AMPOL EXPLORATION LIMITED

WELL COMPLETION REPORT

PAYNESVILLE 1

Petroleum Exploration Permit 98

NOVEMBER, 1985

W911

PAYNESVILLE #1

WELL COMPLETION REPORT

COMPILED FOR

AMPOL EXPLORATION LIMITED

Prepared by:

M. SCHMEDJE
E. de VRIES
B. CASSIE

November, 1985

PAYNESVILLE #1

TABLE OF CONTENTS

WELL DATA
CARDS

WELL DATA CARDS

AMPOL EXPLORATION LTD.

WELL: PAYNESVILLE #1

Location : Latitude: 37° 54' 53" S

Longitude: 147° 40' 21.2" E

Seismic S.P. 293
LINE GM83A-20

Elevation: G.L.: 26 m. ASL K.B. 29.96m ASL

Map: BAIRNSDALE

Grid: 1:50,000

Spudded: 0430 hrs 2/7/85 Completed: 1700 hrs 9/7/85

Type Structure: DRAPE OF TERTIARY SEDIMENTS OVER BASEMENT HIGH

Status: PLUGGED AND ABANDONED

Rig: ATCO-3

Total Depth: Driller: 707.7 m. Log: 709.0 m,

Completion Details: ABANDONMENT PLUGS SET AT
1. 596-550 m.
2. 142- 85.1 m.

Casing Size	Shoe Depth
244 mm	121.9 m (Driller)
	120.5 m (Logger)

Cutting Samples Collected from: shoe to T.D.

FORMATIONS PENETRATED

Age	Formation	Depth	Elevation	Thickness
PLIOCENE TO PLEISTOCENE	HAUNTED HILLS GRAVEL	3.96 m.	+ 26 m.	85±5 m.
PLIOCENE	JEMMYS POINT FM.	85± 5 m.	-55±10 m.	30±10 m.
LATE MIOCENE TO PLIOCENE	TAMBO RIVER FM.	115± 5 m.	-85± 5 m.	10± 5 m.
EARLY TO LATE MIOCENE	GIPPSLAND LIMESTONE	125. 3 m.	-95. 3 m.	404. 2 m.
LATE OLIGOCENE TO EARLY MIOCENE	LAKES ENTRANCE FM.	529. 5 m.	-499.5 m.	39. 5 m.
LATE EOCENE TO LATE OLIGOCENE	LATROBE GROUP	569. 0 m.	-539.0 m.	47 m.
ORDOVICIAN	BASEMENT	616. 0 m.	-586.0 m.	93 m. +
	T.D.	709. 0 m.	-679.0 m.	

AMPOL EXPLORATION LTD.

WELL: PAYNESVILLE #1

LOGS

Type Log	Run. No.	Interval	BHT/Time	Type Log	Run. No	Interval	BHT/Time
DLL-MFSL-GR	1	708-121 m.	42.2°C/	HDT	1	708-345 m.	48.8°C/
			5 hrs				15 hrs
LDT-CNL-GR	1	708-121 m.	44.4°C/	VELOCITY SURVEY			
(G.R. TO SURFACE)			7½ hrs	CST			
BHC (SON)-GR	1	707-121 m.	46.1°C/				
			9¾ hrs				
NGT	1	708-370 m.	47.7°C/				
			12 hrs				

FORMATION TESTS

Test No.	Interval	Formation	Flow (min)	Shut in (min)	Bottom gauge IP/FP	Shut in Press	Fluid to Surf. (min)	Max Press	T C.	B.C.	Rev. Circ.	Results
1	573.4-	LATROBE			MISRUN	PACKER		SEAT		FAILURE		
	596.9 m.											
2	567.1 -	LATROBE	35	71	(TOP GAUGE) 216.6/	649.7	NO		½"	¾"	NO	RECOVERED
	597.4 m.				220.8							9.5 LITRES OF
												FORMATION WATER
												RW = 4.44 @
												18°C. TOOL
												BECAME CLOGGED
												WITH SAND

FULL HOLE CORES

No.	Interval	Formation	Cut	Rec.
1	596.79-605.94m	LATROBE	9.15m	NIL
2	699.5-707.7 m	BASEMENT	8. 2m	48%

PERFORATIONS

Interval	Formation	Shots/ft.
NIL		

AMPOL EXPLORATION LTD.

WELL: PAYNESVILLE #1

LOG INTERPRETATION

Interval	Formation	Ø %	Sw %	Interval	Formation	Ø	Sw.
570-575.5m	LATROBE	2.4	22.6				
577.5-584m	LATROBE	37.5	100				
587-589 m	LATROBE	15.5	63.5				
593-605 m	LATROBE	32.3	100				
610-614.5m	LATROBE	30.0	94.5				
617.3-690.5m	BASEMENT	0	-				

Net Pay Intervals:

NO PAY FOR PAYNESVILLE

CORE ANALYSIS (INTERVAL AVERAGES) - LOGGERS DEPTH

Interval	Ø	K.	So.	Sw.	Interval	Ø	K.	So.	Sw.

ONLY GEOCHRONOLOGICAL WORK WAS CARRIED OUT. THE AGE OF CORE #1 LIES BETWEEN 445-504 Ma (ORDOVICIAN)

AMPOL EXPLORATION LTD.

WELL: PAYNESVILLE #1

SIDEWALL CORES

Depth	Lithology	Depth	Lithology	Depth	Lithology	Depth	Lithology
630 m	SANDSTONE	583 m	NO REC.	615.5 m	NO REC.	561 m	MARL
616.9 m	NO REC.	580 m	NO REC.	613.5 m	NO REC.	514 m	NO REC.
614 m	NO REC	577 m	NO REC.	611 m	NO REC.	492 m	MARL
613 m	NO REC.	617 m	SANDSTONE	599 m	NO REC.	442 m	MARL
610 m	NO REC.	614 m	NO REC.	597 m	CLAYSTONE	387 m	NO REC.
608.5 m	SANDSTONE	605 m	SANDSTONE	592 m	NO REC.		
606.9 m	NO REC.	601 m	NO REC.	590 m	NO REC.		
603 m	SANDSTONE	597.5m	NO REC.	588 m	NO REC.		
601 m	NO REC.	595.5m	SANDSTONE	586 m	SANDSTONE		
597.5 m	NO REC.	592.5m	NO REC.	584 m	SANDSTONE		
595.5 m	NO REC.	585.5	NO REC.	581 m	NO REC.		
593 m	NO REC.	583 m	NO REC.	579 m	CLAYSTONE		
591 m	NO REC.	579 m	NO REC.	578 m	NO REC.		
587.5 m	NO REC.	577 m	NO REC.	576.5 m	SANDSTONE		
585.5 m	NO REC.	574.5m	SILTSTONE	571 m	SILTSTONE		

SUMMARY: PAYNESVILLE #1 is an exploration well located approximately 12 km S.E. of Bairnsdale in the onshore Gippsland Basin.

The PAYNESVILLE #1 prospect was prognosed to be a fourway closed drape of Tertiary sediments over a basement high. The primary objectives were sandstone reservoirs of the Latrobe Group.

The well reached a total depth of 709 m in metasedimentary basement of Ordovician age.

A thicker sequence of Latrobe Group sediment (47 m.) was penetrated in Paynesville #1 compared to that penetrated in the nearby Comley #1 and Fairhope #1 wells.

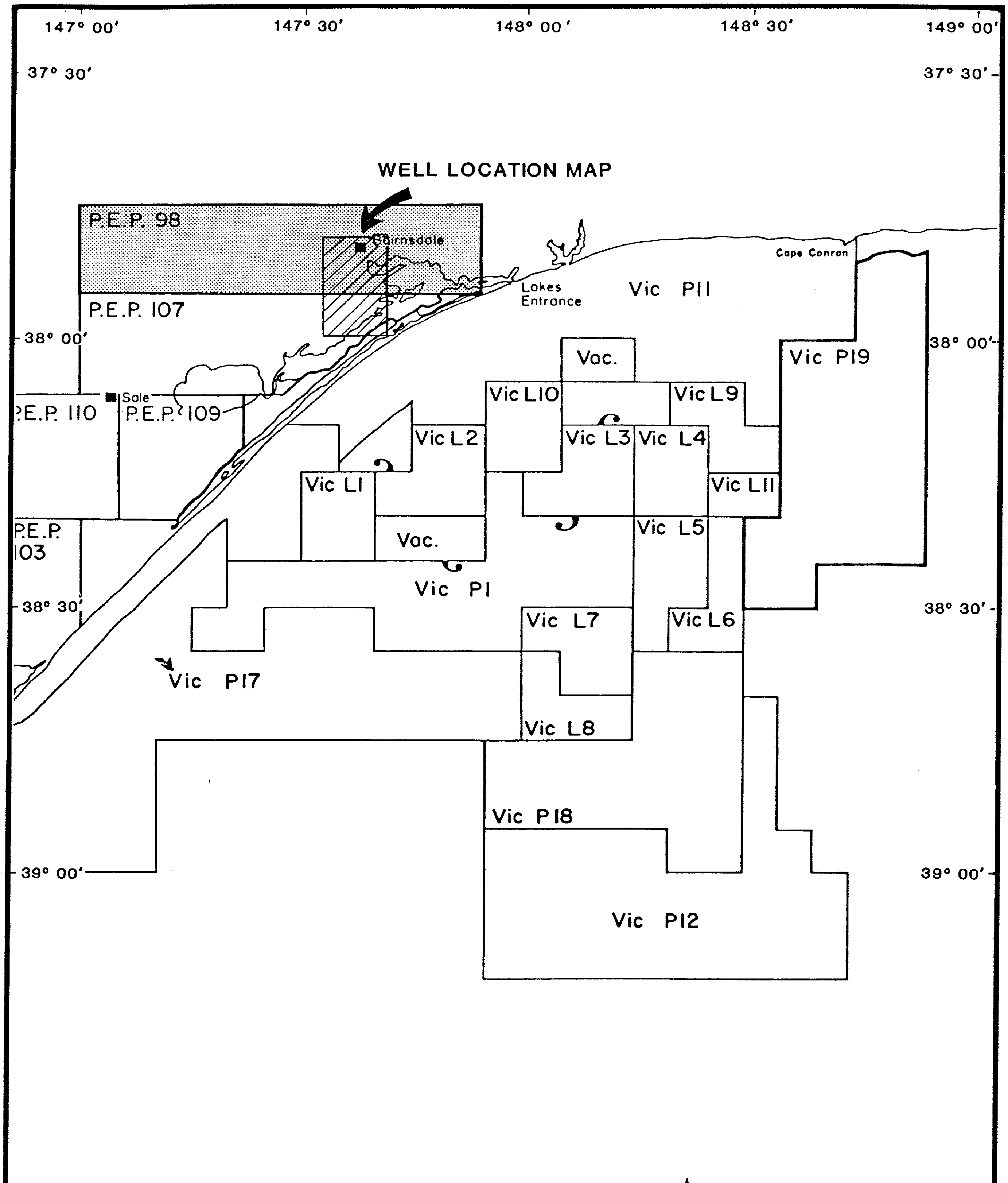
Two cores were cut, one in the Latrobe Group (not recovered) and one in Basement (3.9 m. recovered). Two DST's (DST #1 misrun) were run in the Latrobe Group. DST #2 recovered 9.5 l. of formation water and 28.4 l. of clean sand and formation water before the tool became clogged. Log interpretation showed the Latrobe Group to be 100% water saturated. The well was plugged and abandoned.

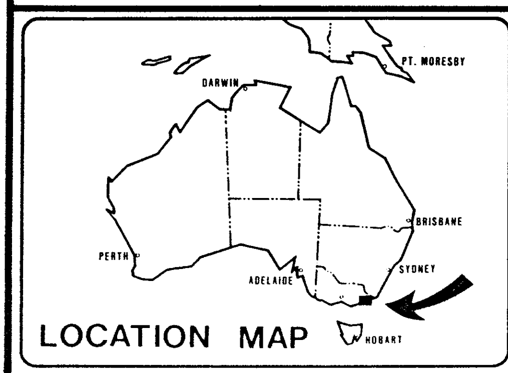
Re-mapping of the seismic for the Paynesville prospect suggests that the structure opens to the north and that the Paynesville #1 well is unlikely to be a valid test.

Wellsite Geologist: M. SCHMEDJE **Card Prepared By:** M. SCHMEDJE **Date:** September 1985

LOCATION

LOCATION





AMPOLEX INTERESTS

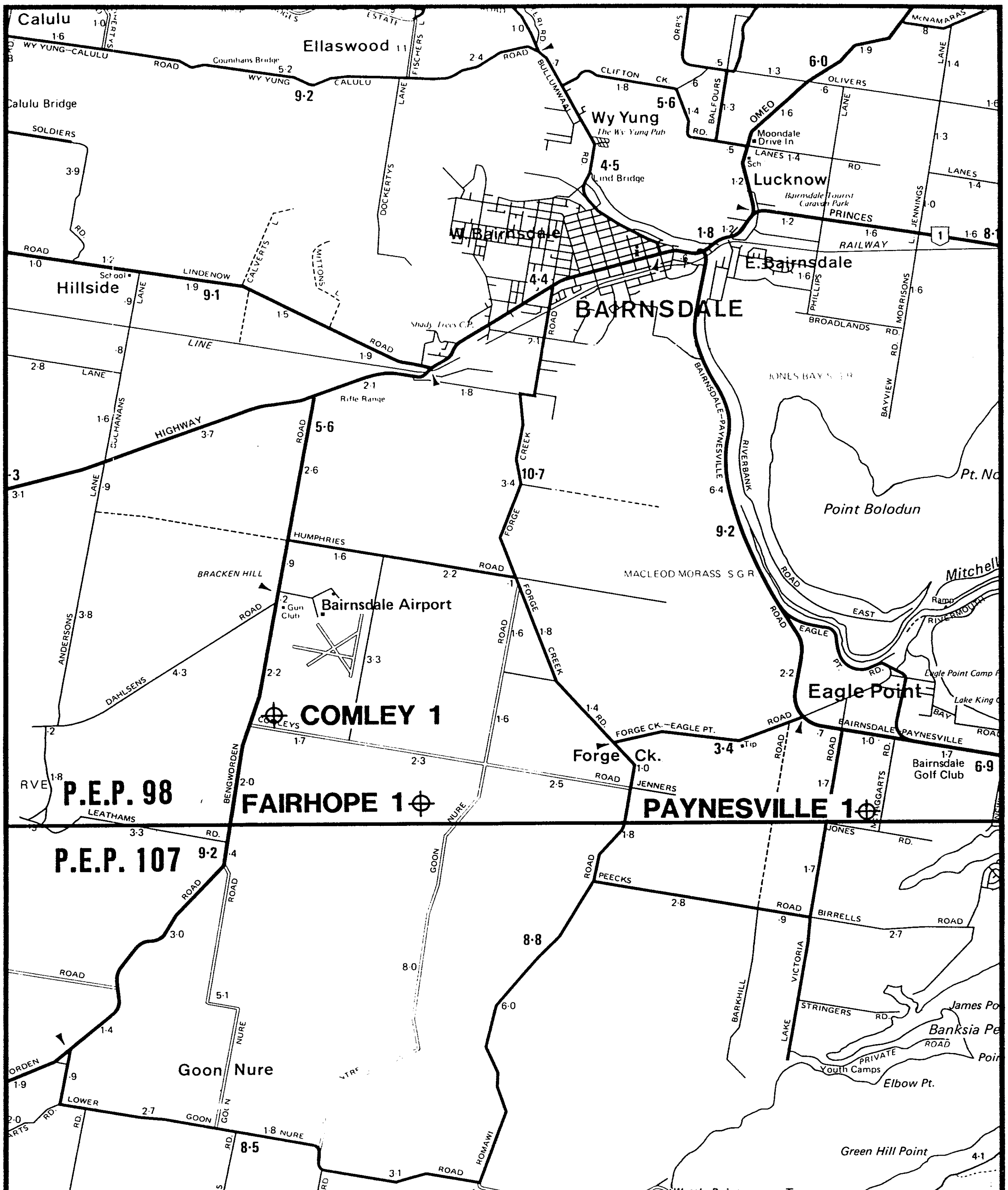
AMPOL EXPLORATION LIMITED

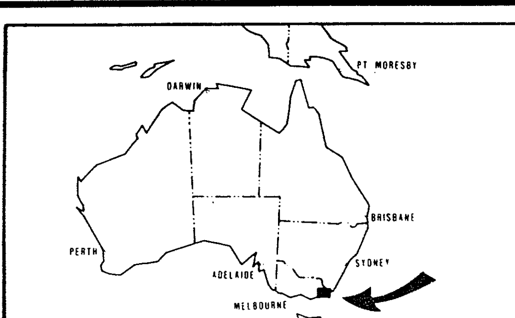
GIPPSLAND BASIN
PEP 98, VICTORIA

PERMIT LOCATION MAP

0 15 30 45 60km

MAY 1985





LOCATION MAP

AMPOL EXPLORATION LIMITED

GIPPSLAND BASIN
PEP 98, VICTORIA

WELL LOCATION MAP

0 1 2 3 4km.

AUTHOR	DATE MAY 1985
DRWG NO.	FIGURE NO.

WELL HISTORY

WELL HISTORY

1. GENERAL DATA

Well Name & Number:	PAYNESVILLE NO. 1
Location:	Latitude: 37° 54' 53" S Longitude: 147° 40' 21.2" E Seismic Line: 83A - 20 Shot Point: 293 Elevation-GL: 26.0 m A.S.L. Elevation-KB: 29.96 m A.S.L.
Licence Area:	Onshore Victoria PEP-98

Interest Holders:	Ampol Exploration Limited	38.32%*
	Mincorp Petroleum N.L.	27.30%
	National Oil	8.75%
	Texas Gas	6.88%
	Messrs. A.R. Burns & D.R. Gascoine	5.00%
	Phoenix Oil & Gas N.L.	5.00%
	Victoria Exploration	5.00%*
	Bralorne International	1.25%
	Petroleum Royalties Pty. Ltd.	1.25%
	Versatile Farm Equipment	1.25%

* Ampol Exploration and Victoria Exploration currently earning interest.

Participating Interests:	Ampol Exploration Limited	81.15%
	Victoria Exploration	11.10%
	Phoenix Oil & Gas N.L.	3.75%

Operator:	Ampol Exploration Limited on behalf of Mincorp Petroleum N.L.
District:	Bairnsdale, Victoria
Total Depth:	707.7 m (Driller) 709.0 m (Logger)
Date Spudded:	July 2, 1985
Date T.D. Reached:	July 6, 1985
Date Rig Released:	July 9, 1985
Drilling time to T.D.:	4 days
Status:	Dry hole. Plugged and abandoned.

2. DRILLING DATA

Drilling Contractor:	Atco-APM Drilling Pty. Ltd., 33 Barfield Crescent, ELIZABETH WEST. S.A. 5112
Rig:	Atco Rig No. A3

DRILLING RIG:

Trailer mounted Franks Cabot drilling rig
Mounted on a 12'8" wide x 47' long Goose Neck trailer
Tandem Rear Axles: 16 - 11R 22.5 Radial Tyres
Hydraulic support legs: Four Locknut Feature
Dog House and Generator Set are mounted on trailer
Trailer Weight: 40.857 tonnes
Axle Loading: 28.0 tonnes

DRAWWORKS

Franks Cabot, Model 1287-TD Single Drum Drawworks
Hydromatic: 22" SR Parmac

DRAWWORKS MOTOR

G.E. Series SGE-76101 electric motor, complete with blower driven by a 5 h.p. electric motor.

HYDRAULIC SYSTEM

1 - 1/4" 'x 2" hydraulic pump, driven by a 50 h.p. electric motor 575 volts, ID# 9002764-049, connected to a 270 gallon fluid reservoir.

S.C.R. SYSTEM

Manufactured by Integrated Power Systems Corporation

Ratings:	Input Voltage	:	600 VAC 30-3W
	Output Voltage	:	0-750 VDC
	Input Current	:	600 ADC Cont
			1250 ADC Int

GENERATORS A.C.

Generators Nos. 1 and 2
E.M. Bemac Brushless Generator
500 KVA, 400 KW, 600 Volts, 60HZ/110V/220V Rig Supply
Powered by a Caterpillar Model D-353E Diesel engine
S.C.R. generator system fully inter-dependent

TABLE ROTARY MACHINE

Ideco Model C-175 Rotary Table
Size: 17 1/2" x 44" complete with split master bushings

SUBSTRUCTURE

Two Section Box Style Substructure
Top Section : 11'W x 11'L x 9' high (BOP Rack)
Pony Sub : 11'W x 11'L x 3'8" high
Overall Size : 11'W x 11'L x 12'8" high

LIGHTING

Including: Mast Light String, Flood Lights, Building Lighting

MAST

96' Two Section Telescoping Type Mast, manufactured by Greco Steel Corp.
Deadline Anchor: Attached to Carrier
Crown Blocks:
Working Sheaves : 4 - 22" dia. - 1" grooving
Fastline Sheave : 1 - 32" dia. - 1" grooving

BLOCKS AND HOOK

Sowa Hook-Block Assembly, 150 ton capacity, Model 3630-4, S/N: 3896-1 with 4 - 30" sheaves, grooved for 1" drilling line

SWIVEL

Oilwell Model No. SA-150 Swivel, Job No. 2048
Kelly Spinner, Foster Model 77, S/N: 77-1-412 complete with 2 - 1" x 60' Long Hydraulic Hoses

KELLY, KELLY BUSHING, KELLY COCK AND STABBING VALVE

1 - 1-1/4" x 40' long Kelly with 4-1/2" XH pin & 6-5/8" Reg. box
1 - Baash Ross 2RCS4 Kelly Bushings
1 - Griffith Upper Kelly Cock, 5000 psi, S/N: 5139 452U-33
1 - Hydril Stabbing Valve with 4-1/2" XH pin and box
1 - Grey Inside B.O.P. with 4-1/2" XH pin and box

PUMPS - SLUSH NO. 1 AND 2

1 - TSM-500 Duplex Slush Pump, Size: 7-1/2" x 16"
Maximum Pump Speed: 65 S.P.M.
Maximum Fluid End Test Pressure: 3000 psi
Pumps loaded w/- 5-1/2" liners
Rated at 1902 psi @D 65 SP.M
5.31 Gallons (U.S)/Stroke @ 90% effic.

NO. 1 PUMP ENGINE

G.E. Electric Motor, Model 5-GE-761-JI

NO. 2 PUMP ENGINE

Caterpillar Model D-353 Diesel Engine, 435 H.P.

TANKS - MUD AND MUD SYSTEM

Mud Tanks - Total Capacity 650 BBL

Tank 1
265 BBL capacity in 3 compartments with sand trap
Low pressure mud system with 3 subsurface guns
2 Grey Agitators model 72-0-5 powered by 2 x 5 hp electric motors
1 Harrisburg double deck shale shaker powered by 5 h.p. electric motor
1 x 3 cone Desander complete sq header manifold and overflow trough
1 Mission 5" x 6" centrifugal pump 1 7/8 shaft
powered by 50 HP 575 volt electric motor
1 x 16" Poorboy Degasser fed by 3" mud line

Tank 2
385 BBL capacity in two compartments (suction tank 342 BBL's and pill) tank of 43 BBL's
Connected to tank 1 via 10" suctions and 12" mud trough
Low pressure mud systems with 4 subsurface guns
Fitted with 2 - 4 x 2 standard mud mix hopper
1 Mission 5" x 6" centrifugal powered by 60 HP 575 volts electric motor
1 x 10 Cone Desilter (Swabco) @D 500 GPM

BLOWOUT AND WELL CONTROL EQUIPMENT

1 - Shaffer "Annular" Blowout Preventer 3000 psi, Assembly No. 5820
Trim : Internal H_2S
Top Connection : Studded
Btm Connection : Flanged
Bore Size : 11"

1 - Cameron 3000 psi Double Gate Blowout Preventer, Type "SS" No. 165. Fitted with 4 1/2" Rams x Blind Rams
Bore Size : 11"
Top and Bottom
Connections : Studded
Outlets : 2 - 3" 3000 psi Flanged
Extra Rams to Fit - 2 3/8", 2 7/8", 5 1/2" and 7"

HYDRAULIC FLUID ACCUMULATOR

1 - Wagner Model 5-80-1BN Hydraulic Fluid Accumulator Unit Four Station Control Manifold with 4 - 20 gallon bladder type Accumulator Bottles, hydraulic pump powered by a 5 HP electric motor
2 - 220 cu. ft. Nitrogen Bottle Back-up System
2 - CIW 3000 and 5000 PSI Hydro Poise Readout Gauges, A-B On/Off Switch panel
System is complete with Remote Control Panel, mounted in Dog House

B.O.P SPOOLS AND VALVES

Including:
1 - 900 Series 11" Adaptor Spool with 2 - 3" Flanged Outlets
1 - 3" 3000 PSI McEvoy Gale Valve with Otis Actuator
2 - 3" McEvoy 3000 PSI Gate Valves
2 - 3" 3000 PSI National Ball Valves
1 - 3" 3000 PSI Check Valve

WELL CONTROL MANIFOLD

McEvoy 3" x 2" Well Control Manifold consisting of:

8 - 2" 3000 PSI Flanged McEvoy Gate Valves
2 - 3" 3000 PSI Flanged McEvoy Gate Valves
2 - 2" Three Way Block Connectors
2 - 3" x 3" x 2" Four Way Block Connectors
2 - Willis Multi-Orifice Chokes
1 - CIW, 3000 PSI Pressure Gauge
1 - Marsh 3000 PSI Gauge complete with 100' 1/2" Hydraulic Hose

DRILL PIPE

90 - Joints (approx 900M) 4 1/2" 16.60# Grade "E" Range 2 Drill Pipe W/ 6 1/4" ID 18 Deg. Reed 4 1/2" XH Tool Joints. Drill Pipe is complete with Hardfacing, Series 200 inspected and internall coated with PA-2000.

10 - Joints 4 1/4" XH Heavi-Wate Drill Pipe Range 2 with 4 1/2" XH Box to pin complete ID Tube cote and Hardfacing Premium No. 1.

