CORIBAND**

**Schlumberger**

**HALLIBURTON**

**Corriband**

**Sample Log**

**Sample Log**

**Sample Log