DRILL COLLARS

20 - 6 1/4" OD Drill Collars, Hardbanded with 4 1/2" Xh Connections
3 - 8" O.D. Drill Collars - Hardbanded - W/- 6 5/8" reg Connections

INSTRUMENTATION

1 - Cameron Type "C" Weight Indicator, 180,000 LB.
2 - 2" Gauges Int. Mud Gauges type "D" (Standpipe)
1 - 2" Cameron type "F" Pressure Gauge (Pump)

TOOL HOUSE

11'6" wide x 30' long x 8'4" high Broken Panel Steel Construction

DOG HOUSE

Mounted on Rig Carrier - Size: 12'W x 12'L x 7'H
Dog House Contents:
1 - Knowledge Box
2 - NRL Light Fixtures recessed into roof of building

COMBINATION BUILDING

S.C.R. Building/Generator Room/Fuel Tank

Fuel Tank Size: 10'L x 6'6"H x 45" Deep (approx. 1500 gallons) or 6860
Overall Skid Size: 10'W x 38'L x 10'6"H

CATWALK - PIPE RACKS

Catwalk - 8'W x 40'L
2 - Sets Pipe Racks built with 4" Square Tubing

PUMPS CENTRIFUGAL

Water Circulating:

1 - 2" x 2" Centrifugal Pump driven by a 5 HP Lincoln Electric Motor

Rig Wash Pump:

Magikist Model 32-C Triplex pump driven by a 3HP Brook Electric Motor, 230-460 Volts Type "DP", S/N: X807080.

Fuel Transfer Pump:

1 - 1" x 1" Fuel Transfer Pump driven by a 3/4 HP Electric Motor.

MATTING - RIG

4 - 8' Wide x 20' Long x 8" High Rig Mats.

WINCHES

Gearmatic Pullmaster Model H-10 powered by a Commercial 1" x 1" Hydraulic motor, Model D230-154-2, S/N: C39-647, complete with approx. 300' - 1/2" steel cable.

1 - Wireline Survey unit, powered by a Hydrailic motor and complete with 7000' of.092 Wire Line.

FISHING EQUIPMENT

1 - 8 1/8" OD S.H. Series 150 Overshot with 4 1/2" FH Box Connection, complete with 4 3/8", 4 1/2", 5 3/4", 6", 6 1/8", 6 1/4" Basket Grapples and Mill Control Packers for each.

CAMP AND FACILITIES

1 - Toolpush Shack - fully furnished and airconditioned

2 - Toyotas - four wheel drive (crewcab, ute)

3. DRILLING SUMMARY : (K.B. DEPTHS)

Paynesville No. 1 was spudded at 0430 hours on July 2 1985 in 12-1/4" hole and drilled to 124.9 metres with surveys. The hole was conditioned and 8 joints of 9-5/8" 40 PPF N.80 Range 3 BT&C casing run, landed at 121.9 metres and cemented with 113 sacks Class 'A' cement with 2% prehydrated gel and 2% $CACL_2$ and 181 sacks Class 'A' cement with 2% $CACL_2$. Good returns were noticed throughout with cement to surface.

After waiting on cement, the bradenhead and B.O.P.'s were installed and nippled up and then tested to the required pressures.

The float collar and shoe were drilled out with a Gel/Polymer mud to 4 metres below the shoe where a Pressure Integrity Test was carried out and gave a mudweight limit of 12.1 PPG.

Drilling continued in 8-1/2" hole with surveys to 597 metres where samples were circulated up and a trip was made to cut Core No. 1, having improved the properties of the Gel/Polymer mud at 340 metres.

Core No. 1 was cut from 597 metres to 606 metres in the Latrobe Section with no recovery.

Drilling continued in 8-1/2" hole to 699.5 metres with surveys where, after circulating up samples, a trip was made to cut Core No. 2.

After reaming 88 metres to bottom, core no. 2 was cut from 699.5 metres to 707.7 metres in Basement with a 48% recovery.

Electric wireline logs were run and then a trip was carried out to ensure the hole was clean for D.S.T. No.1.

D.S.T. No. 1 had a packer failure and subsequently D.S.T. No. 2 was run to test the Latrobe sand.

The D.S.T. flowed water and the well was plugged and abandoned with 2 cement plugs and the rig was released at 1700 hours on July 9, 1985.

(a) Drilling Fluid:

Chemical additives and mud control services were supplied by Geofluids Pty. Ltd. Drilling Fluids.

Spud mud was used from surface to 124.9 metres in the 12-1/4" surface hole and from 124.9 metres to 707.7 metres (T.D.) a Gel/Polymer mud was used in the 8-1/2" hole..

Properties:

Date	Mud Weight (P.P.G.)	Viscosity (Secs)	W.L. (mls/30 mins)	P.H.	Solids
July 2	9.1	37	N/A	9.5	N/A
July 3	8.7	41	6.8	9.5	3.0%
July 4	8.9	41	6.4	8.5	4.0%
July 5	8.9	41	6.2	8.5	4.0%
July 6	9.0	40	7.8	8.5	5.0%
July 7	9.0	42	8.8	10.0	5.0%

Chemicals Used: (12-1/4" Hole)

Milgel	89 sacks	(100 lbs)	4045 kgs
Caustic Soda	2 sacks	(50 kgs)	100 kgs

Chemicals Used: (8-1/2" hole)

Caustic Soda	1 drum	(50 kgs)	50 kgs
Celpol	10 sacks	(25 kgs)	250 kgs
CMC-LV	10 sacks	(25 kgs)	250 kgs
Permalose	20 sacks	(25 kgs)	500 kgs

(b) Water Supply

Make-up water for drilling was obtained from the local Shire Council and trucked to location about 6 kilometres.

Logging and Testing

(a) Formation Sampling

Mudlogging was provided by Geoservices Overseas S.A. Spot samples of ditch cuttings were collected at 10 m intervals from 10 m to 124.9 m. Regular ditch cutting samples were collected at 5 m intervals from 124.9 m to 440 m and then at 3 m intervals to 707.7 metres (T.D.). All samples were washed, checked for fluorescence and visual porosity, described and bagged. One set of washed and dried cutting samples was forwarded to:

Oil & Gas Division,
Office of Minerals & Energy,
Dept. of Industry, Technology & Resources,
151 Flinders Street,
MELBOURNE. VICTORIA. 3000

(b) Coring

Coring equipment and wellsite services were provided by Norton Christensen Inc.

Core No. 1 was cut from 597.8 metres to 606.0 metres in the Latrobe sand using a 30' x 6-3/4" x 4" core barrel with a type RC-4 corehead. No core was recovered due to the unconsolidated nature of the cored section. Average penetration while coring was 30 metres per hour.

Core No. 2 was cut from 699.5 metres to 707.7 metres in Basement using a 30' x 6-3/4" x 4" core barrel with a type C-20 corehead. 3.9 metres (48%) of the core was recovered for analysis. The poor recovery was attributed to jamming in the catcher. Average penetration while coring was 1.8 metres per hour.

(c) Sidewall Cores:

Two guns of sidewall cores were shot. A total of 50 shots were fired and 16 samples were recovered for analysis. The poor recovery was due to the extremely unconsolidated nature of the formations; i.e. cables would snap when trying to recover bullets or samples would get washed out.

(d) Wireline Logging

Electric wireline logging and velocity survey were carried out by Schlumberger Seaco, Inc.

Log	From (m)	To (m)	Temperature (C^{O})
DLL-MSFL-GR	708.0	121.0	42.2 (5.0 hrs)
LDT-CNL-GR (To surface)	708.0	121.0	44.4 (7.5 hrs)
BHC (SONIC) - GR	707.0	121.0	46.1 (9.75 hrs)
NGT	708.0	370.0	47.7 (12.0 hrs)
HDT	708.0	345.0	48.8 (15.0 hrs)
WST			48.8 (16.5 hrs)
CST			

Hole problems: No hole problems were encountered during logging operations.

(e) Formation Testing

Drill stem testing in openhole was carried out by Halliburton Testing Services.

D.S.T. No. 1: On-bottom dual-packer straddle in 8-1/2" hole.

Formation: Latrobe
Interval Tested: Misrun: 573.3 - 596.9 metres (23.6 metres)
Remarks: Could not get a good packer seat on the 3 attempts, possibly due to over-gauge hole or porous nature of formation.

D.S.T. No. 2: On-bottom dual-packer straddle in 8-1/2" hole.

Formation: Latrobe
Interval Tested: 567.1 - 597.3 metres (30.2 metres)
Surface Choke: 1/2"
Bottom Hole Choke: 3/4"
Water Cushion: None

Flow Pressures:

(i) Recorder Depth - 559.6 metres

I.H.H.	880.9 psi
I.F.P.	25.7 psi
F.F.P.	778.8 psi
F.C.I.P.	778.8 psi
F.H.H.	851.4 psi

(ii) Recorder Depth - 576.3 metres

I.H.H.	915.0 psi
I.F.P.	-
F.F.P.	-
F.C.I.P.	-
F.H.H.	868.7 psi

Temperature: 57.2°C @ 706.8 metres

(iii) Flow Periods:

First/Final Flow - 33.1 minutes
First/Final Shut-in - 76.9 minutes

(iv) Recovery

On pulling the tool free, the bar dropped to shear a pin to enable reverse circulation did not shear the pin. A second bar was dropped without success. The tools were pulled to surface and a 1/2 gallon water sample and 7.5 gallons of clear sand were recovered from above the Bar Drop sub. A 2 gallon sample of formation water was recovered from the Sampler for analysis:

Sample 1:	RW of sample at Bar Drop sub: sub: 4.69 @ 18°C (Formation water)
Sample 2:	RW of sample at Sampler sub: 4.18@ 18°C (Formation water)
Sample 3:	RW of water from recovered sand: 4.63 @ 17°C (Formation water)
Sample 4:	RW of water from recovered sand: 4.43 @ 16°C (Formation water)

(v) Remarks

Zone tested was the Latrobe sandstone. Packers were set and the tool opened with a weak blow increasing to a medium blow against a 9" waterhead. After one minute blow became erratic, dying off and picking up again. Chart No. 2 indicates the case for the gauge was plugged off during the flow period, probably due to sand.

(f) Deviation Surveys

Depth (m)	Deviation
39.0	1°
76.0	1°
113.0	$3/4^{\circ}$
213.3	0°
307.8	$1/2^{\circ}$
422.4	$1/4^{\circ}$
527.6	$1/4^{\circ}$
660.8	$1\text{-}1/2^{\circ}$
699.5	1°

(g) Velocity Survey

Survey was carried out using a Sea Slim Hole WST tool with shots taken going down with the tool closed.

Interval surveyed was from 30.0 metres to 708 metres. 32 levels were recorded with a total of 116 shots stacked.

(h) Bits

Five bits were used to drill Paynesville No. 1.

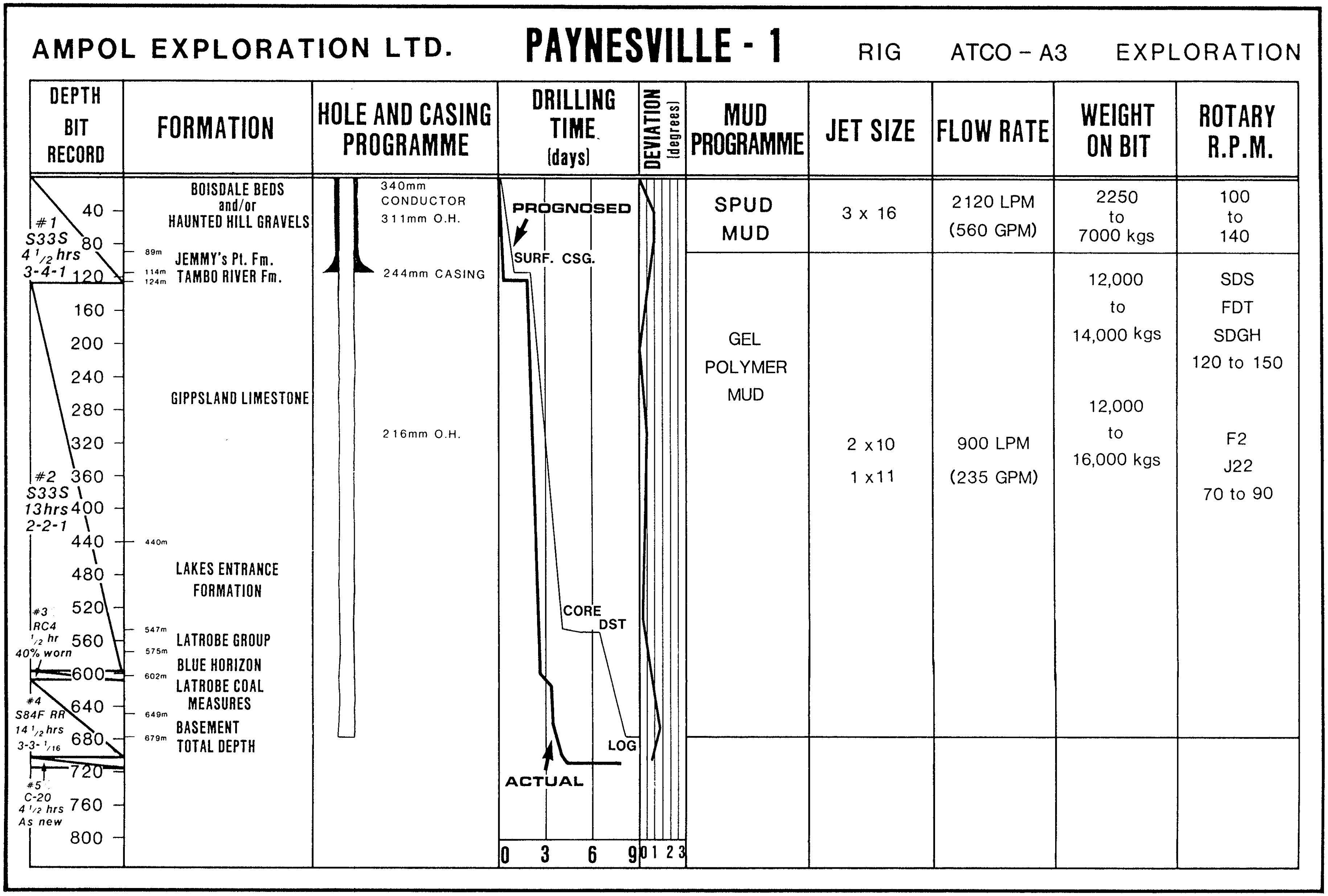
Size	IADC Type	Depth Out (m)	Hours
RR 12-1/4"	1-1-4	124.9	4.5
8-1/2"	1-1-4	597.0	13.0
8-1/2"	RC-4 (Corehead)	606.0	0.5
RR 8-1/2"	5-1-7	699.5	14.5
8-15/32"	C-20	707.7	4.5

(i) Completion

Paynesville No. 1 was plugged and abandoned with a cap screwed on the casing stub at surface with a 1" valve installed.

	Plug Interval (m)	Remarks
1.	596 - 550 m	70 sacks of Class 'A' cement across the top of the Gurnard Formation.
2.	142 - 85.1 m	59 sacks of Class 'A' cement with 2% $CACL_2$ across the surface casing shoe. Top of cement tagged at 85.1 metres.

DRILLING SUMMARY



GEOLOGY

GEOLOGY

1. SUMMARY

Paynesville #1 is an exploration well located approximately 12 km. S.E. of Bairnsdale in the onshore Gippsland Basin.

The Paynesville #1 prospect was prognosed to be a fourway closed drape of Tertiary sediments over a basement high. The primary objectives were sandstone reservoirs of the Latrobe Group.

The well reached a total depth of 709m. in metasedimentary basement of Ordovician age.

A thicker sequence of Latrobe Group sediment (47 m.) was penetrated in Paynesville #1 compared to that penetrated in the nearby Comley #1 and Fairhope #1 wells.

Two cores were cut, one in the Latrobe Group (not recovered) and one in Basement (3.9 m. recovered). Two DST's (DST #1 misrun) were run in the Latrobe Group. DST #2 recovered 9.5 l. of formation water and 28.4 l. of clean sand and formation water before the tool became clogged. Log interpretation showed the Latrobe Group to be 100% water-saturated. The well was plugged and abandoned.

Re-mapping of the seismic for the Paynesville prospect suggests that the structure opens to the north and that the Paynesville #1 well is unlikely to be a valid test.

2. REGIONAL GEOLOGY

Tectonic Setting

PEP 98 is located in the onshore portion of the Gippsland Basin. The Gippsland Basin is the most easterly of several small Mesozoic-Cainozoic basins along the south coast of Australia. The development of the basin was controlled by the opening of the Tasman Sea as the Lord Howe Rise separated from the east coast of Australia late in the Cretaceous.

The basin proper can be considered as that area west of the Lakes Entrance granite high, south of the Tertiary-Paleozoic contact on the north side of the basin and east of a line between the Wilson's Promontory granite and the town of Warragul. The position of the south boundary of the basin is not known as it lies in the area of Bass Strait.

The Gippsland Basin formed on the site of an earlier infilled rift system, (Strzelecki Basin) which developed across the southern margin of Australia during the early Mesozoic. A new rift, the Gippslnd Basin, formed during the Late Cretaceous by down-faulting between two east-west fault systems. The southern margin of the new graben, the Foster Fault System, closely follows that of the ancient rift while the northern boundary, the Rosedale Fault and its offshore extensions, lies some kilometres to the south of the ancient rift margin. Mid-Eocene to Miocene transgressive events combined with progressive subsidence of the platform north of the Rosedale Fault system resulted in deposition of an onlapping series of formations which extended the basin northward to the line of present day paleozoic outcrop. Although normal fault movements predominate, a major phase of wrench faulting along the trend of the Rosedale Fault System during the Late Eocene resulted in the formation of a number of large anticlines which host the major known hydrocarbon reserves of the offshore Gippsland Basin. Although the influence of this event is less pronounced in the onshore areas it probably had significant effects on the stratigraphy, facies distribution and structure. The northern flank of the Gippsland Basin underwent basinwards tilting during the Kosciusko uplift in the Late Pliocene.

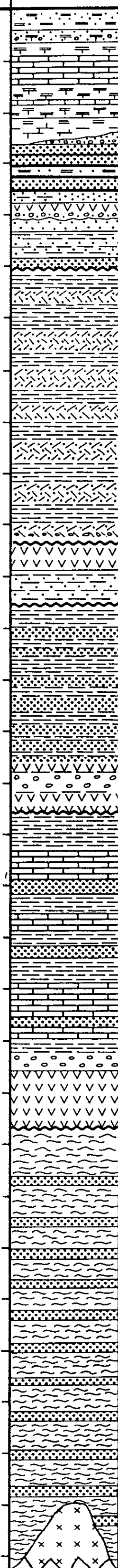
Stratigraphy

The basement of the Gippsland Basin is probably very similar to the area of Paleozoic outcrops on the north side of the basin. Ordovician and Silurian sediments, altered by dynamic metamorphism and intruded by granite, probably underlie Mesozoic strata over most of the basin. Highly folded marine strata of Middle Devonian age occur as erosional remnants, or down-faulted blocks, north of the eastern half of the basin. Isolated occurrences of Middle Devonian rocks could be expected in the subsurface in the eastern half of the basin. Overlying these altered and highly folded older Paleozoic rocks on the northern side of the basin is a thick continental sequence of red shales, sandstones, conglomerates and volcanics of Upper Devonian-Lower Carboniferous age. These beds are slightly to moderately folded and probably extend south at least as far as the Lake Wellington area.

Generalised Stratigraphy
GIPPSLAND BASIN

Aggregate Thickness (ft): 2000, 4000, 6000, 8000, 10000, 12000, 14000, 16000, 18000, 20000, 22000, 24000, 26000, 28000, 30000

Lithology:



Name	Description	Unit Thickness	Era	Age
Haunted Hills Gravels and/or Lake Wellington Fm	Sand,gravel and clay	0-400'	TERTIARY	U.PLIOCENE to PLEISTOCENE
Jemmy's Point Formation	Shelleys sand and marl	100-1000'	TERTIARY	L.PLIOCENE
Tambo River Formation	Shelley marl	20-250'	TERTIARY	U.MIOCENE
Gippsland Limestone	Limestone and marl	500-1650'	TERTIARY	MIOCENE
Lakes Entrance Fm	Shale,clay & marl-Greensand Mbr & Colquhoun Gravel at base	200-776'	TERTIARY	OLIGOCENE
Latrobe Valley Coal Measures	Sand, brown coal,clay and gravel	0-2500'	TERTIARY	L.OLIGOCENE to U.EOCENE
Narracan Group	Basalt,gravel,coal	0-400'	TERTIARY	EOCENE
Marine Cretaceous? Hollands Landing Bore only	Siltstone - mudstone	Unknown,probably very thin	MESOZOIC	L.CRETACEOUS
Strzelecki Group? seen only in Merriman No.1	Shale,mudstone and porous sand	0-650'	MESOZOIC	L.CRETACEOUS
Possible Unconformity				
Strzelecki Group	Monotonous sequence of shale, mudstone,graywacke, sub-graywacke, thin coal beds and minor conglomerate Non - marine	0-20,000' Missing in northern part of basin 490' in Duck Bay No.1 8236'+ in Wellington Park No.1 10,000-20,000' estimated in Strzelecki Ranges	MESOZOIC	L.CRETACEOUS to U.JURASSIC
Unnamed,seen only in Duck Bay No.1	Volcanics	325' in Duck Bay No.1	PALEOZOIC	PERMIAN?
Unnamed,seen only in Duck Bay No.1	Argillaceous,fine grained sandstones	624' in Duck Bay No.1	PALEOZOIC	L.PERMIAN?
Avon River Group or Iguana Creek Beds	Red and green shale, sandstone ,siltstone and conglomerate with volcanics in basal part Non-marine	0-10,000' 2398' in Southwest Bairnsdale No.1 Absent in eastern part of the basin	PALEOZOIC	L.CARBONIFEROUS to U.DEVONIAN
Tabberabbera Beds, Buchan Group and Waratah Bay Limestones	Limestone,dolomite, siltstone and shale with basal conglomerate. Bioherms in Buchan Group Marine	5000'+ at Tabberabbera 2500' ± at Buchan 1200'+ at Waratah Bay	PALEOZOIC	MIDDLE DEVONIAN
Snowy River Volcanics	Flows and pyroclastics	0-2500'	PALEOZOIC	MIDDLE to LOWER DEVONIAN
Basement	Strongly folded slate,shale, sandstone and quartzite with quartz veins intruded by granite and other igneous rocks	30,000'+	PALEOZOIC	SILURIAN and ORDOVICIAN Undifferentiated

AMPOL EXPLORATION LIMITED

DATE: NOV.1985

No Permian sediments are known in the subsurface of the basin. However, conglomerate exposed along a major fault on the south side of the Carrajung uplift, is thought to be glacial tillite of Permian age.

The major structural trend in the Tasman geosyncline is north-south, and because the Paleozoic rocks in the sub-surface of the Gippsland Basin are an extension of this geosyncline the same trend is thought to persist.

No sediments of Triassic age are known in the Gippsland Basin.

The oldest sediments in the basin are those of the Early Cretaceous Strzelecki Group which were deposited in the earlier Strzelecki rift system. Where it is known on the uplifted and eroded flanks of the basin, the Strzelecki Group consists of distinctive non-marine greywackes, shales and minor coals. These rocks were deposited in coalescing alluvial fan and alluvial plain complexes.

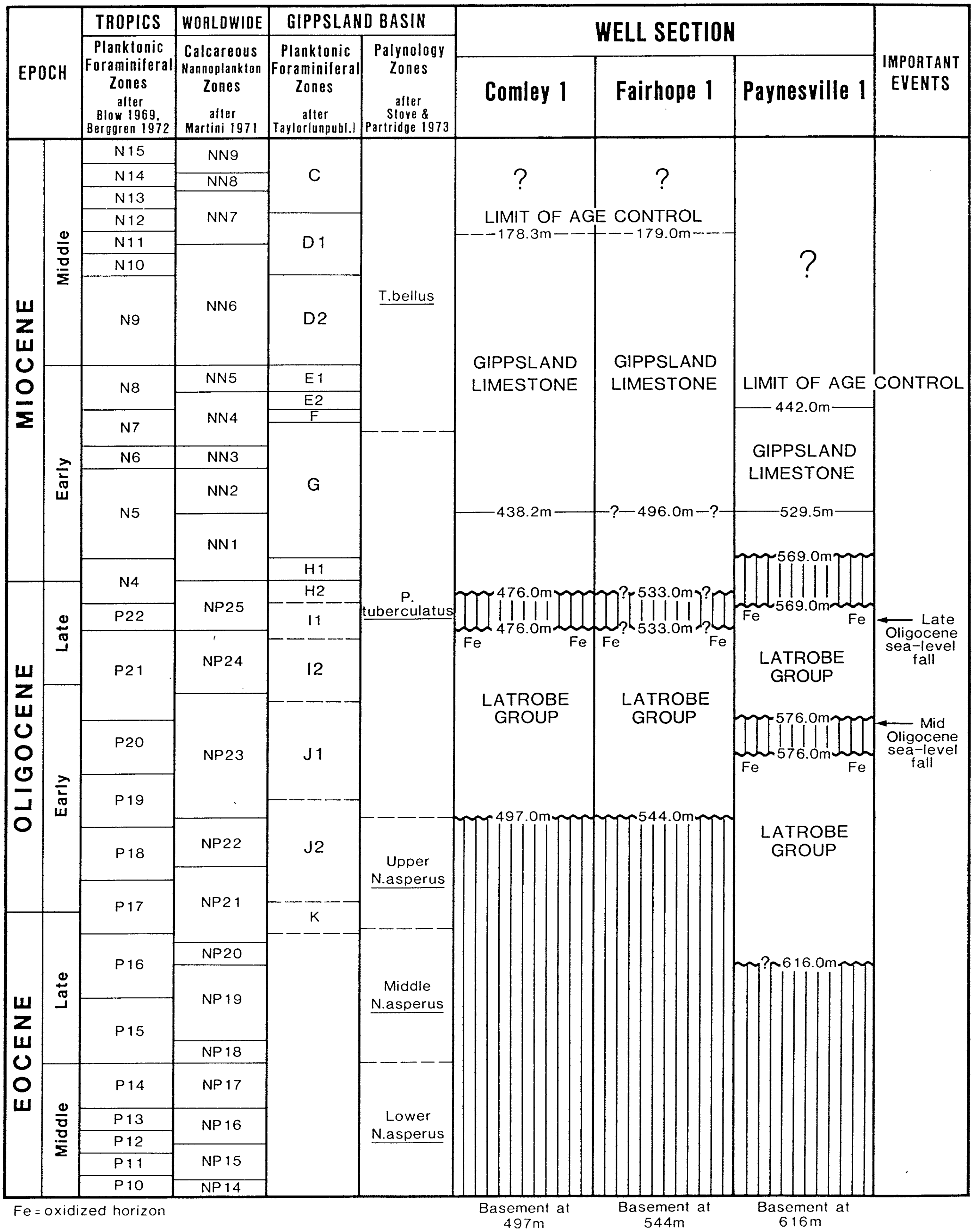
Overlying the Strzelecki Group, often with pronounced angular unconformity, is the Latrobe Group. Onshore in the western portion of the basin, the "Latrobe Valley Coal Measures" contain the world's largest commercial brown coal deposits. These are Miocene to Oligocene in age. Offshore a similar sequence is known from exploratory oil wells where the Latrobe Group ranges in age from Late Cretaceous to Late Eocene. The group thins rapidly north of the Rosedale fault system but is still present at Bairnsdale (located in PEP 98) near the northern limit of the Basin. Well control is very sparse but there may have been several of these embayment areas along the northern basin edge interspersed with locally high areas of non-deposition during Late Latrobe time.

Offshore the Latrobe Group consists of up to 5,000 metres of sandstone, siltstone, shale and coal deposited largely in non-marine environments. Marine incursions are indicated by zones rich in dinoflagellates which have assisted in the subdivision of this otherwise monotonous sequence. In the southeastern part of the basin, foresetted strandline sandstones which have been recognized in well intersections and on seismic records, represent a limit of non-marine sedimentation in the basin at that time. Since the Tasman Sea existed as early as the Late Cretaceous, marine sediments laterally-equivalent to the Latrobe Group may be preserved in deep water along the southeastern margin of the basin.

Onshore to the north of the basin centre, the Latrobe Group consists of up to some hundred metres of fluvial sandstones and gravels interbedded with siltstones and shales and some coals. The sequence appears to be fining upwards with braided stream deposits succeeded by meandering stream deposits with perhaps some marine influence towards the top of the Latrobe transgressive sequence. The Latrobe group here is probably intermediate in age between the older sequence in the offshore area and the younger sequence in the western onshore Coal Measures area.

Uplift of the northeastern part of the basin during Late Eocene periods of wrench faulting, led to the formation of submarine channels in the top of the Latrobe Group which was simultaneously subject to marine

Tentative chronostratigraphic correlation between COMLEY 1, FAIRHOPE 1 & PAYNESVILLE 1 wells, onshore Gippsland Basin - revised by Ampol Exploration Ltd



Fe = oxidized horizon

transgression. Marine greensands at the top of the Latrobe Group mark the onset of Late Eocene transgression, and are overlain by marine shales and marls of the Lakes Entrance Formation (Oligocene to Early Miocene). Deposition of shallow marine shelf carbonates of the Gippsland Limestone began in the Early Miocene with laterally equivalent shales of the Lakes Entrance Formation in deeper water.

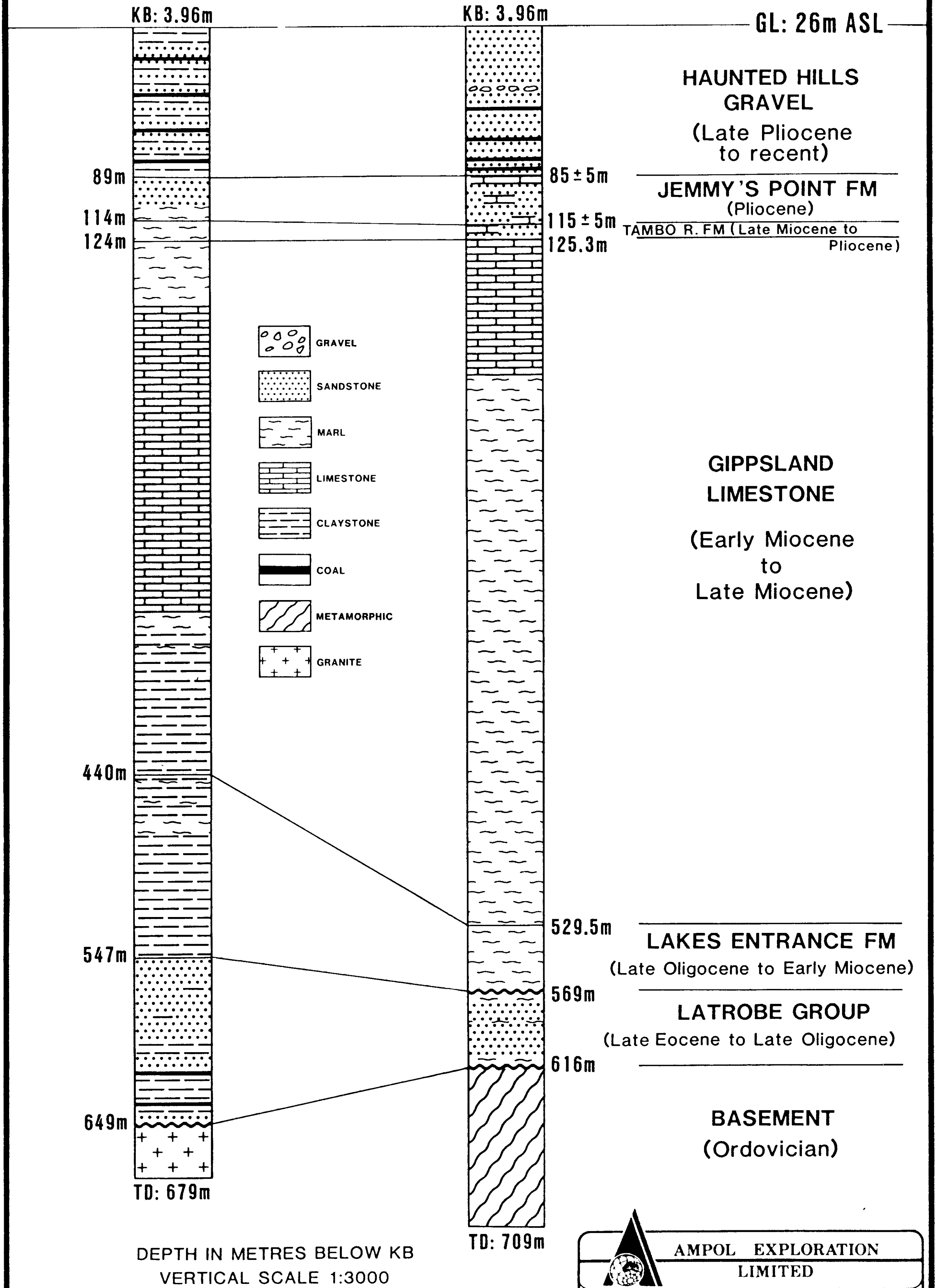
A marine environment continued into Pliocene time but then gradual retreat of the sea ended marine deposition in the Gippsland area of the Gippsland basin. From Upper Pliocene to recent time non-marine conditions prevailed, and a cover of sand, gravel and clay was deposited over part of the basin (Haunted Hills Gravel).

Although only a limited amount of time-stratigraphic data is publicly available it is clear that many of the lithostratigraphic units recognised in the Gippsland Basin are diachronous.

Hydrocarbon Occurrence

Apart from the vast accumulations of oil and gas in the offshore Gippsland Basin, only one field has been discovered onshore to date. The Lakes Entrance oil field is located within the original limits of PEP 98 and was discovered in 1924. During the life of the field 64 bores were drilled and a total of 10,000 barrels of 15.7° A.P.I. gravity crude oil produced (peak production was 572 barrels per annum). The oil is an asphaltic base crude which is devoid of gasoline and kerosene fractions. The oil is stratigraphically trapped in a glauconitic sandstone (greensand) placed at the base of the Lakes Entrance Formation/top Latrobe Group. The areal extent of the greensand is approxmately 15 km^2. Porosity and permeability are highly variable throughout the reservoir but it is usually tight and unproductive. Geochemical analysis of the Lakes Entrance oil shows that it is heavily biodegraded. The gas associated with the oil is rich in CH_4 (up to 94%) and N_2 (up to 71%). The composition of this gas is markedly different to that produced in the offshore Gippsland Basin. The gas in the Lakes Entrance field is likely to have been derived from biodegradation of the crude oil after it had migrated into the Lakes Entrance trap. Gravel (Colquhoun Gravel) with excellent reservoir potential underlies the greensand. Wireline logs show the gravel to be 100% water-saturated. Prior to the Kosciusko uplift late in the Pliocene it is possible that the gravel may have contained significant quantities of oil. Basinward tilting would have resulted in the flushing of the gravel leaving only residual oil in the less porous overlying greensand.

PAYNESVILLE 1
PREDICTED v's ACTUAL



AMPOL EXPLORATION LIMITED

AUTHOR: M.SCHMEDJE	DATE: SEPT.'85
CONTOUR INT.:	MAP No:

4. SUMMARY OF STRATIGRAPHY

HAUNTED HILLS GRAVEL: Surface to 85±5 m (81±5 m)
(Late Pliocene to Recent)

Predominantly SAND: unconsolidated, coarse to very coarse grained, translucent to off-white, subangular to subrounded, moderate to well sorted quartz. Occasional lithic grains and muscovite. Good visual porosity

with common to abundant GRAVEL from 42 m to 50 m: pebbles up to 1/2cm diameter, subangular to subrounded, fine grained igneous rock fragments

with common to abundant SANDSTONE from 50 to 80 m: grey, fine grained, translucent quartz, abundant argillaceous matrix, poorly sorted, non-calcareous, soft, carbonaceous, micaceous. Poor visual porosity

with common to abundant LIGNITE from 50 m: black, dull, moderately indurated, woody texture, pyritized in part.

JEMMY'S POINT FORMATION: 85±5 m to 115±5 m (30±10 m)
(Pliocene)

Predominantly CARBONATE: off-white to smokey grey, unconsolidated, coarse to very coarse, angular, fossil fragments

with common to abundant SANDSTONE: white to very pale grey, fine grained, soft, calcareous, glauconitic?/chloritic?. Nil visual porosity

with common to abundant SAND: A/A.

TAMBO RIVER FORMATION: 115±5 to 125.3 m (10±5 m)
(Late Miocene to Pliocene)

Predominantly SANDSTONE: A/A, more argillaceous, fossiliferous, hard to soft

with minor CARBONATE: A/A.

GIPPSLAND LIMESTONE: 125.3 to 529.5 m (404.2 m)
(Early Miocene to Late Miocene)

Predominantly CARBONATE to 200 m: A/A.

Predominantly MARL from 200 m:pale grey, soft, unconsolidated, poorly sorted micrite and fossil fragments, glauconitic. Nil visual porosity

with minor ARENACEOUS LIMESTONE: very fine to fine grained, grey to white, bioclastic, moderately indurated, poorly sorted, well cemented, glauconitic. Nil visual porosity with trace CLAYSTONE: pale green, soft calcareous

with trace SILTSTONE: grey, soft, fossiliferous, subfissile in part.

LAKES ENTRANCE FORMATION: 529.5 to 569 m (39.5 m)
(Late Oligocene to Early Miocene)

Predominantly MARL: A/A, abundant glauconite and pyrite in lower part

with minor SILTSTONE A/A and CLAYSTONE A/A.

LATROBE GROUP: 569 to 616 m (47 m)
(Late Eocene to Late Oligocene)

Predominantly SANDSTONE: unconsolidated, coarse to very coarse grained, well sorted, subangular, translucent quartz. Good to excellent visual porosity

with abundant SANDSTONE (at top only): fine grained, red-grey glauconitic, pyritic, argillareous, moderately indurated

with minor MARL: A/A, 100% micrite.

BASEMENT: 616 to 709 m (93 m)
(Ordovician)

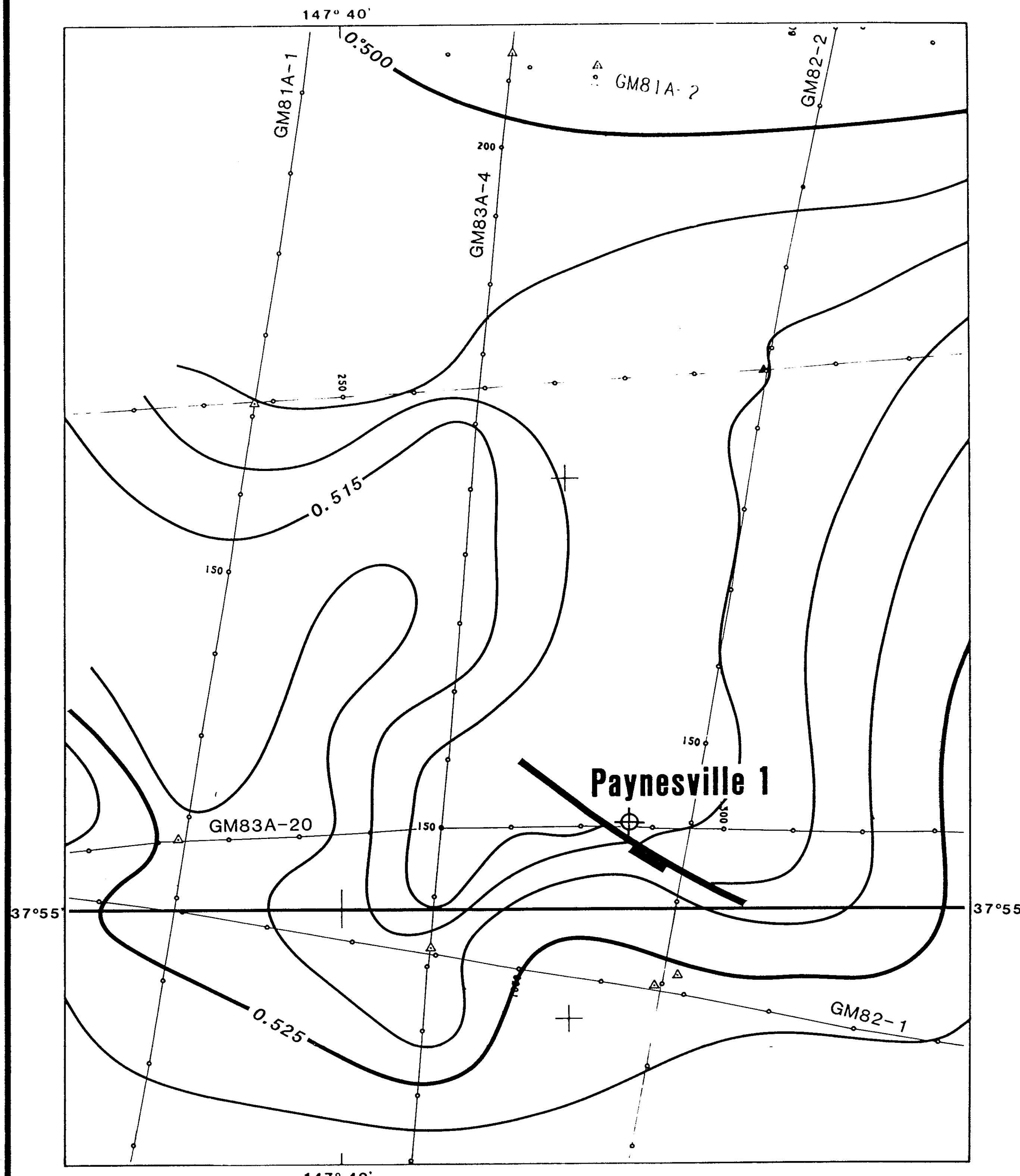
Predominantly QUARTZITE: grey to white, fine grained quartz, well cemented, moderately well indurated, hard, brittle,sucrosic texture. Nil visual porosity

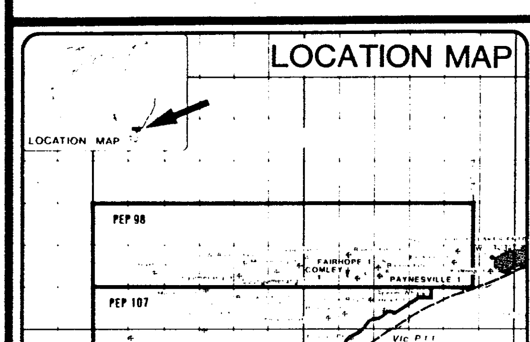
with interbedded SLATE grey to red, soft to hard, micaceous, phyllitic to slatey cleavage, arenaceous in part.

5. GEOPHYSICAL ANALYSIS

Paynesville-1 encountered the Latrobe Group at 569m KB, 22m low to prediction. This was primarily due to the use of a lower velocity (2070 m/s) than the actual velocity recorded by the well seismic survey (2120 m/s) and a slight error in timing. The correct event was picked pre-drill but an 8 millisecond time difference was due to timing the event at the zero crossing as against the peak.

The basement was encountered at 616m KB, 33m high to prediction, and has been correlated with the event which was predicted to be the top of the Latrobe Group Coal Measures. This reduced the total thickness of the Latrobe Group from the predicted 102m to 47m. The event which had been interpreted pre-drill as possible basement is now considered to be a diffraction. The current interpretation is that Paynesville-1 was located on a basement high with a thicker Latrobe Group section off the flanks.





AMPOL EXPLORATION LIMITED

GIPPSLAND BASIN
PEP 98, VICTORIA

PAYNESVILLE 1

TIME STRUCTURE MAP
Top of Latrobe Group

0 — 400m
1:10 000

AUTHOR A NELSON	DATE NOVEMBER 1985
CONTOUR INT. 5msec	MAP N°

Re-mapping of the top of Latrobe Group shows a strong likelihood that there is no closure at this horizon; the feature most likely opens to the north. In addition a small fault has been interpreted at the well location. The absence of the Latrobe Group Coal Measures at the well location meant that the deeper section could not be tested. This deep section may be present in the low immediately east of the well location, but definition of the intra-Latrobe stratigraphy requires migrated sections.

6. POROSITY AND PERMEABILITY

Wireline log evaluation indicates the Latrobe Group is the only sequence in Paynesville #1 with effective porosity. Log calculated porosities range from 0% to 46% with an average of 22.5%. Although no direct measurements of porosity and permeability are available, the recovery of 37.9 litres of clean sand and formation water from DST #2 reflects the excellent permeability of the Latrobe Group sands in Paynesville #1.

7. SUMMARY OF HYDROCARBONS

No significant indications of hydrocarbons were encountered in Paynesville #1. Evaluation of wireline logs shows that the Latrobe Group is 100% water-saturated.

Several gas peaks (up to 5% total gas) were recorded in the Latrobe Group while drilling. The peaks were of short duration and a chromatograph break down was obtained only for the peak at 593 m. (1% total gas, 3000 ppm Cl).

An on bottom straddle test (DST #1-misrun and DST #2) of the Latrobe Group from 567.1 m. to 597.4 m. recovered 9.5 litres of formation water and 28.4 litres of clean sand and formation water before the test tool became clogged. Headspace gas analysis of a formation water sample reveals the composition of the gas is mainly N_2 (44.05%) and CH_4 (42.39%). The dryness of the gas coupled with the strong "rotten" odour of the water noted at the time of testing is consistent with the gas having a microbiological origin. It should be pointed out that gas recovered from the nearby Lakes Entrance oil field is also composed predominantly of CH_4 and N_2. Analysis of an extraction of hydrocarbons from the recovered formation water reveals that only low levels of residual hydrocarbons (4.2 ppm) are present. These hydrocarbons may be the result of contamination.

Analysis of the headspace gas from ditch cutting yielded the highest gas readings from 500 m. to 530 m. at the base of the Gippsland Limestone (18,615 ppm Cl, 5 ppm C2, 2 ppm C3). The highest readings for the heavier hydrocarbon fractions were recorded from 440 m. to 470 m. (888 ppm Cl, 38 ppm C2, 11 ppm C3). Headspace gas levels for the Latrobe Group are up to 5272 ppm. Cl, 2 ppm C2 and 1 ppm C3. The headspace gas from the Latrobe Group in Paynesville #1 is dry, but the amount of total gas present is significantly greater when compared to that in the nearby Comley #1 and Fairhope #1 wells.

8. CONCLUSIONS AND CONTRIBUTIONS TO GEOLOGICAL KNOWLEDGE

- Paynesville #1 was drilled to test sandstone reservoirs of the Latrobe Group. The objective was encountered at 569m KB, 22m low to prognosis.

- The basement was encountered at 616m KB, 33m high to prognosis, and has been correlated with the event which was predicted to be the top of the Latrobe Group Coal Measures. This reduced the total thickness of the Latrobe Group from the predicted 102m to 47m.

- A thicker Latrobe Group section appears to be present off the structural highs. This would indicate that the structures were present at the time of deposition of the Latrobe Group sediments.

- Re-mapping for the prospect suggests that the structure opens to the north and that the Paynesville #1 well is unlikely to be a valid test.

- The good reservoir sands of the Latrobe Group encountered in Paynesville #1 have not yet been tested on a valid structural closure elsewhere in PEP 98. Investigation of valid structural traps in the permit should take priority over the investigation of stratigraphic traps.

- The top 7m of the Latrobe Group consists of glauconitic siltstones, below which a thick water-wet sandstone is present with an average porosity of some 30%.

- The sands of the Latrobe Group were most likely deposited in a beach/barrier environment with a southwest-northeast orientation.

- The age of the basement core lies between 445-504 million years (Ordovician).

- Interpretation of the dipmeter indicates the presence of a weathered layer at the top of the Latrobe and one at the top of Basement.

- No significant hydrocarbon shows were encountered. A drillstem test in the Latrobe Group recovered formation water only.

- Headspace gas analysis of a formation water sample reveals the composition of the gas is mainly N_2 and CH_4, indicating a biogenic origin.

  The composition of the gas is similar to both that recovered from the Lakes Entrance oil field and that associated with the Latrobe Group Coal Measures.

  Analysis of the recovered formation water shows that it contains no significant quantities of residual hydrocarbons.

- The well was plugged and abandoned.

APPENDICES

APPENDICES

APPENDIX 1.

DAILY DRILLING REPORTS

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE NO. 1	DAILY DRILLING REPORT 1

RIG SUPERVISOR I. HOFFMEIER	CONTRACTOR ATCO	RIG A3	TOOLPUSHER B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT
2.7.85	1	4.2	0	42	311mm	406mm	6m

ACTIVITY DRILLING

BHA BIT-BITSUB - 2x			MUD RECORD	IN	OUT	PUMP DATA	1	2
8" DC-xo-3 x 6½ DC -			Wt S.G.		1.08	MAKE	TRI-SERVICE	
LENGTH	-		Vis		38	MODEL	500	500
BHA TOTAL WT	-		W.L.	SPUD		LINER	5½	5½
DRILL PIPE	-		PV	MUD		STROKE	16	16
TOT. STR. WT.	-		YP			S.P.M.	65	
W.O.B.	5		GELS			PRESSURE	425	
BIT NO	IRR		FILT CK.			G.P.M.	1325	
TYPE	S33S		Chlorides			Total G.P.M.	1325	
JETS	3x16		pH			D.C. Annul Vel	30.4 M/MIN	
DEPTH IN	0		KCl			D.P. Annul Vel	21 M/MIN	
FOOTAGE	42		Solids			Circ. Time		
RPM	80/120		TEMP.			Hole Volume		
ROT. HRS	1.5		Additives	GEL 80 -		Pit Volume		
CONDITION	IN		CAUSTIC 2 -					

FROM	TO	HRS	OPERATIONS SUMMARY	DAY COST	$ 50,928
0600	2400	18	MOVE IN & RIG UP	Previous Cost	-
2400	0300	3	DIG RAT HOLE & MOUSE HOLE	Cumulative Cost	$ 50,928
0300	0430	1.5	FINISH RIGGING UP	Major Items	
0430	0600	1.5	DRILL FROM 0 - 42M	RIG MOVE	$ 48,333
				BUDGET	
				Cond.	
				Surf.	
				Int.	
				Prod.	

NEXT 24 HRS DRILL SURFACE HOLE - RUN & CMT 244MMCSG

DISCUSSION

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	TOTAL
13		2		5	20

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1 | DAILY DRILLING REPORT 2

RIG SUPERVISOR I. HOFFMEIER	CONTRACTOR ATCO	RIG A3	TOOLPUSHER B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT
3/7/85	2	124.9M	42M	82.9M	311 MM	244MM	121.9M

ACTIVITY TESTING B.O.P's

BHA BIT/B.SUB/2x203mm			MUD RECORD	IN	OUT	PUMP DATA	1	2
D.C./^{x}/o / 10x152mmD.C.			Wt S.G.	1.09		MAKE	TRI-SERVICE	
LENGTH	112.8M		Vis	37		MODEL	500	
BHA TOTAL WT			W.L.			LINER	140	
DRILL PIPE			PV			STROKE	406	
TOT. STR. WT.	27,300	kg.	YP			S.P.M.	65	
W.O.B.	2-5,000	kg.	GELS			PRESSURE	450	
BIT NO	1 RR		FILT CK.			G.P.M.	1325	
TYPE	S33S		Chlorides			Total G.P.M.	1325	
JETS	3x16		pH	9.5		D.C. Annul Vel	30.4 M/MIN	
DEPTH IN	0		KCl			D.P. Annul Vel	21.0 M/MIN	
FOOTAGE	124.9		Solids			Circ. Time	43	
RPM	120		TEMP.			Hole Volume	9.5M^3	
ROT. HRS	4.5		Additives	GEL: 9sx		Pit Volume	47.7M^3	
CONDITION	3.4.IN							

FROM	TO	HRS	OPERATIONS SUMMARY		
0600	0930	3½	DRILL 311MM HOLE TO 124.9M W/SURVEYS	DAY COST	$ 59,540
0930	1000	½	CIRCULATE HOLE CLEAN & RUN SURVEY	Previous Cost	$ 50,928
1000	1100	1	WIPER TRIP - STRAP OUT	Cumulative Cost	$110,468
1100	1130	½	CIRC. HOLE CLEAN - SPOT HI-VIS PILL	Major Items LEASE PREP	$ 33,000
1130	1230	1	P.O.H. TO RUN 244MM CASING		
1230	1430	2	RIG UP & RUN 8 JNTS 244MM CASING		
1430	1500	½	CIRCULATE CASING @ 121.9M	BUDGET	
1500	1630	1½	RIG UP HOWCO & CEMENT W/328sx 'A' CMT - GOOD RETURNS		
1630	2030	4	W.O.C.	Surf.	
2030	2330	3	SLACK OFF; CUT COLLAR & LAY OUT LANDING JNT.		
2330	2400	½	LAY OUT 8" D.C.	Prod.	
2400	0600	6	INSTALL BRADEN HEAD & N/U B.O.P's TEST MANIFOLD TO 3000		

NEXT 24 HRS TEST B.O.P. DRILL CMT & RUN P.I.T. DRILL AHEAD

DISCUSSION SURVEYS: 1 DEGREE @ 39M; 1 DEGREE @ 76M; 3/4 DEGREE @ 113M

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	TOTAL
13		2		5	20

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1	DAILY DRILLING REPORT 3

RIG SUPERVISOR	CONTRACTOR	RIG	TOOLPUSHER
I. HOFFMEIER	ATCO	A3	B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT
4.7.85	3	330M	124.9M	205.1M	216MM	244MM	121.9M

ACTIVITY DRILLING 216MM HOLE @ 330M

BHA BIT/B.SUB-16x152MM D.C. 6 HWDP.			MUD RECORD	IN	OUT	PUMP DATA	1	2
			Wt S.G.	1.06		MAKE	TRI SERVICE	
LENGTH	204.5		Vis	40		MODEL	500	
BHA TOTAL WT			W.L.	5.9		LINER	140	
DRILL PIPE			PV	13		STROKE	406	
TOT. STR. WT.	37,700	kg	YP	11		S.P.M.	43	
W.O.B.	9,000	kg	GELS	3/12		PRESSURE		
BIT NO	2		FILT CK.	2		G.P.M.	889	
TYPE	S33S		Chlorides	650		Total G.P.M.	889	
JETS	3 x 11		pH	9.0		D.C. Annul Vel	58.5 M/MIN	
DEPTH IN	125 M		KCl	-		D.P. Annul Vel	33.8 M/MIN	
FOOTAGE	205 M		Solids	3.5%		Circ. Time	80	
RPM	90/120		TEMP.			Hole Volume	4.8M3	
ROT. HRS			Additives	CELPOL: 2		Pit Volume	66.8M3	
CONDITION	IN		CMC LV: 5 PERMALOSE: 10					

FROM	TO	HRS	OPERATIONS SUMMARY		
0600	0630	½	NIPPLE UP BOP's	DAY COST	$ 14,266
0630	1000	3½	TEST BOP's & CHOKE MANIFOLD	Previous Cost	$110,468
1000	1300	3	REPAIR & REPLACE STAND PIPE UNIONS	Cumulative Cost	$124,734
1300	1330	½	TEST KELLY COCK-HOSE BLEW @ 1500 PSI	Major Items	
1330	1400	½	RIH W/BIT & D.C.'s		
1400	1730	3½	REPLACE KELLY HOSE		
1730	1900	1½	TEST KELLY COCKS & STAND PIPE	BUDGET	
1900	1930	½	P/U D.C.'s & TAG PLUG @ 104.9M	Cond.	
1930	2230	3	DRILL PLUG: FLOAT & CMT. TO 119M	Surf.	
2230	2300	½	CIRC. & TEST CSG TO 500 PSI	Int.	
2300	2400	1	DRILL CMT & SHOE: RUN P.I.T. @ 128M 75 PSI = 12.1 EQUIV.		
2400	0100	1	DRILL 216MM 128M-186M		cont'd ...2/..

NEXT 24 HRS CONTINUE DRILLING; CUT CORE # 1

DISCUSSION SURVEYS: 0 DEGREE @ 213M; ½ DEGREE @ 308M

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	TOTAL
13		2		6	21

AMPOL EXPLORATION LIMITED (2)

WELL: PAYNESVILLE # 1	DAILY DRILLING REPORT 3

RIG SUPERVISOR	I. HOFFMEIER	CONTRACTOR	ATCO	RIG	A3	TOOLPUSHER	B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT

ACTIVITY

BHA			MUD RECORD	IN	OUT	PUMP DATA	1	2
			Wt			MAKE		
LENGTH			Vis			MODEL		
BHA TOTAL WT			W.L.			LINER		
DRILL PIPE			PV			STROKE		
TOT. STR. WT.			YP			S.P.M.		
W.O.B.			GELS			PRESSURE		
BIT NO			FILT CK.			G.P.M.		
TYPE			Chlorides			Total G.P.M.		
JETS			pH			D.C. Annul Vel		
DEPTH IN			KCl			D.P. Annul Vel		
FOOTAGE			Solids			Circ. Time		
RPM			TEMP.			Hole Volume		
ROT. HRS			Additives			Pit Volume		
CONDITION								

FROM	TO	HRS	OPERATIONS SUMMARY	DAY COST	
0100	0200	1	REPAIR RIG: KELLY SPINNER HOSES	Previous Cost	
0200	0600	4	DRILL 216MM HOLE W/SURVEYS TO 330M	Cumulative Cost	
				Major Items	
				BUDGET	
				Cond.	
				Surf.	
				Int.	
				Prod.	

NEXT 24 HRS

DISCUSSION

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1	DAILY DRILLING REPORT 4

RIG SUPERVISOR I. HOFFMEIER	CONTRACTOR ATCO	RIG A3	TOOLPUSHER B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT
5.7.85	4	616M	330M	286M	216MM	244MM	121.9M

ACTIVITY DRILLING 216MM HOLE

BHA BIT/B. SUB/16x152MM D.C			MUD RECORD	IN	OUT	PUMP DATA	1	2
6 HWDP			Wt S.G.	1.07		MAKE	TRI-SERVICE	
LENGTH	204.5		Vis	40		MODEL	500	
BHA TOTAL WT	19,500kg		W.L.	7.4		LINER	140	
DRILL PIPE	–		PV	13		STROKE	406	
TOT. STR. WT.	46,000kg		YP	11		S.P.M.	43	
W.O.B.	9-13K	4-5K	GELS	4/16		PRESSURE	800	
BIT NO	2	1RR	FILT CK.	2		G.P.M.	890	
TYPE	S33S	RC4	Chlorides	600		Total G.P.M.	890	
JETS	3 x 11	OPEN	pH	8.5		D.C. Annul Vel	58.5 M/MIN	
DEPTH IN	125M	597M	KCl	–		D.P. Annul Vel	33.8 M/MIN	
FOOTAGE	472M	9M	Solids	4%		Circ. Time	78	
RPM	90/120	70/80	TEMP.	30 DGRS. C		Hole Volume	$21.5M^3$	
ROT. HRS		½	Additives	CMC L.V.: 5		Pit Volume	$47.7M^3$	
CONDITION	2-2-I	40% WORN IN/OUT	PERMALOSE: 10 CELPOL: 2					

FROM	TO	HRS	OPERATIONS SUMMARY		
0600	1430	8½	DRILL W/SURVEYS FROM 330-546M	DAY COST	$ 11,904
1430	1500	½	CIRC. SAMPLE @ 546M	Previous Cost	$124,734
1500	1600	1	DRILL 216MM HOLE: 546-577M	Cumulative Cost	$136,638
1600	1630	½	CIRC SAMPLE @ 577M	Major Items	
1630	1700	½	DRILL: 577-594M		
1700	1730	½	CIRC. SAMPLE @ 594M		
1730	1800	½	DRILL: 594-597M	BUDGET	
1800	1830	½	CIRC. SAMPLE @ 597M	Cond.	
1830	2030	2	STRAP OUT F/CORE # 1	Surf.	
2030	2400	3½	M/U CORE BBL & R.I.H.	Int.	
2400	0100	1	CIRC. DROP BALL & CUT CORE # 1 TO 606M	Prod.	
0100	0230	1½	CHAIN OUT	cont'd.....2/..	

NEXT 24 HRS DRILL AHEAD CORE TO T.D. & LOG.

DISCUSSION

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	TOTAL
13		2		6	21

AMPOL EXPLORATION LIMITED (2)

WELL: PAYNESVILLE # 1

DAILY DRILLING REPORT 4

RIG SUPERVISOR I. HOFFMEIER	CONTRACTOR ATCO	RIG A3	TOOLPUSHER B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT

ACTIVITY

BHA			MUD RECORD	IN	OUT	PUMP DATA	1	2
			Wt			MAKE		
LENGTH			Vis			MODEL		
BHA TOTAL WT			W.L.			LINER		
DRILL PIPE			PV			STROKE		
TOT. STR. WT.			YP			S.P.M.		
W.O.B.			GELS			PRESSURE		
BIT NO			FILT CK.			G.P.M.		
TYPE			Chlorides			Total G.P.M.		
JETS			pH			D.C. Annul Vel		
DEPTH IN			KCl			D.P. Annul Vel		
FOOTAGE			Solids			Circ. Time		
RPM			TEMP.			Hole Volume		
ROT. HRS			Additives			Pit Volume		
CONDITION								

FROM	TO	HRS	OPERATIONS SUMMARY		
				DAY COST	
0230	0330	1	NO RECOVERY: LAY OUT CORE BBL	Previous Cost	
0330	0500	1½	M/U BIT & R.I.H.	Cumulative Cost	
0500	0530	½	UNBLOCK JETS & WASH TO BTM	Major Items	
0530	0600	½	DRILL 216MM HOLE: 606M-616M		
				BUDGET	
				Cond.	
				Surf.	
				Int.	
				Prod.	

NEXT 24 HRS

DISCUSSION

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1

DAILY DRILLING REPORT 5

RIG SUPERVISOR	CONTRACTOR	RIG	TOOLPUSHER
I. HOFFMEIER	ATCO	A3	B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT
6.7.85	5	701	616	85	216MM	244MM	121.9

ACTIVITY CUTTING CORE # 2

BHA BIT-BITSUB-16x6'/4D.C.			MUD RECORD	IN	OUT	PUMP DATA	1	2
6 HWDP			Wt	1.07		MAKE	TRISERVICE	
LENGTH	204.5		Vis	39		MODEL	500	
BHA TOTAL WT	20K.		W.L.	7.7		LINER	5½	
DRILL PIPE	-		PV	12		STROKE	16	
TOT. STR. WT.	49K.		YP	12		S.P.M.	43	
W.O.B.	13/16	4/7	GELS	3/8		PRESSURE	800	
BIT NO	4RR	5	FILT CK.	2/32		G.P.M.	890	
TYPE	S84F	C20	Chlorides	600		Total G.P.M.	890	
JETS	3 x 11	CORE	pH	8.5		D.C. Annul Vel	58.5 M/MIN	
DEPTH IN	606	699.5	KCl	-		D.P. Annul Vel	33.8 M/MIN	
FOOTAGE	93.5	1.5	Solids	4		Circ. Time	82	
RPM	70	75-100	TEMP.	32 DGRS. C		Hole Volume	25.4M³	
ROT. HRS	14.5	1.5	Additives	CELPOL 5-		Pit Volume	47.7M³	
CONDITION	3-3-1/16 IN		BARITE 8-					

FROM	TO	HRS	OPERATIONS SUMMARY
0600	1500	9	DRILL FROM 616 TO 673 M
1500	1530	.5	SURVEY @ 661 1½ DGRS.
1530	2030	5	DRILL FROM 673 TO 699.5 M
2030	2100	.5	CIRC HOLE CLEAN
2100	2230	1.5	DROP SURVEY & STRAP OUT
2230	2300	.5	SLIP LINE
2300	2400	1	MAKE UP CORE BARREL
2400	0130	1.5	R.I.H.
0130	0530	4	REAM 88M. TO BTM.
0530	0600	.5	CUT CORE # 2 TO 701 M.

DAY COST	$ 16,414
Previous Cost	$136,638
Cumulative Cost	$153,052
Major Items	
BUDGET	
Cond.	
Surf.	
Int.	
Prod.	

NEXT 24 HRS RECOVER CORE # 2 - WIPER TRIP - LOGGING.

DISCUSSION

CONTRACTOR PERS.	AMPOL PERS.	OTHERS	TOTAL
13	2	6	21

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1

DAILY DRILLING REPORT 6

RIG SUPERVISOR	CONTRACTOR	RIG	TOOLPUSHER
I. HOFFMEIER	ATCO	A3	B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT
7.7.85	6	707.7	701	6.7	216 MM	244MM	121.9

ACTIVITY LOGGING

BHA CORE HEAD - CORE BBL			MUD RECORD	IN	OUT	PUMP DATA	1	2
16x6¼ D.C. - 6 HWDP			Wt S.G.	1.08		MAKE	TRISERVICE	
LENGTH	213.6		Vis	40		MODEL		
BHA TOTAL WT	20K.		W.L.	7.8		LINER		
DRILL PIPE	-		PV	10		STROKE		
TOT. STR. WT.	49K.		YP	14		S.P.M.		
W.O.B.	4-7K		GELS	3/5		PRESSURE		
BIT NO	5		FILT CK.	2/32		G.P.M.		
TYPE	C20		Chlorides	600		Total G.P.M.		
JETS	CORE		pH	8.5		D.C. Annul Vel		
DEPTH IN	699.5		KCl	-		D.P. Annul Vel		
FOOTAGE	8.2		Solids	5		Circ. Time		
RPM	75-100		TEMP.	33 DGRS C		Hole Volume		
ROT. HRS			Additives	CELPOL 1		Pit Volume		
CONDITION	2%							

FROM	TO	HRS	OPERATIONS SUMMARY		
0600	1000	4	CUT CORE # 2	DAY COST	$ 12,417
1000	1230	2.5	CHAIN OUT & RECOVER CORE 48%	Previous Cost	$153,052
1230	0600	17.5	RIG UP & LOG WITH SCHLUMBERGER	Cumulative Cost	$165,469
				Major Items	
				BUDGET	
				Cond.	
				Surf.	
				Int.	
				Prod.	

NEXT 24 HRS DST # 1

DISCUSSION 3.9 MTRS OF CORE RECOVERED.

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	TOTAL
13		2		9	24

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE #1	DAILY DRILLING REPORT 7

RIG SUPERVISOR	CONTRACTOR	RIG	TOOLPUSHER
I. HOFFMEIER	ATCO	A3	B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT
8.7.85	7	707.7M	707.7 (T.D)	-	216 MM	244MM	121.9M

ACTIVITY

BHA			MUD RECORD	IN	OUT	PUMP DATA	1	2
			Wt S.G.	1.08		MAKE		
LENGTH			Vis	42		MODEL		
BHA TOTAL WT			W.L.	8.8		LINER		
DRILL PIPE			PV	11		STROKE		
TOT. STR. WT.			YP	14		S.P.M.		
W.O.B.			GELS	3/7		PRESSURE		
BIT NO			FILT CK.	2/32		G.P.M.		
TYPE			Chlorides	600		Total G.P.M.		
JETS			pH	10.0		D.C. Annul Vel		
DEPTH IN			KCl	-		D.P. Annul Vel		
FOOTAGE			Solids	5		Circ. Time		
RPM			TEMP.	-		Hole Volume		
ROT. HRS			Additives	CAUSTIC 1		Pit Volume		
CONDITION								

FROM	TO	HRS	OPERATIONS SUMMARY	DAY COST	$ 73,588
0600	1330	7.5	LOGGING	Previous Cost	$165,469
1330	1400	.5	RIG DOWN SCHLUMBERGER	Cumulative Cost	$239,057
1400	1800	4	R.I.H. - WASH PAST PACKER SEATS	Major Items	
			TO CLEAN OFF SIDEWALL SHOTS	SCHLUMBERGER	63,072
1800	2000	2	CIRC & COND. MUD		
2000	2200	2	P.O.H. - STRAP OUT		
2200	0300	5	MAKE UP HOWCO TEST TOOLS	BUDGET	
0300	0430	1.5	MAKE UP TEST HEAD & TEST TO 3000 PSI	Cond.	
0430	0600	1.5	R.I.H.	Surf.	
				Int.	
				Prod.	

NEXT 24 HRS DST # 1 - P & A

DISCUSSION AFTER R.I.H. W/-TEST TOOLS.CHICKSAN LEAKING WHEN TESTED - HOWCO TOOL TOOK LONGER THAN USUAL TO MAKE UP, MORE MAKEUP ON CATWALK COULD HAVE BEEN DONE.

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	TOTAL
13		2		4	19

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1	DAILY DRILLING REPORT

RIG SUPERVISOR I. HOFFMEIER	CONTRACTOR ATCO	RIG A3	TOOLPUSHER B. NIEHAUS

DATE	SINCE SPUD	DEPTH	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT
9.7.85	8	707.7	-	-	8½	$9^5/8$	121.9

ACTIVITY CIRC. & TEST LINES FOR CMT PLUG#2

BHA			MUD RECORD	IN	OUT	PUMP DATA	1	2
			Wt	CEMENT	PLUGS	MAKE		
LENGTH			Vis	#1	#2	MODEL		
BHA TOTAL WT			W.L. SX	70	59	LINER		
DRILL PIPE			PV MIX H_2O	8.1	6.9	STROKE		
TOT. STR. WT.			YP LEAD	5.0	5.0	S.P.M.		
W.O.B.			GELS TAIL	1.4	1.4	PRESSURE		
BIT NO			FILT CK. DISPL	23.4	2.6	G.P.M.		
TYPE			Chlorides $CACL_2$	0	2%	Total G.P.M.		
JETS			pH FROM	550	96	D.C. Annul Vel		
DEPTH IN			KCl TO	596	14.2	D.P. Annul Vel		
FOOTAGE			Solids EXCESS	30	10	Circ. Time		
RPM			TEMP. WT	15.6	15.6	Hole Volume		
ROT. HRS			Additives			Pit Volume		
CONDITION								

FROM	TO	HRS	OPERATIONS SUMMARY		
0600	0800	2	FINISH R.I.H. - HEADUP & TEST LINES	DAY COST	$25,209
0800	0830	.5	ATTEMPT TO SET PACKERS - LOSING SEAT	Previous Cost	$239,057
0830	1030	2	CHAIN OUT	Cumulative Cost	$264,266
1030	1230	2	BREAK & SERVICE TEST TOOLS	Major Items	
1230	1430	2	CHANGE PACKER DEPTHS-M/U DST	DST x 2	10,000
1430	1600	1.5	R.I.H.		
1600	1630	.5	HEAD UP - TEST LINES	BUDGET	
1630	1830	2	DST # 2	Cond.	
1830	1930	1	PULL PACKERS - DROP BAR - UNABLE TO REVERSE OUT		
1930	2130	2	POH SLOW	Int.	
2130	0200	4.5	RECOVER SAMPLES - BREAK & LAYOUT TEST TOOLS		
0200	0400	2	R.I.H. & PICK UP SINGLES		
0400	0430	.5	CIRC & TEST LINES		Cont'd..2/.

NEXT 24 HRS RELEASE RIG

DISCUSSION
0430-0500 M + PLUG #1
0500-0530 PULL 4 STANDS & CIRC.
0530-0600 PULL 21 STANDS

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	TOTAL
13		2		4	19

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1	DAILY DRILLING REPORT 9

RIG SUPERVISOR I. HOFFMEIER	CONTRACTOR ATCO	RIG A3	TOOLPUSHER B. NIEHAUS

DATE	SINCE SPUD	DEPTH PBTD	PREVIOUS DEPTH	FOOTAGE	BIT SIZE	CASING	SHOE AT
10.7.85	9	85.1	707.7	-	-	244mm	121.9

ACTIVITY RIG RELEASED 1700 HRS. 9/7/85

BHA			MUD RECORD	IN	OUT	PUMP DATA	1	2
			Wt			MAKE		
LENGTH			Vis			MODEL		
BHA TOTAL WT			W.L.			LINER		
DRILL PIPE			PV			STROKE		
TOT. STR. WT.			YP			S.P.M.		
W.O.B.			GELS			PRESSURE		
BIT NO			FILT CK.			G.P.M.		
TYPE			Chlorides			Total G.P.M.		
JETS			pH			D.C. Annul Vel		
DEPTH IN			KCl			D.P. Annul Vel		
FOOTAGE			Solids			Circ. Time		
RPM			TEMP.			Hole Volume		
ROT. HRS			Additives			Pit Volume		
CONDITION								

FROM	TO	HRS	OPERATIONS SUMMARY	DAY COST	$ 8,188
0600	0630	.5	CMT PLUG #2 - POH 4 STDS & CIRC.	Previous Cost	$264,266
0630	0700	.5	POH	Cumulative Cost	$272,454
0700	1200	5	LAY OUT D/Cs & D/P	Major Items	
1200	1230	.5	R.I.H. & TAG HARD CMT AT 85.1 MTRS		
1230	1700	4.5	NIPPLE DOWN BOP - ATTEMPT TO UNSCREW		
			CSG HEAD (TIGHT) CUT OFF CSG HEAD -		
			DUMP & CLEAN OUT MUD TANKS - LAY OUT	BUDGET	
			KELLY & SWIVEL & RATHOLE	Cond.	
				Surf.	
				Int.	
			RIG RELEASED AT 1700 HRS ON 9/7/85	Prod.	

NEXT 24 HRS

DISCUSSION

CONTRACTOR PERS.		AMPOL PERS.		OTHERS	TOTAL
13		1		2	16

APPENDIX 2.

DAILY GEOLOGICAL REPORTS

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 2/7/85

DEPTH: 42 m PROGRESS: 42 m DAYS FROM SPUD: 1

REPORT PERIOD: 0600, 1/7 to 0600, 2/7/85. OPERATION: DRILLING AHEAD

FORMATION: HAUNTED HILLS GRAVELS PAGE: 1 OF: 1

FORMATION TOPS: NO MUD LOGGING IN TOP HOLE
(10 m spot samples only)

DEPTH INTERVAL	ROP M/hr			LITHOLOGY
	MIN	AVE	MAX	
0m	15	50	120	QUARTZ SAND (100%)
to				coarse to very coarse grained (predominately
42m				very coarse), translucent-off white,
				subangular to subrounded quartz. Moderate -
				well sorted, yellow staining in part.
				Infered good visual porosity.
				LITHIC SAND (Trace)
				Coarse grained fragments, rounded, very
				hard & well indurated, very fine grained
				igneous rock fragments red, green, blue & grey.
				MICA (RARE - TRACE)
				Muscovite, coarse grained flakes.
				LIMESTONE (TRACE at 20-30m)
				Unconsolidated, very coarse, angular
				fossil fragments (corals), off white & blue grey.

GAS: BACKGROUND: UNITS; C_1, C_2, C_3, C_4+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4+.

SHOWS: NIL

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 3/7/85

DEPTH: 124.9m PROGRESS: 82.9m DAYS FROM SPUD: 2

REPORT PERIOD: 0600, 2/7 to 0600, 3/7/85 OPERATION: NIPPLING UP B.O.P.

FORMATION: TAMBO RIVER FORMATION PAGE: 1 OF: 3

FORMATION TOPS: JEMMY'S POINT FORMATION (85 ± 5m)
TAMBO RIVER FORMATION (115 ± 5m)

NO MUD LOGGING ON TOP HOLE; SPOT SAMPLES ONLY (10 METRES)

DEPTH INTERVAL	ROP M/hr MIN	ROP M/hr AVE	ROP M/hr MAX	LITHOLOGY
42m		42.9		SAND (70%)
to				coarse to very coarse grained,
50m				translucent to off white, subangular to
				subrounded, unconsolidated quartz. Moderate
				sorting. Yellow staining in part. Trace
				lithic sand. Good visual porosity.
				GRAVEL (30%)
				Subrounded to subangular, quartz & lithic
				igneous rock fragments, up to ½ cm in
				diameter.
				CLAY (TRACE)
				Yellow, soft, dispersed.
50m				SAND (45 - 100%) as above.
to				coarse grained.
80m				SANDSTONE (NIL - 60%)
				grey, fine grained, translucent quartz,
				.....2/..

GAS: BACKGROUND: UNITS; C_1, C_2, C_3, C_4^+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4^+.

SHOWS: NIL

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT (2)

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 3/7/85

DEPTH: PROGRESS: DAYS FROM SPUD: 2

REPORT PERIOD: to . OPERATION:

FORMATION: PAGE: 2 OF: 3

FORMATION TOPS:

DEPTH INTERVAL	ROP			LITHOLOGY
	MIN	AVE	MAX	
				abundant argillaceous matrix, poorly
				sorted, non-calcareous, soft, poorly
				indurated, micaceous & carbonaceous,
				poor visual porosity.
				COAL (NIL - 10%)
				black, dull, moderately indurated, woody
				structure, pyritized in part.
80m				LIMESTONE (5-60%)
to				Unconsolidated, very coarse (up to ½ cm
110m				in length), angular, off-white &
				blue grey fossil fragments (predominately
				shell fragments, corals, gastropods & forams).
				SAND (5-20%) as above
				SANDSTONE (NIL - 15%)
				as above, very calcareous, glauconitic,
				poor to moderately indurated.
				COAL (NIL - 10%) as above

.....3/..

GAS: BACKGROUND: UNITS; C_1, C_2, C_3, C_4^+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4^+.

SHOWS: NIL

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT (3)

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 3/7/85

DEPTH: PROGRESS: DAYS FROM SPUD: 2

REPORT PERIOD: to . OPERATION:

FORMATION: PAGE: 3 OF: 3

FORMATION TOPS:

DEPTH INTERVAL	ROP			LITHOLOGY
	MIN	AVE	MAX	
110m				SANDSTONE (70-80%)
to				as above fossiliferous.
124.9m				MICRITE (20%)
				LIMESTONE (NIL - 5%) as above
				SAND (NIL - 5%) as above

GAS: BACKGROUND: UNITS; C_1, C_2, C_3, C_4^+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4^+.

SHOWS: NIL

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 4/7/85

DEPTH: 330m PROGRESS: 205.1m DAYS FROM SPUD: 3

REPORT PERIOD: 0600, 3/7 to 0600, 4/7/85. OPERATION: DRILLING AHEAD

FORMATION: GIPPSLAND LIMESTONE PAGE: 1 OF: 2

FORMATION TOPS: GIPPSLAND LIMESTONE (TOP OBSCURED BY POOR RETURNS)

NO GAS READINGS, CHROMATOGRAPH NOT WORKING

DEPTH INTERVAL	ROP M/hr MIN	ROP M/hr AVE	ROP M/hr MAX	LITHOLOGY
124.9m	30	165.5	600	Poor returns, mainly cement.
to				
145m				
145m	600	600	600	MARL (100%)
to				Fossil fragments : (80-95%)
185m				unconsolidated, very coarse (up to ½cm in
				length), angular, off-white & blue-grey,
				poorly sorted, glauconitic.
				Micrite. (5-20%)
				pale grey, soft, unconsolidated. Poor
				visual porosity.
185m	600	600	600	MARL (100%)
to				Fossil fragments (70%)
200				as above but predominately medium-coarse
				grained fragments; arenaceous in part.
				Micrite (30%) as above
				....2/..

GAS: BACKGROUND: NIL UNITS; C_1, C_2, C_3, C_4+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4+.

SHOWS: NIL: TRACE DULL YELLOW TO DULL WHITE MINERAL FLUORESCENCE IN CARBONATE.

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT (2)

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 4/7/85

DEPTH: PROGRESS: DAYS FROM SPUD: 3

REPORT PERIOD: to . OPERATION:

FORMATION: PAGE: 2 OF: 2

FORMATION TOPS:

NO GAS:CHROMATOGRAPH NOT WORKING

DEPTH INTERVAL	ROP			LITHOLOGY
	MIN	AVE	MAX	
200m	300	360	600	MARL (100%)
to				Micrite (50-70%) as above
215m				Fossil fragments (30-50%) as above,
				rare glauconite.
215m	33.3	75.4	300	MARL (95-100%)
to				Micrite (70%) as above
330m				Fossil fragments (30%) as above
				GLAUCONITE (TRACE - 5%)
				green & black, rounded, medium grained
				pellets.

GAS: BACKGROUND: NIL UNITS; C_1, C_2, C_3, C_4+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4+.

SHOWS: NIL: TRACE DULL YELLOW & DULL WHITE MINERAL FLUORESCENCE.

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 5/7/85

DEPTH: 616m PROGRESS: 286m DAYS FROM SPUD: 4

REPORT PERIOD: 0600, 4/7 to 0600, 5/7 . OPERATION: DRILLING AHEAD

FORMATION: LATROBE PAGE: 1 OF: 3

FORMATION TOPS: LAKES ENTRANCE (INDISTINGUISHABLE IN CUTTINGS);
LATROBE (572m);

CHROMATOGRAPH NOT WORKING TO 362m

DEPTH INTERVAL	ROP			LITHOLOGY
	MIN	AVE	MAX	
330m	40	63.2	120	MARL (100%)
to				Micrite (70%) as above
430m				Fossil fragments (30%) as above
				GLAUCONITE (TRACE)
				PYRITE (RARE)
				Fine grained, granular aggregates.
430m	6.3	52.8	120	MARL (70-100%)
to				Micrite (60-70%) as above
551m				Fossil fragments (TRACE - 30%) as above
				ARENACEOUS LIMESTONE (TRACE-30%)
Gas				very fine-fine grained, grey to white,
Range NIL-2 Units	C_1			fossiliferous, moderately indurated, well
				cemented, brittle, poorly sorted, glauconitic.
				Nil visual porosity.
				SILTSTONE (NIL-15%)
				grey, soft, fossiliferous, subfissile in part.
				CLAYSTONE: (NIL-10%)
				pale green, soft, poorly indurated, calcareous.
				....2/..

GAS: BACKGROUND: SEE ABOVE UNITS; C_1, C_2, C_3, C_4'.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4'.

SHOWS: NIL:
GAS PEAKS ONLY AT:
(1) 584m - 5% total gas (No chromatograph breakdown)
(2) 593m - 1% total gas, 15 units C_1
(3) 596.7m - 3% total gas (No chromatograph breakdown)

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT (2)

WELL: PAYNESVILLE #1 PERMIT: PEP 98 DATE: 5/7/85

DEPTH: PROGRESS: DAYS FROM SPUD: 4

REPORT PERIOD: to . OPERATION:

FORMATION: PAGE: 2 OF: 3

FORMATION TOPS:

DEPTH INTERVAL	ROP M/hr MIN	ROP M/hr AVE	ROP M/hr MAX	LITHOLOGY
551m	21.4	47	66.7	MARL (80-95%)
to				Micrite (70-80%) as above
572m				Fossil fragments (10-15%) as above
Gas				SILTSTONE (TRACE) as above
Range 1.25-2.75	units	Cl		CLAYSTONE (TRACE) as above
				GLAUCONITE (5%)
				Medium-coarse, rounded, green pellets.
				PYRITE (TRACE) as above
572m	75	171.4	200	SANDSTONE (90%)
to				coarse to very coarse grained (predominately
586m				very coarse) well sorted, very unconsolidated,
				subangular, translucent quartz. Trace
Gas Range 2.75-3.5	units	Cl		blue-grey lithics;
				NOTE: (10%) fine grained, red-grey, glauconitic,
				pyritic, argillaceous, moderate indurated
				sandstone at top
				MICRITE: (10%) as above
				.....3/..

See above

GAS: BACKGROUND: UNITS; C_1, C_2, C_3, C_4+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4+.

SHOWS: Gas only

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT (3)

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 5/7/85

DEPTH: PROGRESS: DAYS FROM SPUD: 4

REPORT PERIOD: to . OPERATION:

FORMATION: PAGE: 3 OF: 3

FORMATION TOPS:

DEPTH INTERVAL	ROP M/hr MIN	AVE	MAX	LITHOLOGY
586m	21.4	36.8	200	SANDSTONE (60-80%) as above
to				
593m				MICRITE (20-40%) as above
Gas:				
Range 3.5-15 units C1				
593m	200	200	200	SANDSTONE (85%) as above
to				MICRITE (15%) as above
596.79m				COAL (Rare)
Gas: Range 2.25 units C_1				black, dull, soft.
596.79m	30	30	30	CORE #1: No recovery
to				Infered as above
605.94m				
605.94m	200	200	200	Infered as above (No samples recovered; driller
to				told mudlogger were R.I.H., were actually
616m				drilling).

GAS: BACKGROUND: see above UNITS; C_1, C_2, C_3, C_4^+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4^+.

SHOWS: GAS ONLY

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT

WELL: PAYNESVILLE #1 PERMIT: P.E.P. 98 DATE: 6/7/85

DEPTH: 701m PROGRESS: 85m DAYS FROM SPUD: 5

REPORT PERIOD: 0600, 5/7 to 0600, 6/7/85. OPERATION: CORING

FORMATION: BASEMENT PAGE: 1 OF: 2

FORMATION TOPS:

DEPTH INTERVAL	ROP M/hr MIN	AVE	MAX	LITHOLOGY
616m	7.1	9.8	20	SANDSTONE (75-100%)
to				coarse-very coarse, translucent , frosted,
629m				subangular, well sorted quartz.
				MARL (10-15%)
				as above (cavings)
				PYRITE (TRACE - 10%)
				fine grained, aggregates & medium-coarse
				cubes. Occasionally encrusting quartz grains.
629m	6	9	30	SANDSTONE (30-45%) as above
to				
641m				QUARTZITE (30-45%) fine grained,
				translucent quartz, white, well cemented,
				moderately-well indurated, hard, brittle,
				moderately sorted, sucrosic texture. Nil
				visual porosity.
				SILTSTONE (TRACE - 5%)
				red, hard, very micaceous, sandy in part.
				"phyllitic texture"
				......2/..

GAS: BACKGROUND: NIL UNITS; C_1, C_2, C_3, C_4+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4+.

SHOWS: NIL

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT (2)

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 6/7/85

DEPTH: PROGRESS: DAYS FROM SPUD: 5

REPORT PERIOD: . to . OPERATION:

FORMATION: PAGE: 2 OF: 2

FORMATION TOPS:

DEPTH INTERVAL	ROP M/hr MIN	ROP M/hr AVE	ROP M/hr MAX	LITHOLOGY
				MARL (10-35%)
				as above (cavings)
				PYRITE (TRACE - 10%) as above
641m	4.6	6.2	10	CLAY (50-90%)
to				orange-brown, soft, unconsolidated,
674m				very cohesive.
				QUARTZITE (5-20%) as above
				SILTSTONE (5-20%) as above
				PYRITE (TRACE) as above
674m	4.2	6.4	8.6	QUARTZITE (55-85%) as above;
to				occasional quartz veins
699.5m				SILTSTONE (5-40%) as above;
				occasional quartz veins
				CLAY (10-40%); brown, soft, unconsolidated.
699.5m	2.6	2.6	2.6	Coring.
to				
701m				

GAS: BACKGROUND: NIL UNITS; C_1, C_2, C_3, C_4^+.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4^+.

SHOWS: NIL

AMPOL EXPLORATION LIMITED

DAILY GEOLOGICAL REPORT

WELL: PAYNESVILLE # 1 PERMIT: P.E.P. 98 DATE: 7/7/85

DEPTH: 707.7m PROGRESS: 6.7m DAYS FROM SPUD: 6

REPORT PERIOD: 0600, 6/7 to 0600, 7/7 . OPERATION: WIRE LINE LOGGING

FORMATION: BASEMENT PAGE: 1 OF: 1

FORMATION TOPS: T.D. 707.7m

DEPTH INTERVAL	ROP M/hr MIN	ROP M/hr AVE	ROP M/hr MAX	LITHOLOGY
701m	1.2	1.7	3.2	QUARTZITE (45-55%)
to				as above
707.7m				SILTSTONE (5-15%)
(T.D.)				as above
				CLAY (40%)
				as above
				NOTE: CORE # 2 indicates basement to be a
				metasedimentary sequence of interbedded
				quartzites & slates.

GAS: BACKGROUND: NIL UNITS; C_1, C_2, C_3, C_4.

PEAK @ M: UNITS; C_1, C_2, C_3, C_4.

SHOWS: NIL

APPENDIX 3.

FIELD ELECTRIC LOG REPORT

AMPOL EXPLORATION LIMITED

FIELD ELECTRIC LOG REPORT

GENERAL INFORMATION

WELL: (PAYNESVILLE # 1

PROGNOSED TO T.D.: 679M

CO-ORDINATES: 37° 54'54" 147° 40'21"

MUD TYPES: FRESH GEL POLYMER

AREA: ONSHORE GIPPSLAND BASIN

LOGGING COMPANY: SCHLUMBERGER

PERMIT: P.E.P. 98

LOGGING ENGINEER: J. ELLIS

ELEVATION: GL 26m ASL ;KB 29.96m ASL

GEOLOGIST: M. SCHMEDJE

LOGS RUN

RUN No: 1

DRILLERS DEPTH: 707.7m

HOLE SIZE: 8½m

LOGGERS DEPTH: 709.0m

CASING SHOE: 121m

DATE LOGGED: 6/7 to 7/7/85

HOLE PROBLEMS:

TYPE OF LOG	FROM	TO	REPEAT SECTION	Time Since Last Circ/BHT
DLL-MSFL-GR	708m	121m	706-504m	5hr/42.2 DGR. C
LDT-CNL-GR	708m	121m	650-540m	7½hr/44.4 DGRS.C
	(G.R. TO	SURFACE)		
BHC (SONIC)-GR	707m	121m	650-540m	9¾hr/46.1 DGR. C.
NGT	708m	370m	655-555m	12/47.7 DGRS.C
HDT	708m	345m	705-621m	15hr/48.8 DGRS.C
VELOCITY SURVEY.				16½hrs/48.8 DGRS.C
CST				

S.W.C. No. OF ATTEMPTS: 50 RECOVERED: 16 MISFIRED: 34

R.F.T. No. OF ATTEMPTS: – FLUID SAMPLES: –

FORMATION TOPS

FORMATION	PROGNOSED	CUTTINGS	LOGS	DIFF.FROM PROGNOSED
HAUNTED HILLS	9m			
JEMMY'S POINT	89m	85±5m		
TAMBO RIVER	114m	115±5m		
GIPPSLAND L.S	124m	(?)	125.5m	+1.5m
LAKES ENTRANCE	440m	(?)	481	+41
LATROBE	547m	572m	569	+22
BASEMENT	649m	616m	616m	-33m

COMMENTS ON LOGGING RUN:

APPENDIX 4.

SIDEWALL CORE REPORT

AMPOL EXPLORATION LIMITED ONSHORE GIPPSLAND BASIN	WELL: PAYNESVILLE 1	FORMATION: BASEMENT
	DATE: 6/5/85	CORE NUMBER: 2
	AUTHOR: M.SCHMEDJE	INTERVAL: 699.5-707.7m
CORE DESCRIPTION	SCALE: 1:20	RECOVERED: 3.9m (48%)
	SHEET NO: 1 OF: 1	CORE SIZE: 95mm dia

DEPTH (m)	LITHOLOGY	SED. STR.	Grain Size (s L f m crs crs)	DIP	BIOT.	∅		HARD.	CEM.	OIL	POR. (P F G)	COMMENTS	SAMP.
699.5 – 699.9												QUARTZITE grey, massive, fine grained quartz, hard & very well indurated. Nil visual porosity.	
699.9 – 702.5										NO OIL STAIN / NO FLUORESCENCE		SLATE soft-moderately hard, very well indurated, extremely fine grained, grey, homogenous, soapy feel, well developed slatey cleavage (90° to horizontal) occassional quartz veining, iron staining in upper part.	
702.5 – 703.4												QUARTZITE A/A, but red-grey & argillaceous in part.	
												INTERPRETATION: METASEDIMENTARY SEQUENCE CONSTITUTING BASEMENT.	

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1

SIDEWALL CORE REPORT

DEPTH INTERVAL: 574.5 - 630m

GEOLOGIST: M. SCHMEDJE

GUN NO. : 1

SHEET : 1 OF: 4

SWC NO.	DEPTH M	REC.	BOUGHT/ REJECT	PALYN. EVAL.	LITHOLOGICAL DESCRIPTION, FLUORESCENCE, ETC.
1	630m	60%	BOUGHT	PAL	SANDSTONE: fine grained, well cemented, quartz, hard, indurated, micaceous, Nil visual porosity. No fluorescence.
2	616.9	-	REJ		NOT RECOVERED.
3	614.0	-	REJ		NOT RECOVERED.
4	613	-	REJ		NOT RECOVERED.
5	610	-	REJ		NOT RECOVERED.
6	608.5	80%	BOUGHT	PAL	SANDSTONE: fine grained quartz, extremely soft and poorly consolidated. Poor-moderate visual porosity. No fluorescence.
7	606.9	-	REJ		Not recovered.
8	603m	100%	BOUGHT	THIN SECT.	SANDSTONE: As above, argillaceous. No fluorescence.
9	601	-	REJ		NOT RECOVERED.
10	597.5	-	REJ		NOT RECOVERED.
11	595.5	-	REJ		NOT RECOVERED.
12	593	-	REJ		NOT RECOVERED.
13	591	-	REJ		NOT RECOVERED.
14	587.5	-	REJ		NOT RECOVERED.
15	585.5	-	REJ		NOT RECOVERED.
16	583	-	REJ		NOT RECOVERED.
17	580	-	REJ		NOT RECOVERED.
18	577	-	REJ		NOT RECOVERED.

COMMENTS: POOR RECOVERY DUE TO EXTREMELY UNCONSOLIDATED NATURE OF FORMATION, i.e. CABLES SNAP WHEN TRYING TO RECOVER BULLETS OR SAMPLE GETS WASHED OUT.

NOTE: if more than one gun of SWC is shot please number the cores consecutively

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1

SIDEWALL CORE REPORT

DEPTH INTERVAL: RECOVERY 50 SHOT 16 RECOVERED

GEOLOGIST: M. SCHMEDJE

GUN NO. : 1

SHEET : 2 OF: 4

SWC NO.	DEPTH M	REC.	BOUGHT/ REJECT	PALYN. EVAL.	LITHOLOGICAL DESCRIPTION, FLUORESCENCE, ETC.
19	617	100%	BOUGHT	PAL	SANDSTONE; buff brown, very fine grained, moderately sorted, quartz, soft, moderately indurated, fair visual porosity. No fluorescence.
20	614	-	REJ		NO RECOVERY.
21	605	50%	BOUGHT	PAL	SANDSTONE: fine grained, pale grey, moderately sorted, very soft & unconsolidated. Moderate-good visual porosity. No fluorescence.
22	601	-	REJ		NO RECOVERY.
23	597.5	-	REJ		NO RECOVERY.
24	595.5	80%	BOUGHT		SANDSTONE: very soft, very poorly indurated, friable, fine grained, very pale grey, fair-good visual porosity. No fluorescence
25	592.5	-	REJ		NO RECOVERY.
26	585.5	-	REJ		NO RECOVERY.
27	583	-	REJ		NO RECOVERY.
28	579	-	REJ		NO RECOVERY.
29	577	-	REJ		NO RECOVERY.
30	574.5	100%	BOUGHT	PAL	SILTSTONE: soft, moderately indurated, black, very fine grained, abundant micrite, glauconitic, poor visual porosity. No fluorescence.

COMMENTS: FROM CORE 19 TO CORE 30, RAN OUT OF HOLE & TAPED BULLETS TO GUN TO TRY TO REDUCE IMPACT & INCREASE RECOVERY.

NOTE: if more than one gun of SWC is shot please number the cores consecutively.

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE #1

SIDEWALL CORE REPORT

DEPTH INTERVAL: 387-615.5 GEOLOGIST: M. SCHMEDJE

GUN NO. : 2 SHEET : 3 OF: 4

SWC NO.	DEPTH M	REC.	BOUGHT/ REJECT	PALYN. EVAL.	LITHOLOGICAL DESCRIPTION, FLUORESCENCE, ETC.
31	615.5	-	REJ		NO RECOVERY
32	613.5	-	REJ		" "
33	611	-	REJ		" "
34	599	-	REJ		" "
35	597	30%	BOUGHT	PAL	CLAYSTONE: Very soft and unconsolidated. No fluorescence.
36	592	-	REJ		NO RECOVERY
37	590	-	REJ		NO RECOVERY
38	588	-	REJ		NO RECOVERY
39	586	100%	BOUGHT	PAL	SANDSTONE: Fine grained, grey, soft, moderately indurated, poor visual porosity. No fluorescence.
40	584	50%	BOUGHT		SANDSTONE: grey, medium grained quartz, well sorted, very soft, very poorly consolidated, good visual porosity, micaceous. No fluorescence.
41	581	-	REJ		NO RECOVERY
42	579	80%	BOUGHT	PAL	CLAYSTONE: grey, very soft, very poorly indurated, sandy in part. Nil visual porosity. No fluorescence.
43	578	-	REJ		NO RECOVERY
44	576.5	80%	BOUGHT	PAL	SANDSTONE: rusty brown, fine grained, poorly sorted, poor visual porosity. No fluorescence.

COMMENTS: CORES 31 - 50 TAPED TO GUN TO REDUCE IMPACT.

NOTE: if more than one gun of SWC is shot please number the cores consecutively.

AMPOL EXPLORATION LIMITED

WELL: PAYNESVILLE # 1

SIDEWALL CORE REPORT

DEPTH INTERVAL:

GEOLOGIST: M. SCHMEDJE

GUN NO. : 2

SHEET : 4 OF: 4

SWC NO.	DEPTH M	REC.	BOUGHT/ REJECT	PALYN. EVAL.	LITHOLOGICAL DESCRIPTION, FLUORESCENCE, ETC.
45	571	100%	BOUGHT	PAL	SILTSTONE: Calcareous, moderately hard and indurated, glauconitic, nil visual porosity. No fluorescence.
46	561	100%	BOUGHT	PAL	MARL: extremely calcareous, grey-black, moderately hard and indurated. No fluorescence.
47	514	-	REJ		NO RECOVERY
48	492	100%	BOUGHT	PAL	MARL: As above, grey. No fluorescence.
49	442	40%	BOUGHT	PAL	MARL: grey, extremely calcareous, soft & poorly indurated, fossiliferous, gritty. No fluorescence.
50	387	-	REJ		NO RECOVERY

COMMENTS:

NOTE: if more than one gun of SWC is shot please number the cores consecutively

APPENDIX 5.

CORE REPORT

APPENDIX 6.

GEOCHRONOLOGICAL AND PETROLOGICAL ANALYSIS OF CORE

SLABBING DETAILS

Four boxes of whole core from Paynesville No. 1 well were received on 10 July, 1985 for slabbing into 3 sections as requested in M. SCHMEDJE's letter of 7 July, 1985.

Depth intervals were as follows:

Box 1	699.5 -700.5	m
Box 2	700.5 -701.65	m
Box 3	701.65-702.5	m
Box 4	702.5 -703.4	m

Two outer segments each approximately one-quarter of the core volume were cut from the core leaving a third parallel sided central section of approximately half the core volume.

The two outer quarters were packed separately and forwarded to:

The Director
Oil and Gas Division
Office of Minerals and Energy
151 Flinders Street
MELBOURNE VIC 3000

The central section was packed and forwarded to Ampol Explorations' Sydney office.

It should be noted that the core was badly broken and difficult to slab.

Box 4 (702.5-703.4 m) was not slabbed but divided into 3 portions as the core was completely broken into fine material.

PAYNESVILLE-1 702.1m

1. INTRODUCTION

One core from Paynesville-1 was received. The rock is a brown to grey fine-grained sediment mud, since the rock is notably homogeneous, only one thin section was made.

This section shows an essentially monomineralic rock which consists of illite/sericite. The material is fine-grained and shows a marked preferred orientation of the flakes. This rock is a mudstone which has possibly undergone coarsening of the original clay (perhaps in an early diagenitic environment).

2. GEOCHRONOLOGY

One sample of drill core from Paynesville No. 1, 702.1m, was received with a request to carry out an Rb-Sr age determination on the total rock. A thin section had been examined and the sample found to be a very fine grained, extensively recrystallised illite (or sericite) with a strong parallel banding.

2.1 Procedures

The rock was pulverised and a split analysed in duplicate by XRF to give an accurate Rb/Sr ratio. Another split was dissolved in acid, the Sr concentrated by ion exchange methods and the isotopic composition of the Sr determined by mass spectrometry.

2.2 Results

The Rb/Sr and isotopic ratios are given in Table 1. Because only one sample was analysed, it was necessary to make estimates of the anticipated initial $^{87}Sr/^{86}Sr$ ratio of the sample. Rocks of Palaeozoic age have primary or "mantle" initial $^{87}Sr/^{86}Sr$ ratios of the order of 0.706 ± 0.002 while rocks of crustal derivation e.g. sediments, have initial ratios in excess of this value. The amount by which this value exceeds ~ 0.706 will depend on the Rb/Sr ratio and the length of time the material has resided in the crust before its deposition as a sediment. Initial ratios of 0.710 or greater are common for sedimentary rocks.

Table 2 gives a number of possible ages for the present sample, based on different values of initial $^{87}Sr/^{86}Sr$. This age span (445-504 Ma, Ordovician) gives the maximum and also the most likely age of deposition. The rock appears to have undergone a low grade metamorphism to produce the sericite but no conclusions can be drawn from the present data concerning the time of this recrystallisation.

TABLE 1 : Rb-Sr Analyses

Rb/Sr	$^{87}Rb/^{86}Sr$	$*^{87}Sr/^{86}Sr$
4.085	11.891	0.79041

TABLE 2 : Age Calculations based on assumed values of initial $^{87}Sr/^{86}Sr$

Assumed $^{87}Sr/^{86}Sr$	Age (Ma)
0.705	504
0.710	475
0.715	445

* Normalised to $^{88}Sr/^{86}Sr = 8.3752$

Constants Used: $^{85}Rb/^{87}Rb = 2.600$
$\lambda\ ^{87}Rb = 1.42 \times 10^{-11} y^{-1}$

Errors in the quoted ages, due to analytical errors, are ±1% (1 standard deviation).

APPENDIX 7.

DRILL STEM TEST DATA AND ANALYSIS

APPENDIX 7: DRILL STEM TEST DATA AND EVALUATION

Two on bottom straddle tests were conducted on Paynesville #1. The reports of these tests by Ampolex and Halliburton are contained here.

DST No. 1 (Latrobe Group) 573.36 to 596.93 m.
(Straddle test) - Misrun

DST No. 2 (Latrobe Group) 567.1 to 597.4 m.
(Straddle test)

No interpretation was performed on the above tests as they failed to obtain sufficient recovery.

AMPOL EXPLORATION LIMITED

DST DETAILS

Date

Field & Well No.	Test No.	INTERVAL TESTED	Top	Bottom
P.E.P. 98: PAYNESVILLE #1	#1		573.36M	596.93M

Area	Rig	Formation Tested
GIPPSLAND	ATCO-3	LATROBE

HOLE AND TOOL DATA	All depths measured from	Hydrospring/Aux. Valve Depth	Surface Choke Size
	RKB	565.2	½"

Casing or Liner Size	Depth of Shoe	Elevation of reference (ft-msl)	Packer Size	Packer Type	Bottom Choke Size
	121.9		7 3/4	NR#2	3/4"

TEST STRING	Size and Type	Length	Weight (lb/ft)		
5"	CONVENTIONAL	37.18		Packer Depths: 573.4 - 596.9	FINAL FWHP
				Open Hole Size: 8.5	Measured Bottom-hole temp.: 134 °F @ 706.8
				Total Depth: 707.7	

MUD DATA: Weight — Viscosity —

GAUGES	TYPE	Gauge No.	DEPTH	Press. Range	Blanked off	CLOCK NO.	RANGE
TOP	1	4344	565.9	8000		32025	24HR
MIDDLE	1	4345	585.3	8000		32064	24HR
BOTTOM							

		BOTTOM HOLE PRESSURE READINGS — FIELD READINGS: TIME	TOP	MIDDLE	BOTTOM	SURFACE PRESSURES: TIME	PRESSURE	COMMENT
Initial Hydro. Mud Press.			853.5	867.0				
1st	IFP							
	FFP							
	FCIP		MISS	RUN				
2nd	IFP							
	FFP							
	FCIP							
Final Hydro. Mud Press.			849.3	862.7				

RECOVERY

AMOUNT (FEET)	DESCRIPTION (GRAVITY OR CI)

Cushion	Amount, Feet	Type	Time Reverse Out Commenced	BH Sampler used ☐ Yes ☐ No	Flow Calculations

Intervals, Remarks and Sample Description (Halliburton's Equipment Data Sheet and Job Log should be attached to each report)

SAMPLE #1: FORMATION FLUID & TURKEY NEST WATER i.e. Contaminated.
(clean water, 8.92 @ 14 DGRS. C)

SAMPLE #2: FORMATION, FLUID & TURKEY NEST WATER i.e. Contaminated.
(clean water, 8.69 @ 14 DGRS. C)

SAMPLE #3: MUD FILTRATE
(5.69 @ 16 DGRS.C)

SAMPLE #4: MUD FILTRATE
(4.05 at 16 DGRS.C)

MUD FILTRATE (Rmf) 5.4 Ω @ 62 DGRS. F

MUD (Rm) 4.5 Ω @ 62 DGRS. F

TURKEYS NEST WATER 100 Ω @ 62 DGRS. F

+ 3 ATTEMPTS TO OPEN TOOL; packer seat failure and/or flow around packer every time.

Witnessed By	Phone No.	Tester	Test No.
I.C. HOFFMEIER	AMPOL	PAUL ERWIN	1

PAYNESVILLE
LEASE NAME

1
WELL NO.

1
TEST NO.

1881.1 - 1958.4
TESTED INTERVAL

AMPOL EXPLORATION LIMITED
LEASE OWNER/COMPANY NAME

LEGAL LOCATION
SEC. - TWP. - RNG.
SEE REMARKS

FIELD
AREA
GIPPSLAND

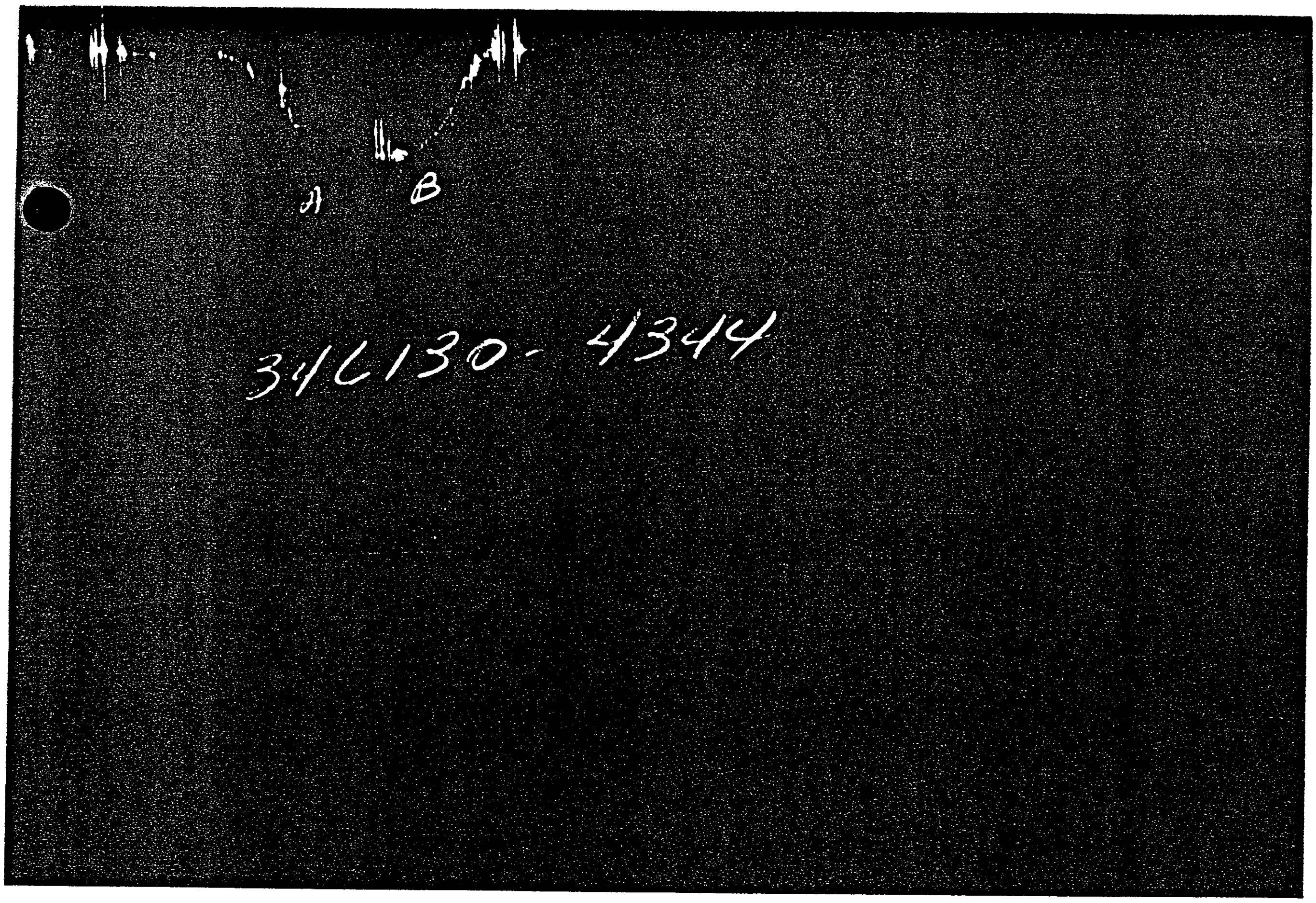
COUNTY
VICTORIA

STATE
AUSTRALIA IC

HALLIBURTON
SERVICES

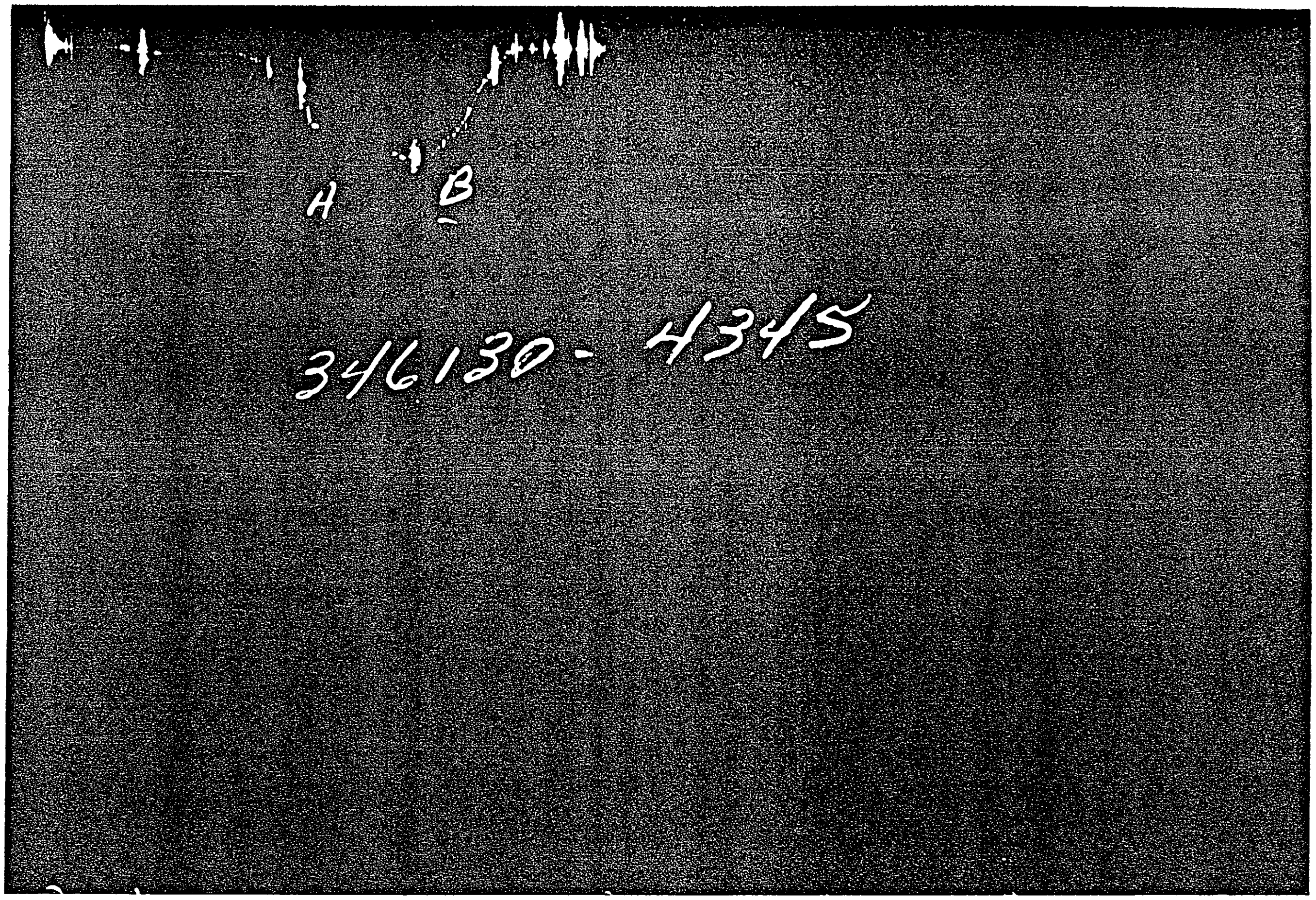
TICKET NO. 34613000
23-JUL-85
ADELAIDE

RMATION TESTING SERVICE REPORT



GAUGE NO: 4344 DEPTH: 1856.7 BLANKED OFF: NO HOUR OF CLOCK: 24

ID	DESCRIPTION	PRESSURE		TIME		TYPE
		REPORTED	CALCULATED	REPORTED	CALCULATED	
A	INITIAL HYDROSTATIC	853	880.0			
B	FINAL HYDROSTATIC	849	874.5			



GAUGE NO: 4345 DEPTH: 1920.2 BLANKED OFF: NO HOUR OF CLOCK: 24

ID	DESCRIPTION	PRESSURE		TIME		TYPE
		REPORTED	CALCULATED	REPORTED	CALCULATED	
A	INITIAL HYDROSTATIC	867	910.7			
B	FINAL HYDROSTATIC	862	907.3			

EQUIPMENT & HOLE DATA

FORMATION TESTED: LATROBE
NET PAY (ft):
GROSS TESTED FOOTAGE: 77.3
ALL DEPTHS MEASURED FROM: R. KELLY BUSHING
CASING PERFS. (ft):
HOLE OR CASING SIZE (in): 8.500
ELEVATION (ft): 98.3 R.K.B.
TOTAL DEPTH (ft): 2321.9
PACKER DEPTH(S) (ft): 1873, 1881, 1958, 1966
FINAL SURFACE CHOKE (in): 0.50000
BOTTOM HOLE CHOKE (in): 0.750
MUD WEIGHT (lb/gal): 9.00
MUD VISCOSITY (sec): 38
ESTIMATED HOLE TEMP. (°F):
ACTUAL HOLE TEMP. (°F): 134 @ 2318.9 ft

TICKET NUMBER: 34613000

DATE: 7-8-85 TEST NO: 1

TYPE DST: ON BTM. STRADDLE

HALLIBURTON CAMP: ADELAIDE

TESTER: PAUL UNWIN

WITNESS: DON ???

DRILLING CONTRACTOR: ATCO A.P.M. RIG #3

FLUID PROPERTIES FOR RECOVERED MUD & WATER

SOURCE	RESISTIVITY	CHLORIDES
	@ °F	ppm
	@ °F	ppm
	@ °F	ppm
	@ °F	ppm
	@ °F	ppm
	@ °F	ppm

SAMPLER DATA

Psig AT SURFACE:
cu.ft. OF GAS:
cc OF OIL:
cc OF WATER:
cc OF MUD:
TOTAL LIQUID cc:

HYDROCARBON PROPERTIES

OIL GRAVITY (°API): @ °F
GAS/OIL RATIO (cu.ft. per bbl):
GAS GRAVITY:

CUSHION DATA

TYPE	AMOUNT	WEIGHT

RECOVERED:

MEASURED FROM TESTER VALVE

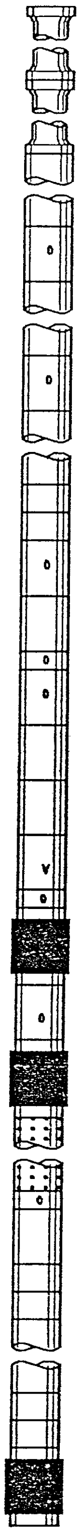
REMARKS:

TEST DATE IS 8 JULY, 1985.

LEGAL LOCATION: LAT. 37 DEG., 54', 54"; LONG. 47 DEG., 20', 21"

TYPE & SIZE MEASURING DEVICE: .5" CERAMIC CHOKE (SURFACE)					TICKET NO: 34613000
TIME	CHOKE SIZE	SURFACE PRESSURE PSI	GAS RATE MCF	LIQUID RATE BPD	REMARKS
7-7-85					
2257					MADE UP BLANKED OFF B.T. CASE
					AND TEMPERATURE RECORDER - RAN
					DRILL COLLARS
7-8-85					
0000					MADE UP INVERTED PACKERS AND
					ANCHOR PIPE SAFETY JOINT
0100					B.T. #4345 INTO STRING
0223					B.T. #4344 INTO STRING
					NOTE: NO THIRD GAUGE CASE WAS
					SUPPLIED WITH TEST STRING
0250					DUAL CIP VALVE THROUGH ROTARY
					TABLE
0330					MADE UP TEST HEAD, MANIFOLD AND
					LINES - PRESSURE TESTED TO 3000#
					RAN IN HOLE
0720					TESTED MANIFOLD & LINES TO 2000#
0749					OPENED TOOL-LOST ANNULUS-PULLED
					UP
0752					RESET TOOL
					OPENED TOOL - LOST ANNULUS
0755					PULLED UP
0801					SET TOOL
0803					OPENED TOOL - LOST ANNULUS -
					PULLED UP AND BROKE OUT - LAID
					DOWN TEST HEAD - PULLED OUT OF
					HOLE
1037					B.T. #4344 OUT OF STRING
1045					B.T. #4345 OUT OF STRING

TICKET NO. 34613000

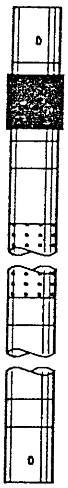


		O.D.	I.D.	LENGTH	DEPTH
1	DRILL PIPE......................	4.000	3.340	1308.4	
4	FLEX WEIGHT.....................			308.2	
3	DRILL COLLARS..................	6.250	2.938	177.0	
51	PUMP OUT REVERSING SUB..........	6.000	3.000	1.0	1773.5
3	DRILL COLLARS..................	6.250	2.975	30.7	
50	IMPACT REVERSING SUB............	6.000	3.000	1.0	1805.5
3	DRILL COLLARS..................	6.250	2.975	30.5	
5	CROSSOVER......................	5.750	1.500	1.0	
5	CROSSOVER......................	5.000	2.250	1.0	
12	DUAL CIP VALVE..................	5.000	0.870	4.9	
97	SAMPLE CHAMBER..................	5.000	2.500	4.9	
33	DRAIN VALVE.....................	5.000	2.200	0.9	
60	HYDROSPRING TESTER..............	5.000	0.750	5.3	1854.6
80	AP RUNNING CASE.................	5.000	2.250	4.1	1856.7
5	JAR.............................	5.000	1.750	5.0	
16	VR SAFETY JOINT.................	5.000	1.000	2.8	
17	PRESSURE EQUALIZING CROSSOVER...	5.000	1.000	1.0	
70	OPEN HOLE PACKER................	5.000	1.530	5.8	1873.3
18	DISTRIBUTOR VALVE...............	5.000	1.680	2.0	
70	OPEN HOLE PACKER................	5.000	1.530	5.8	1881.1
20	FLUSH JOINT ANCHOR..............	5.000	2.370	36.0	
17	PRESSURE EQUALIZING CROSSOVER...	5.000	1.000	1.0	
80	AP RUNNING CASE.................	5.000	2.250	4.1	1920.2
5	CROSSOVER......................	5.000	2.500	1.6	
5	CROSSOVER......................	6.000	2.625	1.0	
3	DRILL COLLARS..................	6.250	2.937	30.1	
5	CROSSOVER......................	6.000	2.250	0.9	
5	CROSSOVER......................	5.000	2.500	0.7	
70	OPEN HOLE PACKER................	5.000	1.530	5.8	1958.4

CONTINUED

EQUIPMENT DATA

TICKET NO. 34613000



		O.D.	I.D.	LENGTH	DEPTH
[illegible]	DISTRIBUTOR VALVE...............	5.000	1.680	2.0	
70	OPEN HOLE PACKER................	5.000	1.530	5.8	1966.3
5	CROSSOVER.......................	5.000	2.500	0.7	
19	ANCHOR PIPE SAFETY JOINT........	5.000	1.500	4.3	
20	FLUSH JOINT ANCHOR..............	5.000	2.370	6.0	
5	CROSSOVER.......................	6.375	2.250	1.0	
3	DRILL COLLARS...................	6.250	2.938	334.1	
5	CROSSOVER.......................	5.750	2.375	0.7	
81	BLANKED-OFF RUNNING CASE........	5.000		4.1	2318.9

TOTAL DEPTH 2321.9

EQUIPMENT DATA

AMPOL EXPLORATION LIMITED

ST DETAILS

Date

Field & Well No.	Test No.	INTERVAL TESTED Top	Bottom
PAYNESVILLE # 1	2	567.1	597.4

Area	Rig	Formation Tested
GIPPSLAND	ATCO A3	LATROBE

HOLE AND TOOL DATA

All depths measured from: RKB	Hydrospring/Aux. Valve Depth: 1834	Surface Choke Size: ½"	
Casing or Liner Size: 9 5/8	Depth of Shoe: 1R1.9	Elevation of reference (ft-msl):	Packer Size: 7 3/4; Type: NR# 2
Bottom Choke Size: 3/4"			
TEST STRING — Size and Type: 5" CONVENTIONAL	Length: 32.61	Weight (lb/ft): -	Packer Depths: 567.1 - 597.4
FINAL FWHP:	Open Hole Size: 8.5	Total Depth: 707.7	Measured Bottom-hole temp.: 134 °F @ 706.8

GAUGES	TYPE	Gauge No.	DEPTH	Press. Range	Blanked off	CLOCK NO.	RANGE
TOP	1	4344	559.6	8000		32025	24 HR
MIDDLE	1	4345	576.3	8000		32064	"
BOTTOM							

MUD DATA — Weight: 9.0; Viscosity: 42

BOTTOM HOLE PRESSURE READINGS — FIELD READINGS

		TIME	TOP	MIDDLE	BOTTOM
Initial Hydro. Mud Press.			853.5	862.7	
1st	IFP		216.6	UNABLE TO READ FLOW DUE TO PLUGGING	
	FFP		220.8		
	FCIP		649.7		
2nd	IFP				
	FFP				
	FCIP				
Final Hydro. Mud Press.			849.3	858.4	

SURFACE PRESSURES

TIME	PRESSURE	COMMENT

RECOVERY

AMOUNT (FEET)	DESCRIPTION (GRAVITY OR CI)

Cushion — Amount, Feet: NIL; Type: -; Time Reverse Out Commenced: -; BH Sampler used: [X] Yes [ ] No

Flow Calculations: -

Intervals, Remarks and Sample Description (Halliburton's Equipment Data Sheet and Job Log should be attached to each report)

TOOL OPEN AT 1636, MEDIUM BLOW INCREASING TO STRONG AGAINST A 9" WATERHEAD AFTER 1 MIN - STARTED TO DIE, DEAD AT 1638 - AT 1643 VERY WEAK BLOW STARTED AGAIN INCREASING SLOWLY TO A MEDIUM BLOW AGAINST 9" WATER HEAD AT 1645 - AT 1647 BLOW STARTED TO REDUCE - WEAK BLOW AT 1649 AGAINST 8" HEAD - AGAINST 5" HEAD AT 1650 - AGAINST A 3" HEAD AT 1651 - 1½" HEAD AT 1652 - DEAD AT 1655 - SHOT IN AT 1711 HRS - ATTEMPT TO REVERSE SAMPLE OUT (BAR DID NOT REACH SUB) DROPPED SECOND BAR (NO SUCCESS) POH & CAUGHT ½ GAL SAMPLE AT BAR DROP SUB - CAUGHT 2 GAL SAMPLE OF FORMATION WATER AT SAMPLER SUB - RECOVERED 7.5 GALS OF CLEAN SAND OUT OF D/COLLAR ABOVE SAMPLER SUB.

W OF SAMPLE AT BAR DROP SUB:- 4.69 Ω @ 18°C (Sample-1, Formation water)

W OF SAMPLE AT SAMPLER SUB:- 4.18 Ω @ 18°C (Sample-2, Formation water)

RW OF WATER FROM RECOVERED SAND:- 4.63 Ω @ 17°C (Sample-3, Formation water)

RW OF WATER FROM RECOVERED SAND:- 4.43 Ω @ 16°C (Sample-4, Formation water)

Witnessed By	Phone No	Tester	Test No.
I.C. HOFFMEIER	(066) 793383	PAUL ERWIN	2

HALLIBURTON SERVICES

TICKET NO. 34613100

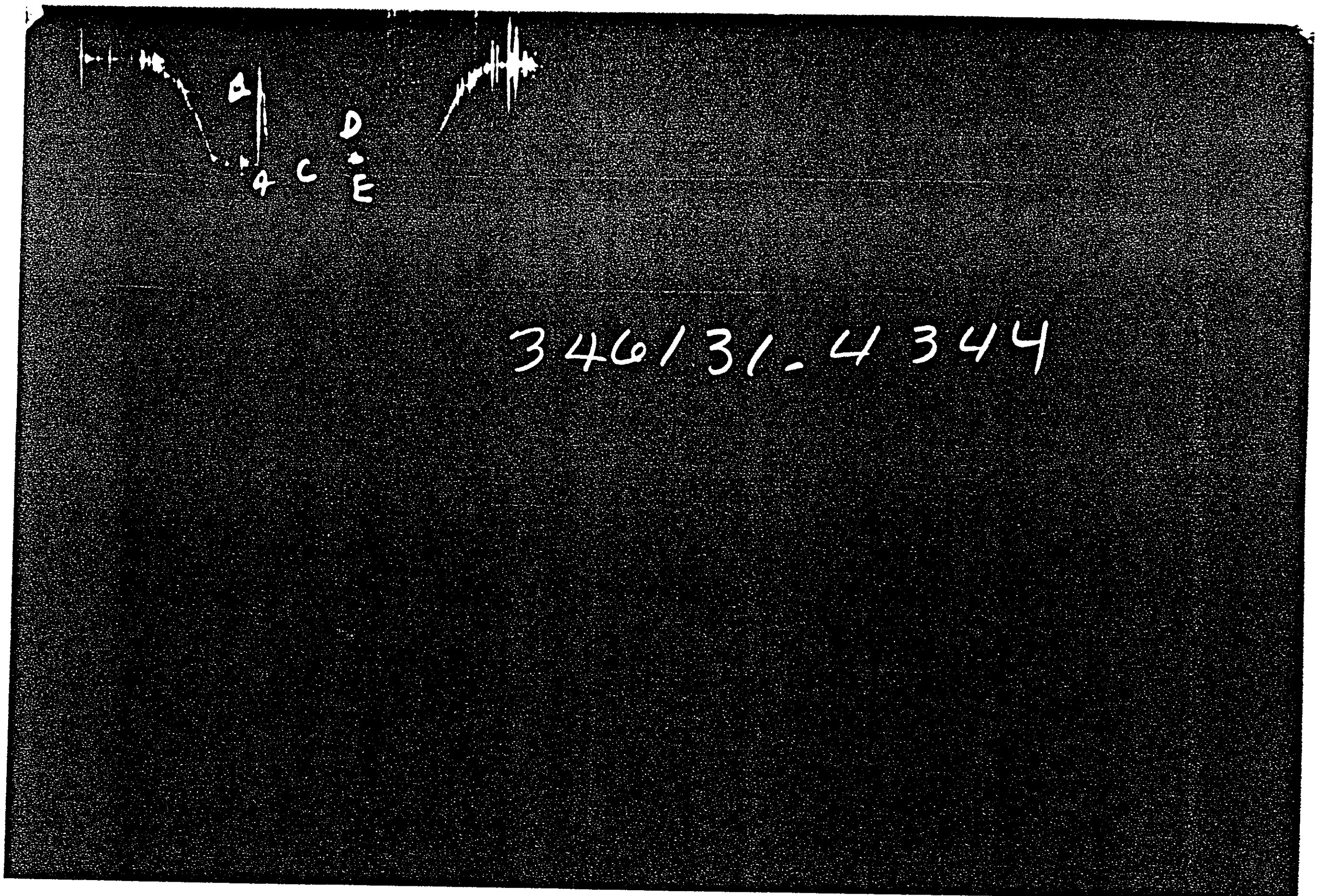
25-JUL-85

ADELAIDE

FORMATION TESTING SERVICE REPORT

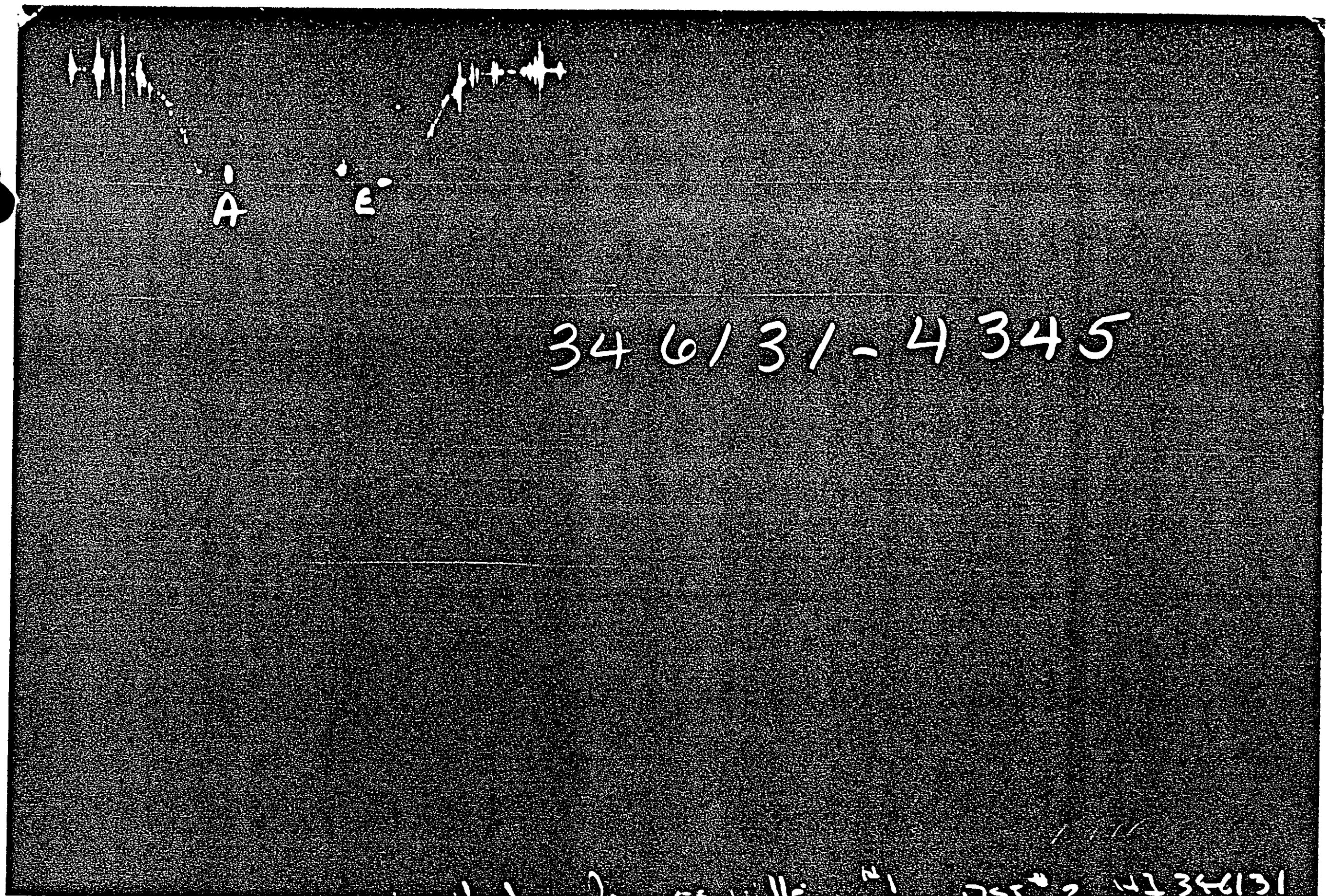
LEASE NAME	WELL NO.	TEST NO.	TESTED INTERVAL	LEASE OWNER/COMPANY NAME
PAYNESVILLE	1	2	1860.6 - 1959.9	AMPOL EXPLORATION LIMITED

LEGAL LOCATION SEC. - TWP. - RNG.	FIELD AREA	COUNTY	STATE
SEE REMARKS	CIPPSLAND	VICTORIA	AUSTRALIA DR



GAUGE NO: 4344 DEPTH: 1836.2 BLANKED OFF: NO HOUR OF CLOCK: 24

ID	DESCRIPTION	PRESSURE REPORTED	PRESSURE CALCULATED	TIME REPORTED	TIME CALCULATED	TYPE
A	INITIAL HYDROSTATIC	854	880.9			
B	INITIAL FIRST FLOW	217	25.7	36.0	33.1	F
C	FINAL FIRST FLOW	221	778.8			
C	INITIAL FIRST CLOSED-IN	221	778.8	74.0	76.9	C
D	FINAL FIRST CLOSED-IN	650	778.8			
E	FINAL HYDROSTATIC	849	851.4			



GAUGE NO: 4345   DEPTH: 1890.7   BLANKED OFF: YES   HOUR OF CLOCK: 24

ID	DESCRIPTION	PRESSURE		TIME		TYPE
		REPORTED	CALCULATED	REPORTED	CALCULATED	
A	INITIAL HYDROSTATIC	863	915.0			
B	INITIAL FIRST FLOW			36.0		F
C	FINAL FIRST FLOW					
C	INITIAL FIRST CLOSED-IN			74.0		C
D	FINAL FIRST CLOSED-IN					
E	FINAL HYDROSTATIC	858	868.7			

EQUIPMENT & HOLE DATA

FORMATION TESTED: LATROBE
NET PAY (ft):
GROSS TESTED FOOTAGE: 99.4
ALL DEPTHS MEASURED FROM: R. KELLY BUSHING
CASING PERFS. (ft):
HOLE OR CASING SIZE (in): 8.500
ELEVATION (ft): 98.3 R. KELLY BUSHING
TOTAL DEPTH (ft): 2321.9
PACKER DEPTH(S) (ft): 1853, 1861, 1960, 1968
FINAL SURFACE CHOKE (in): 0.50000
BOTTOM HOLE CHOKE (in): 0.750
MUD WEIGHT (lb/gal):
MUD VISCOSITY (sec):
ESTIMATED HOLE TEMP. (°F):
ACTUAL HOLE TEMP. (°F): 134 @ 2318.9 ft

TICKET NUMBER: 34613100
DATE: 7-8-85 TEST NO: 2
TYPE DST: ON BT. STRADDLE
HALLIBURTON CAMP: ADELAIDE
TESTER: UNWIN
WITNESS: DON ????
DRILLING CONTRACTOR: ATCO APM RIG #3

FLUID PROPERTIES FOR RECOVERED MUD & WATER

SOURCE	RESISTIVITY	CHLORIDES
	@ °F	ppm
	@ °F	ppm
	@ °F	ppm
	@ °F	ppm
	@ °F	ppm
	@ °F	ppm

SAMPLER DATA

Psig AT SURFACE:
cu.ft. OF GAS:
cc OF OIL:
cc OF WATER:
cc OF MUD:
TOTAL LIQUID cc:

HYDROCARBON PROPERTIES

OIL GRAVITY (°API): @ °F
GAS/OIL RATIO (cu.ft. per bbl):
GAS GRAVITY:

CUSHION DATA

TYPE	AMOUNT	WEIGHT

RECOVERED:

.5 GAL. SAMPLE AT BAR DROP SUB
2 GAL. OF FORMATION WATER AT SAMPLER
RECOVERED 7.5 GAL. OF CLEAN SAND AT BAR DROP SUB

MEASURED FROM TESTER VALVE

REMARKS:

TEST DATE IS 8-JULY-1985

LEGAL LOCATION: LAT. 37 DEGREES 54' 54", LONG. 47 DEGREES 20' 21"

CHARTS INDICATE THE CASE FOR THE MIDDLE GAUGE #4345, WAS PLUGGED OFF DURING THE FLOW PERIOD.

TYPE & SIZE MEASURING DEVICE: 0.5 CERAMIC CHOKE					TICKET NO: 34613100
TIME	CHOKE SIZE	SURFACE PRESSURE PSI	GAS RATE MCF	LIQUID RATE BPD	REMARKS
7-8-85					
1300					RUN IN DRILL COLLARS AND
					HEAVY WEIGHT DRILL PIPE WITH
					BOTTOM B.T. AND TEMP. RECORDER.
1315					MADE UP TOOLS
1327					B.T. 4345 INTO TEST STRING
1412					B.T. 4344 INTO TEST STRING
					NOTE:
					TOP AP B.T. RUNNING CASE WAS
					NOT SUPPLIED WITH STRADDLE
					STRING.
1417					DUAL CIP VALVE THROUGH TABLE
1620					PRESSURE TEST HEAD MANIFOLD
					AND LINES 2000 PSI
					STRING WEIGHT 100,000#
1635	.5				OPENED TOOL WITH 60,000#
					MODERATE-WEAK BLOW
1637	.5				BLOW WEAKENS
1640	.5				WEAK BUBBLE
1644	.5				MODERATE BLOW BOTTOM OF BUCKET
1645	.5				WEAK-MODERATE BLOW
1648	.5				WEAK BLOW 7" HEAD BOTTOM OF
					BUCKET
1650	.5				WEAK BLOW 5" HEAD
1651	.5				WEAK BLOW 3" HEAD
1655	.5				DEAD. NO SURFACE INDICATION
					TOOL PLUGGING
1711	.5				TOOL CLOSED
1822					PULLED TOOL
1825					BYPASS OPENED-STRING WEIGHT
					105.000#
					PULLED 2 STANDS-REVERSE
					CIRCULATE
1843					DROPPED FLUTED BAR. NO
					INDICATION IMPACT PIN SHEARED.

TYPE & SIZE MEASURING DEVICE: 0.5 CERAMIC CHOKE					TICKET NO: 34613100
TIME	CHOKE SIZE	SURFACE PRESSURE PSI	GAS RATE MCF	LIQUID RATE BPD	REMARKS
1926					DROPPED SECOND FLUTED BAR
					THROUGH TEST HEAD LO-TORC
					NO SURFACE INDICATION IMPACT
					PIN SHEARED.
1945					LAID OUT TEST HEAD
					PULLED OUT OF HOLE UNTIL HIT
					FLUID
2115					DUAL CIP VALVE THROUGH TABLE
					30' OF FLUID AND SAND IN
					COLLARS
2145					B.T. 4344 OUT OF STRING
2215					B.T. 4345 OUT OF STRING
7-9-85					
0025					JOB COMPLETED. LAID OUT
					TOOLS

TICKET NO: 34613100	GAUGE NO: 4344
CLOCK NO: 32025 HOUR: 24	DEPTH: 1836.2

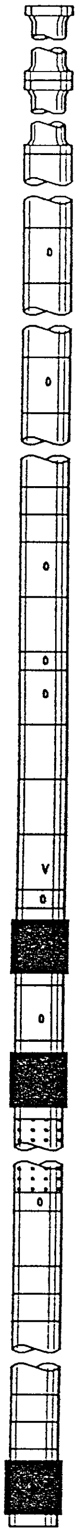
HALLIBURTON SERVICES

REF		MINUTES	PRESSURE	ΔP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$
			FIRST FLOW			
B	1	0.0	25.7			
	2	5.0	283.7	258.0		
	3	10.0	627.8	344.2		
	4	15.0	758.4	130.6		
	5	20.0	775.6	17.2		
	6	25.0	776.4	0.8		
	7	30.0	776.4	0.0		
C	8	33.1	778.8	2.3		
			FIRST CLOSED-IN			
C	1	0.0	778.8			
D	2	76.9	778.8	0.0	23.1	0.155

REF	MINUTES	PRESSURE	ΔP	$\frac{t \times \Delta t}{t + \Delta t}$	$\log \frac{t + \Delta t}{\Delta t}$

REMARKS:

TICKET NO. 34613100

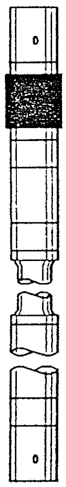


		O.D.	I.D.	LENGTH	DEPTH
1	DRILL PIPE......................	4.000	3.340	1267.7	
4	FLEX WEIGHT.....................			157.4	
3	DRILL COLLARS..................	6.250	2.938	329.5	
51	PUMP OUT REVERSING SUB..........	6.000	3.000	1.0	1754.3
3	DRILL COLLARS..................	6.250	2.938	30.4	
50	IMPACT REVERSING SUB...........	6.000	3.000	1.0	1786.0
3	DRILL COLLARS..................	6.250	2.938	30.5	
5	CROSSOVER......................	5.750	2.250	1.0	
5	CROSSOVER......................	5.000	2.250	1.0	
12	DUAL CIP VALVE.................	5.000	0.870	4.9	
97	SAMPLER CASE...................	5.000	2.500	4.9	
33	DRAIN VALVE....................	5.000	2.200	0.9	
60	HYDROSPRING TESTER.............	5.000	0.750	5.3	1834.0
80	AP RUNNING CASE................	5.000	2.250	4.1	1836.2
15	JAR............................	5.000	1.750	5.0	
16	VR SAFETY JOINT................	5.000	1.000	2.8	
17	PRESSURE EQUALIZING CROSSOVER...	5.000	1.000	1.0	
70	OPEN HOLE PACKER...............	5.000	1.530	5.8	1852.8
18	DISTRIBUTOR VALVE..............	5.000	1.680	2.0	
70	OPEN HOLE PACKER...............	5.000	1.500	5.8	1860.6
20	FLUSH JOINT ANCHOR.............	5.000	2.370	27.0	
17	PRESSURE EQUALIZING CROSSOVER...	5.000		1.0	
80	AP RUNNING CASE................	5.000	2.250	4.1	1890.7
5	CROSSOVER......................	5.000	2.500	1.6	
5	CROSSOVER......................	6.000	2.625	1.0	
3	DRILL COLLARS..................	6.250	2.938	61.1	
5	CROSSOVER......................	6.000	2.250	0.9	
5	CROSSOVER......................	5.000	2.500	0.7	
70	OPEN HOLE PACKER...............	5.000	1.530	5.8	1959.9

CONTINUED

EQUIPMENT DATA

TICKET NO. 34613100



		O.D.	I.D.	LENGTH	DEPTH
18	DISTRIBUTOR VALVE..............	5.000	1.680	2.0	
70	OPEN HOLE PACKER................	5.000	1.680	5.8	1967.7
5	CROSSOVER......................	5.000	2.500	0.7	
19	ANCHOR PIPE SAFETY JOINT........	5.000	1.500	4.3	
5	CROSSOVER......................	6.375	2.250	1.0	
4	FLEX WEIGHT.....................			187.6	
3	DRILL COLLARS...................	6.250	2.938	151.0	
5	CROSSOVER......................	5.750	2.375	0.7	
81	BLANKED-OFF RUNNING CASE........	5.000		4.1	2318.4

TOTAL DEPTH 2321.9

EQUIPMENT DATA

APPENDIX 8.

WATER ANALYSIS

WATER ANALYSIS REPORT METHOD [illegible] PAGE W[illegible]

SAMPLE ID. PAYNESVILLE 1 DST 2

CHEMICAL COMPOSITION

		MG/L	ME/L
CATIONS			
CALCIUM	(CA)	41.0	2.05
MAGNESIUM	(MG)	21.0	1.73
SODIUM	(NA)	560	24.4
POTASSIUM	(K)	34.0	0.869
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO3)		
BICARBONATE	(HCO3)	789	12.9
SULPHATE	(SO4)	19.0	0.396
CHLORIDE	(CL)	551	15.6
NITRATE	(NO3)	1.2	0.019

REACTION PH	8.1
CONDUCTIVITY (E.C.) MICRO S/CM AT 25 C	2900
RESISTIVITY OHM.M @ 25C	3.45

DERIVED DATA

	MG/L
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	1600
B. CALCULATED (HCO3=CO3)	1620
TOTAL HARDNESS	189
CARBONATE HARDNESS	189
NON-CARBONATE HARDNESS	
TOTAL ALKALINITY	647
(EACH AS CACO3)	

TOTALS AND BALANCE

CATIONS(ME/L) 29.0 DIFF = 0.101

ANIONS (ME/L) 28.9 SUM = 57.9

DIFF*100./SUM = 0.175%

SODIUM / TOTAL CATION RATIO 84.0%

REMARKS

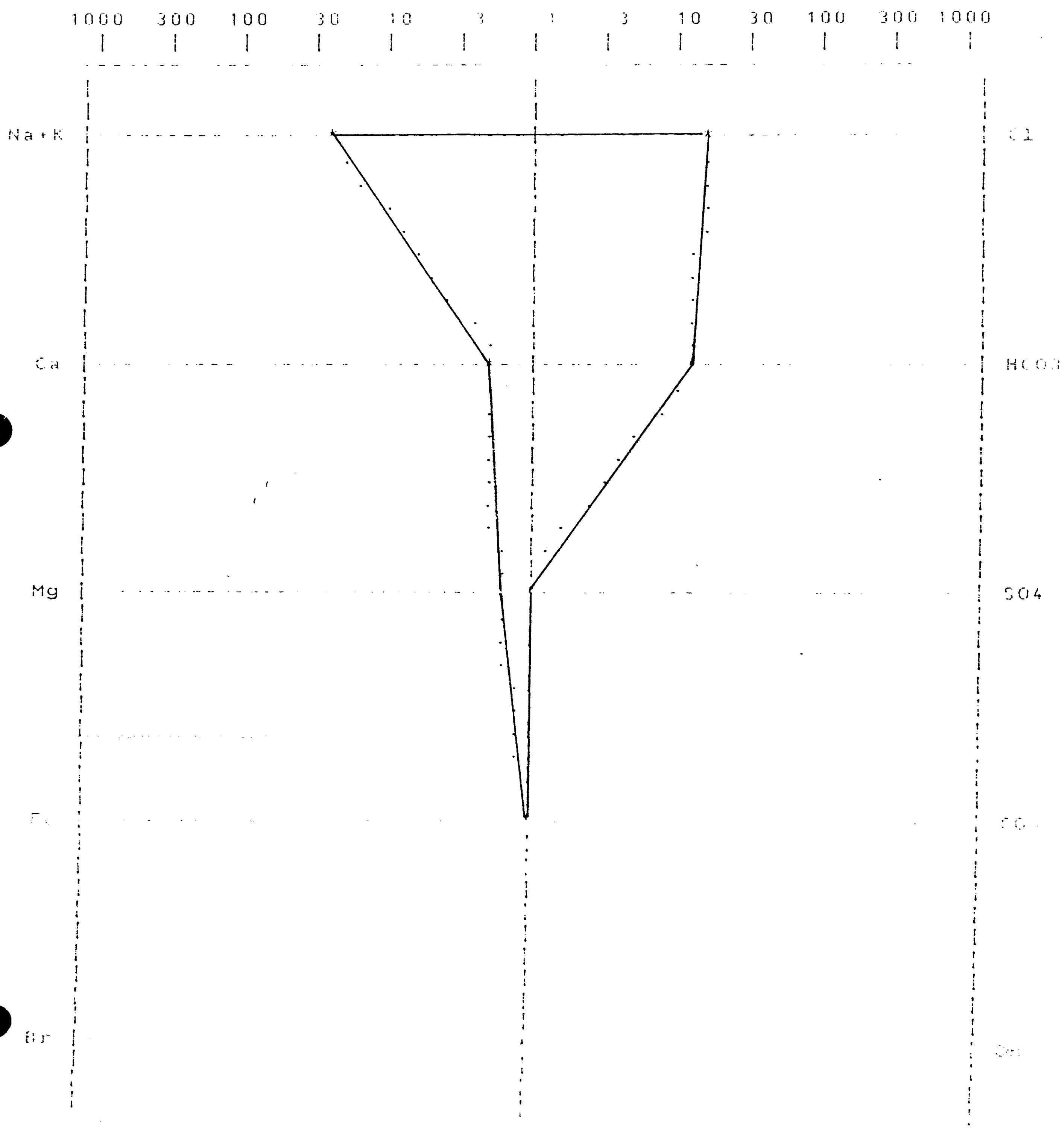
NOTE: MG/L = MILLIGRAMS PER LITRE

ME/L = MILLIEQUIVS. PER LITRE

STIFF DIAGRAM. Page W:

Sample: PAYNESVILLE 1 DST 2

Scale is logarithm (base 10) of milli equivalent values



APPENDIX 9.

ANALYSIS OF HYDROCARBONS EXTRACTED FROM WATER

1. INTRODUCTION

A water sample from Paynesville-1, DST 2 was sent by the client for extraction of hydrocarbons. This report formally presents the results of the extraction, a gas chromatogram of the hydrocarbons and some brief interpretative comments.

2. ANALYTICAL PROCEDURE

2.1 Extraction of Hydrocarbons

A portion of the water sample (400 mls) was mixed thoroughly in a separating funnel with dichloromethane (100 mls) and then allowed to stand until the two phases had separated. The hydrocarbon residue was obtained by collecting the solvent phase and carefully rotovaping the dichloromethane off.

2.2 Gas Chromatography of Hydrocarbons

The hydrocarbon residue was examined by gas chromatography using the following instrumental parameters.

Gas chromatograph:	Perkin Elmer Sigma 2 fitted with on-column injector
Column:	25 mm x 0.3 mm fused silica, SGE QC3/BP1
Detector temperature:	300°C
Carrier gas:	He at 85 kPa
Column temperature:	100-290°C at 5° per minute and held at 290°C until all peaks eluted

3. RESULTS

The result of the extraction is displayed in Table 1. Figure 1 is a gas chromatograph of the hydrocarbon residue.

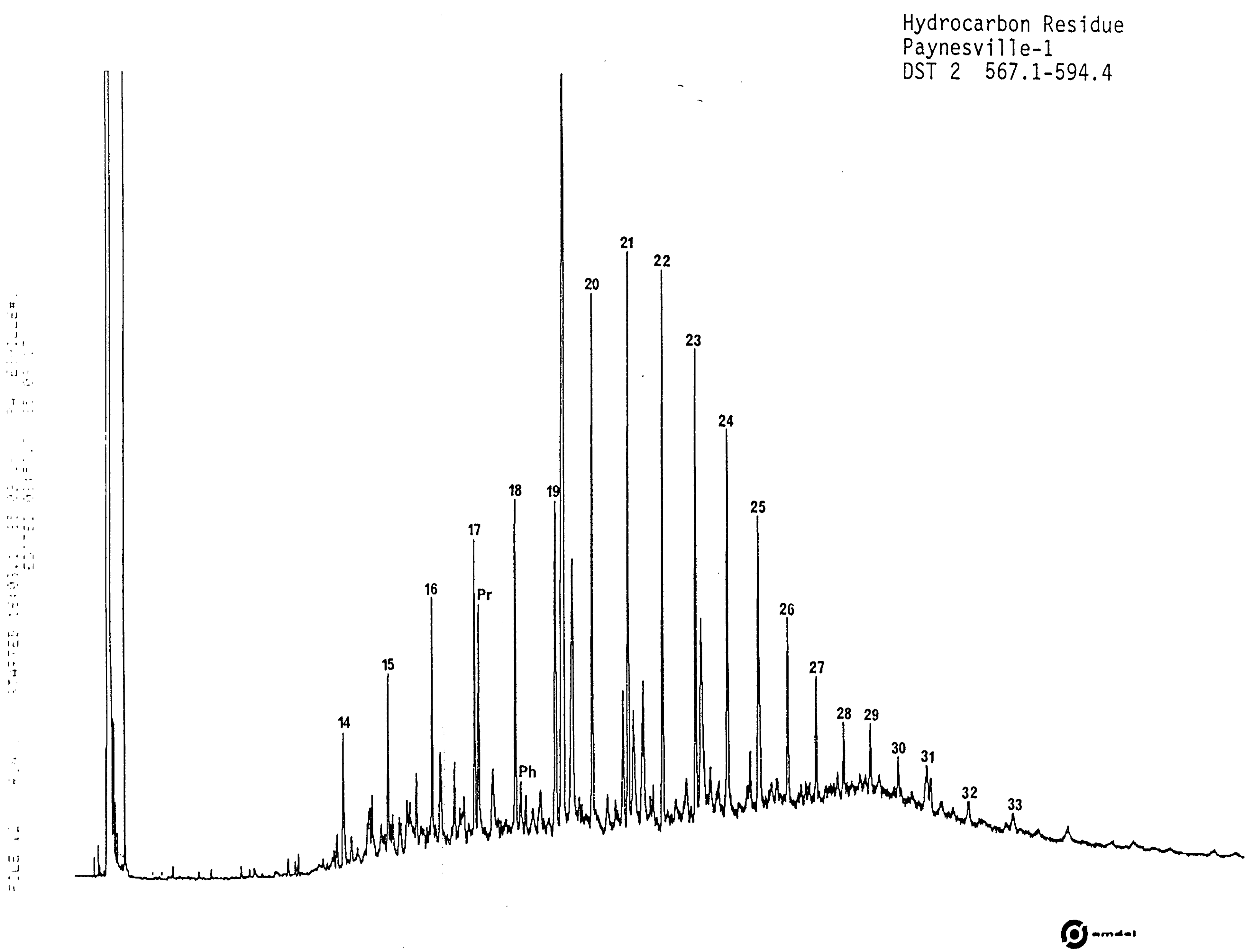
4. DISCUSSION

The low levels of hydrocarbons present in the water collected from Paynesville-1 strongly suggests that the hydrocarbons present may be due to contamination.

TABLE 1: EXTRACTION OF HYDROCARBONS, PAYNESVILLE-1, DST 2

	Test	Depth (m)	Concentrations of Hydrocarbons ppm
Paynesville-1	DST 2	567.1-594.4	4.2

FIG 1


Hydrocarbon Residue
Paynesville-1
DST 2 567.1-594.4
14
15
16
17
Pr
18
Ph
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33

APPENDIX 10.

HEADSPACE GAS ANALYSIS OF WATER SAMPLE

1. INTRODUCTION

This report contains headspace analysis data on a formation water sampled from Paynesville-1, Gippsland Basin.

2. ANALYTICAL PROCEDURE

The headspace sample was analysed by a Sigma 3B; thermal conductivity detector using a sieve column at 95°C.

3. RESULTS

Results of headspace analysis are displayed in Table 1.

4. CONCLUSIONS

The dryness of the headspace gas sampled from Paynesville-1 and the strong odour of the water noted by the client is consistent with the methane having a microbiological origin.

TABLE 1: HEADSPACE ANALYSIS RESULTS, PAYNESVILLE-1

Client: AMPOL EXPLORATION
Well: PAYNESVILLE-1
Internal: DST2, 567.1-597.4 m

Component	Percentage (Air Free)
O_2+Ar	<0.01
N_2	44.05
CO_2	2.12
CH_4	42.39
C_2H_6	0.02

Wet gas = 0.05%

APPENDIX 11.

WIRE LINE LOG EVALUATION REPORT

BOWLER LOG CONSULTING SERVICES PTY. LTD.

JACK BOWLER
Telephone: (051) 56 6170

P.O. BOX 2,
PAYNESVILLE, VICTORIA.
AUSTRALIA, 3880.

Ms Erna de Vries
Ampol Exploration Limited
7th Floor
76 Berry Street
North Sydney, NSW, 2060

13 July, 1985

Dear Erna,

Please find my evaluation of the Latrobe and Basement for Paynesville #1. There are no log anomalies which suggest the presence of Hydrocarbons. Water saturation values both in the flushed zone and the uninvaded zone of the Latrobe sand are around 100% and may be found listed in Table Two along with porosity values. The presence of water in the upper part of the Latrobe sand was confirmed by the recovery of 5.6 barrels of fresh water in DST #2 (567-597 meters).

<u>Latrobe 569-616 meters</u>

The top 7 meters of Latrobe from 569 to 576 meters is characterized by high RHOB, NPHI, K and PEF values which agrees well with the description of the sidewall core taken at 571 meters "Siltstone: calcareous, mod hard & indurated, glauconitic, nil vis Ø." Data points from this siltstone interval fall in a widely scattered group of their own on the Resistivity-Porosity and Density-Neutron plots. The 574.5 meter data point plots closer (but still faraway) to the sandstone line than do the other siltstone levels. This increased sand content is confirmed by the 574.5 meter sidewall core which is described as "Sandstone: soft, mod indurated 50% very fine grained, abundant micrite, glauconitic.......... 50% fine grained..........".

Next comes a thick, water-wet sandstone from 576 to 616 meters. Porosities are very high reaching 38 to 46?%. The RHOB values at these very high porosities are somewhat suspect because they are associated with DRHO corrections and hole washouts. However they are only a few percentage points too high based on NPHI values (converted to sandstone lithology) which are less sensitive to the hole washouts (but still may be a little too high due to the washouts and increased standoff opposite the washouts). Most likely the upper part of the sand contains porosities close to the theoretical maximum of around 42% ?? as I recall. The SP, GR and Pe curves suggest that the sand contains thin clay laminae. This is confirmed by sidewall core recoveries at 579 and 597 meters. The Density-Neuton plot suggests that the sandstone often contains "clay" with log characterisics of the formation at 588-591 meters. This is most likely micrite according to the cuttings description on the Geoservices Masterlog.

The sonic travel times of 170 µsec/foot in the upper part of the Latrobe sands correlate closely with the hole washouts seen on both the HDT and LDT-CNL calipers. Some of the washouts are such that the hole diameter reaches 14 to 16". In these cases it is only possible for a 3'-5' BHC sonic to correctly read formation travel times of 155 and 140 µsec/foot respectively. Very high sonic travel times such as these can be expected in a poorly compacted sandstone at shallow depth. This is because in the case of large diameter holes and high formation transit times (with a centralized 3'-5' sonic) the near receiver signal arrives first through the mud column instead of through the formation and thus the measured transit time is not truly representative of the formation. The transit time logged will be too large because too small a travel time to the 3' receiver is subtracted from the 5' receiver travel time.

This is illustrated in Figure 8 of the enclosed paper "An investigation into discrepancies between sonic log and seismic check shot velocities". This diagram shows that a long spacing sonic tool would be able to properly log very high travel time formations. The other alternative is to eccentralize the BHC sonic to minimize the distance between the tool and formation. This should have been done after the logging run with the centralized tool to see if an improvement could have been obtained.

Basement 616-709 meters

Most data from the Basement levels fall in a tight group in the lower left of the Resistivity-Porosity plot with 3 of the upper levels trending toward, and falling among, the Latrobe sandstones. The Basement data is spread out over the Density-Neutron plot with a trend of increasing NPHI with decreasing depth. This suggests an increasing amount of water, possibly due to an increase in clay content, with decreasing depth. The plot also suggests an increasing amount of quartz with depth. The high PEF and RHOB values such as those at 634, 642, 660, 666-667, and 685-688 meters etc. are probably due to the pyrite described in the samples. The raw dipmeter curves suggest that Basement is a finely laminated formation. To me the logs suggest that Basement consists of a shale or siltstone and as a result I do not think it contains any effective porosity. There is total porosity but it is probably associated with the clays. This is despite the sidewall core recovered from 630 meters which was described as "Sandstone: fine grained, well cemented, qtz, hard, indurated. Micaceous, Nil vis Ø." The mica may account for the K content of the gamma ray. Note the increasing K and Th with depth. On future logging runs the microlog would help to identify permeable zones and thus those with effective porosity.

The sidewall core recovered from 617 meters is described as a fine grained quartz sandstone. This description does not fit very well with the logs. A data point at 617.3 meters plots close to the clay point on the Density-Neutron plot and amongst the Latrobe sandstone points on the Resistivity-Porosity plot. My guess is that the interval from 616 to 618 meters is either a unique lithology or a weathered product of the deeper Basement rocks. Note the high K (3.5%) and Thorium (20 PPM) content. It might be worthwhile to take a closer look at the sidewall core recovered from 617 meters to see exactly what minerals are present.

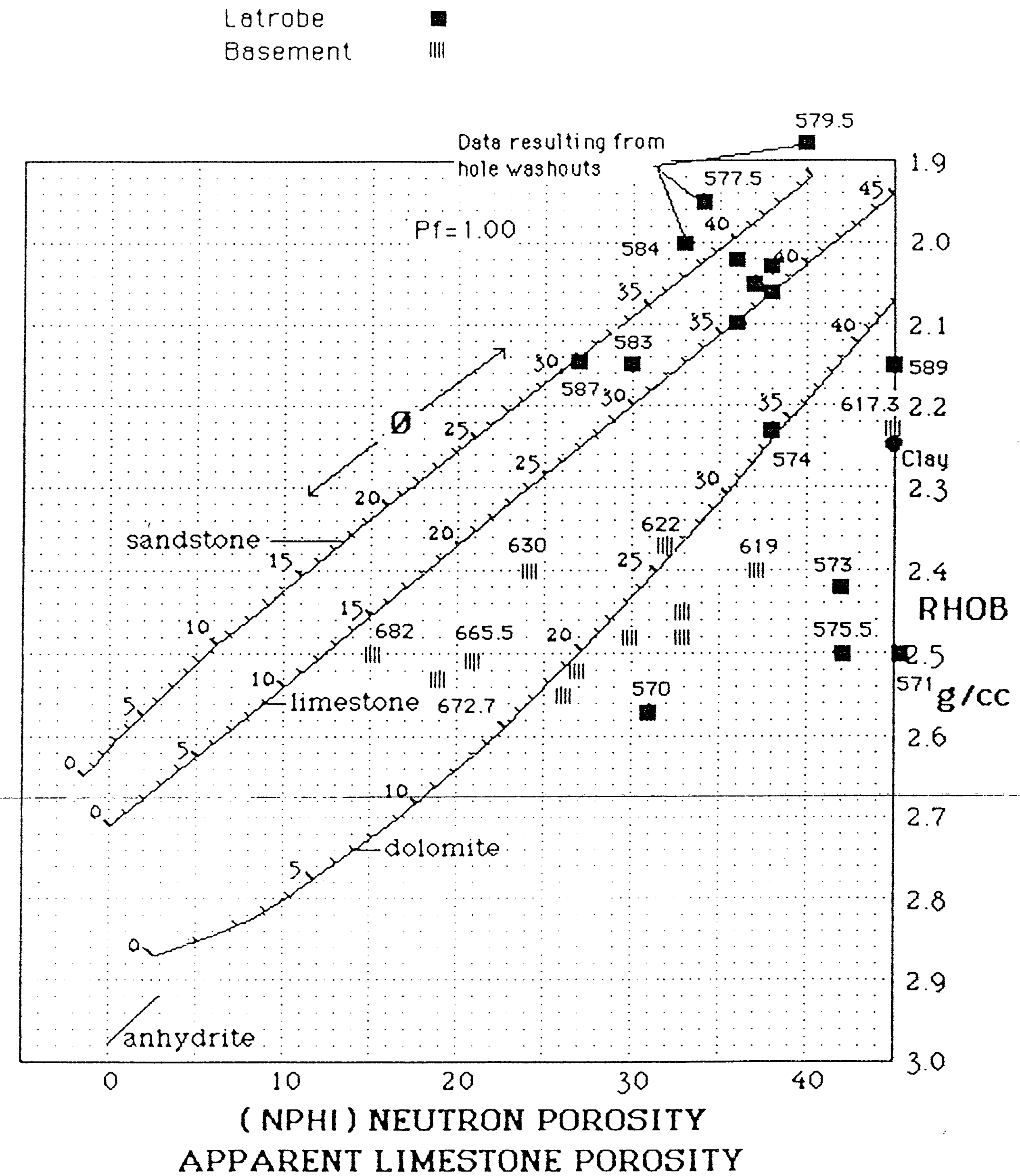
Yours truly,

J Bowler

Jack Bowler

Paynesville #1

DENSITY-NEUTRON
POROSITY AND LITHOLOGY



Paynesville # 1

RESISTIVITY-POROSITY

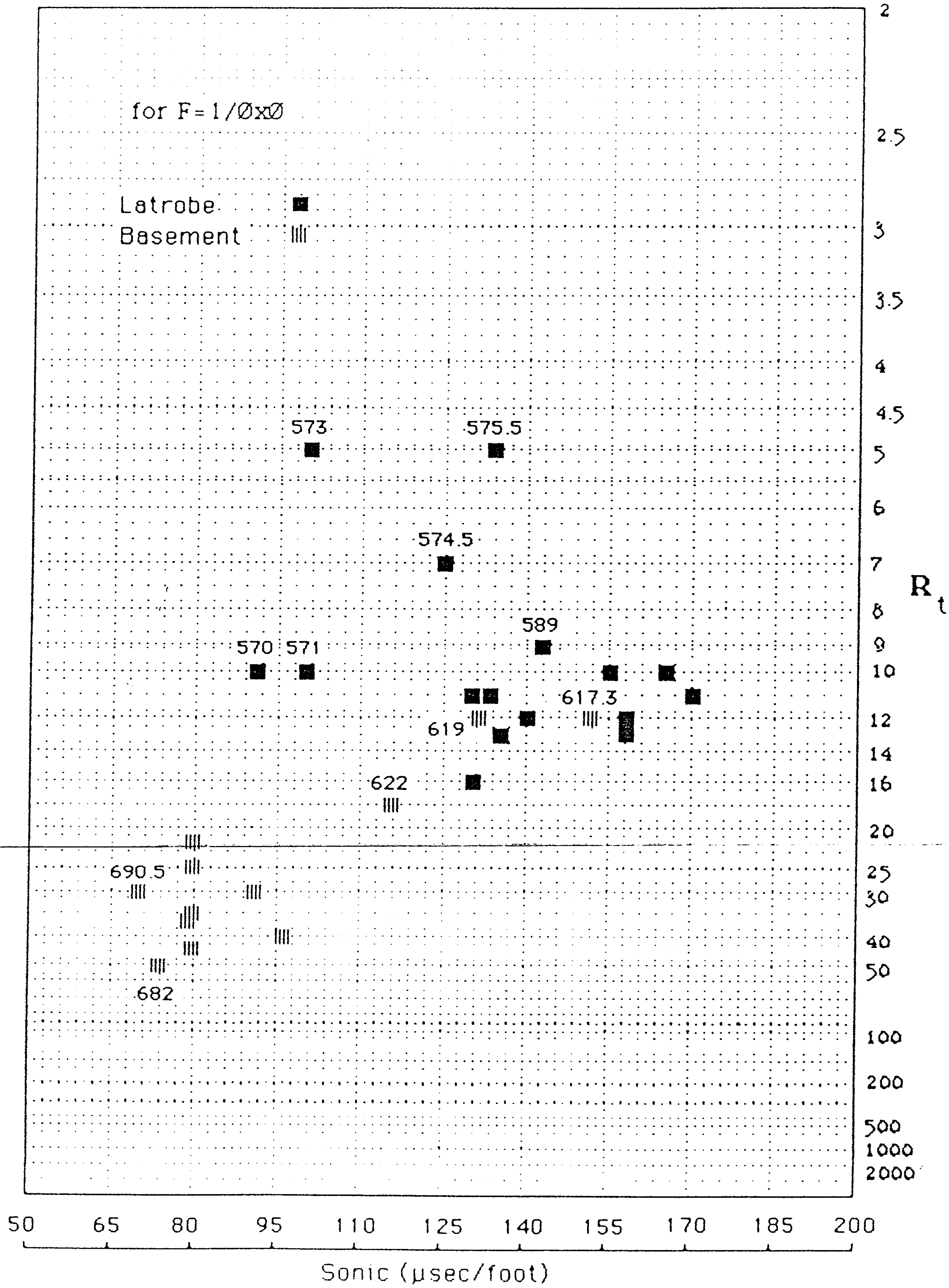


TABLE ONE Paynesville #1

Level	Depth (meters)	MSFL (ohm.m)	RT (ohm.m)	GR (API)	RHOB (g/cc)	NPHI (ls. por.)	SONIC (µsec/ft)
1			LATROBE				
2	570.0	20.0	10	85	2.57	31	90
3	571.0	14.0	10	100	2.50	46	100
4	573.0	3.0	5	75	2.42	42	100
5	574.5	9.0	7	95	2.23	38	125
6	575.5	5.0	5	115	2.50	42	134
7	577.5	14.0	10	55	1.95?	34	155
8	579.5	13.0	10	60	1.87?	40	165
9	583.0	18.0	13	40	2.15	30	158
10	584.0	15.0	12	45	2.00	33	158
11	587.0	20.0	13	60	2.15	27	135
12	589.0	10.0	9	110	2.15	45	143
13	593.0	9.0	11	40	2.05	37	170
14	595.0	20.0	12	47	2.05	37	140
15	600.0	20.0	11	60	2.06	38	130
16	605.0	20.0	11	60	2.02	36	133
17	610.0	18.0	11	115	2.10	36	130
18	614.5	10.5	16	85	2.03	38	130
19			BASEMENT				
20	617.3	12.0	12	160	2.23	45	152
21	619.0	12.0	12	140	2.40	35	131
22	622.0	28.0	18	105	2.37	32	115
23	630.0	50.0	40	90	2.40	24	96
24	636.0	30.0	30	130	2.45	33	90
25	640.0	80.0	36	110	2.55	26	78
26	650.0	40.0	22	140	2.48	30	80
27	663.0	30.0	25	150	2.48	33	80
28	665.5	60.0	35	105	2.51	21	80
29	672.7	70.0	44	85	2.53	19	80
30	682.0	80.0	50	95	2.50	15	73
31	690.5	30.0	30	145	2.52	27	70
32							
33							
34							
35							
36							
37							
38							
39							
40							

TABLE TWO Paynesville #1

Level	Depth (meters)	RMFA (ohm.m)	RWA (ohm.m)	PHIT %	Vclay %	Porosity %	Sw %	Sxo %
1			LATROBE					
2	570.0	0.80	0.40	20	100	0		
3	571.0	1.26	0.90	30	100	0		
4	573.0	0.29	0.48	31	100	0		
5	574.5	1.04	0.81	34	65	12	113	106
6	575.5	0.39	0.39	28	100	0		
7	577.5	2.24	1.60	40	0	40	112	120
8	579.5	2.75	2.12	46	0	46	97	108
9	583.0	1.84	1.33	32	18	26	109	109
10	584.0	2.17	1.73	38	0	38	107	122
11	587.0	1.92	1.25	31	0	31	127	129
12	589.0	1.37	1.23	37	100	0		
13	593.0	1.30	1.59	38	16	32	105	139
14	595.0	2.89	1.73	38	16	32	100	93
15	600.0	2.89	1.59	38	23	29	101	88
16	605.0	3.04	1.67	39	7	36	107	98
17	610.0	2.33	1.43	36	25	27	104	94
18	614.5	1.60	2.43	39	16	33	85	126
19			BASEMENT					
20	617.3	1.83	1.83	39	100	0		
21	619.0	0.87	0.87	27	100	0		
22	622.0	2.35	1.51	29	100	0		
23	630.0	2.21	1.76	21	100	0		
24	636.0	1.73	1.73	24	100	0		
25	640.0	2.89	1.30	19	100	0		
26	650.0	1.94	1.06	22	100	0		
27	663.0	1.59	1.32	23	100	0		
28	665.5	1.54	0.90	16	100	0		
29	672.7	1.58	0.99	15	100	0		
30	682.0	1.57	0.98	14	100	0		
31	690.5	1.08	1.08	19	100	0		
32								
33								
34								
35								
36								
37								
38								
39								
40								

TABLE ONE & TWO comments

Formation	Levels	Rmf	Rw	Temp. °F	Source of Rw	Rclay
Latrobe	2-18	3.2	2.0	108	estimated from R_{wa}	9
Basement	20-31					

R_w computed from the -30mv SP at 601 meters gives 3.5 ohm.m @108°F (1.070 PPM $NaCL_{eqv}$) while the 4.94 ohm.m @ 64.4°F water recovered from DST #2 (567-597m) yields 2.90 ohm.m @ 108°F (1,350 PPmM $NaCl_{eqv}$). It was decided to use the estimated R_{wa}=2.0 @ 108°F (2,000PPM $NaCl_{eqv}$) value from the logs in order to account for the fact that m might not be actualy = 2. Use of this lower R_w value will be optimistic as far as identifying hydrocarbons is concerned.

Rmf= 5.12 ohm.m @ 64.4 °F measured. BHT = 108°F @ 709 meters.
R_t is determined from LLD, LLS, MSFL and Schlumberger Chart Rint-9.

R_{wa} and R_{mfa} are computed from density-neutron porosity prior to clay correction. $R_{wa}=PHIT^2R_t$ $R_{mfa}=PHIT^2R_{MSFL}$

The log characteristics of the micrite at 588-591 meters have been used for the clay point in this evaluation for the Latrobe.

Porosity values are clay corrected. Porosity and V_{clay} are determined from the density-neutron crossplot. Porosity=$(1-V_{clay})$PHIT.

Water saturations are computed from the Indonesian Water Saturation Equation and thus are clay corrected.

a=1 and m=n=2.

AN INVESTIGATION INTO DISCREPANCIES BETWEEN SONIC LOG AND SEISMIC CHECK SHOT VELOCITIES

by J.F. Goetz and L. Dupal
Schlumberger Technical Services Inc., Singapore
and J. Bowler,
Schlumberger Seaco Inc., Perth.

ABSTRACT

Well data, and in particular Sonic Logs, are the basis for calibration of seismic data leading to improved reservoir delineation. Sonic data are adjusted to match seismic times by comparison to check shots. Recent improvements in Sonic Logging tend to show that, on average, Sonic velocities are faster than seismic velocities. The main reason appears to be frequency dependence of velocities.

INTRODUCTION

The Sonic Log, adjusted by check shots, is the basis for calibration of surface seismic data and, in favourable cases, for detailed seismic work, which allows a better description of the reservoir.

For reliable detailed studies the adjustment of the Sonic Log is important. Until recently, this adjustment very often showed that the Sonic transit times were too long; this can be rather easily explained. However, it is less easy to explain the opposite case, that in which the Sonic transit times are judged too short by comparison with check shots. Both cases will be reviewed and possible explanations proposed.

SEISMIC CALIBRATION

Surface Seismic Reflection

A surface seismic record is basically a measure of contrasts in formation acoustic impedance by means of a measuring tool, the seismic pulse. Those contrasts are located by means of the two-way time needed by the seismic pulse to go down to and up from that contrast; the vertical scale of seismic sections is two-way time. If, for example, the surface formation acoustic impedance is known, a measure of contrasts leads to a measure of each formation's acoustic impedance. Acoustic impedance is defined as the product of density and velocity. If one of the parameters is assumed, or fitted with some law, the other one may then be determined. In this manner, stratigraphy, porosity, etc., can be defined from the surface, between wells, under favourable conditions.

Applications Of Well Logs

A Sonic Log provides a continuous conversion between the depth of the log and the total transit time from the top of the log. A check shot at the top of the Sonic Log makes that conversion absolute, from the surface. Further check shots are used to adjust the Sonic Log for various borehole and other effects.

The Seismic Calibration Log (Figure 1) can then be used to calibrate seismic sections in terms of depth; additionally, other logs can be scaled in terms of time. The Sonic and Density Logs, on a time scale, can be combined into an acoustic impedance log from which a reflection log is derived. From this, a synthetic seismogram is generated.

A good synthetic seismogram, matching a good seismic section, allows a more precise depth scaling of the section. This may highlight delays on the seismic section due to processing or to surface conditions. Qualitative correlations can be made between seismic data and well data, displayed on a time scale, as shown on Figure 2. Quantitative comparisons between the synthetic seismogram and the seismic section lead to quantitative measurement of acoustic impedance from seismic data. Refinement of seismic data recording and processing are made possible. Seismic modelling studies may be simplified when structural dips, interpreted from Dipmeter results, are used to model the synthetic seismogram (Figure 2).

Quantitative studies can be made only when seismic data are good and log data are representative of true formation parameters. Because of borehole conditions and effects of drilling fluids, recorded logs may require editing and adjustment in order to reflect virgin formation conditions. We shall consider in the following only the case of the Sonic Log.

SEISMIC CALIBRATION LOG

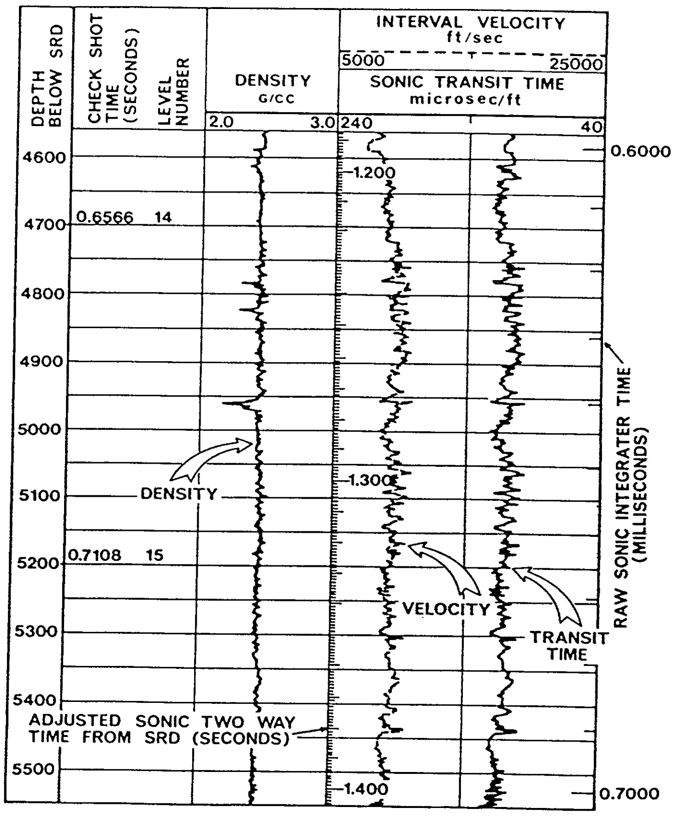


Figure 1 The adjusted Sonic Log displayed on a linear depth scale. For any recognizable formation, the Seismic Calibration Log can be entered to read two-way travel time and depth, both relative to the Seismic Reference Datum.

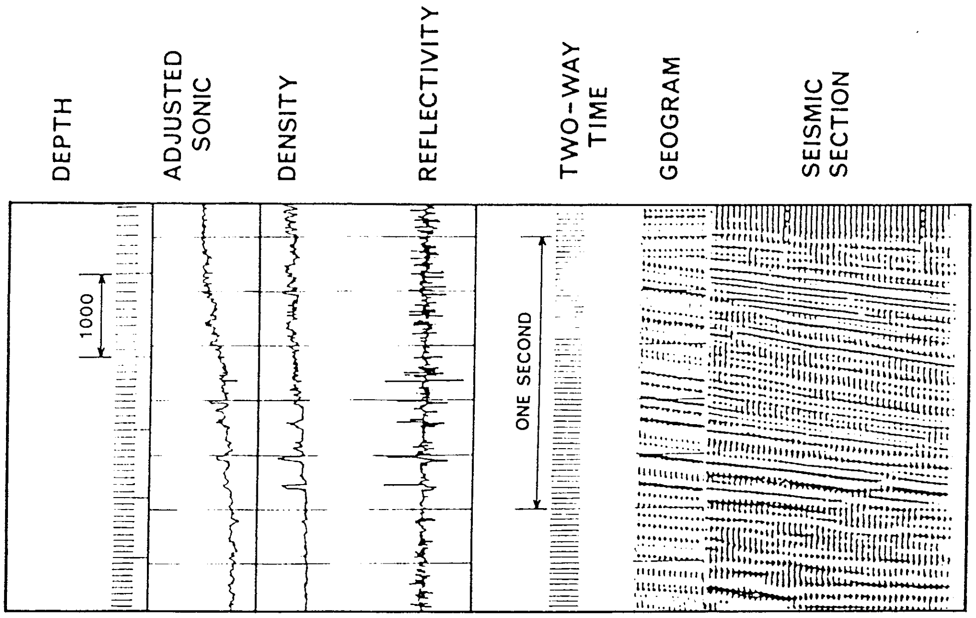


Figure 2 Sonic and Density Logs, on a linear time base, are combined to generate a synthetic seismic trace. Structural dip data from Dipmeter results is added to the GEOGRAM display.*

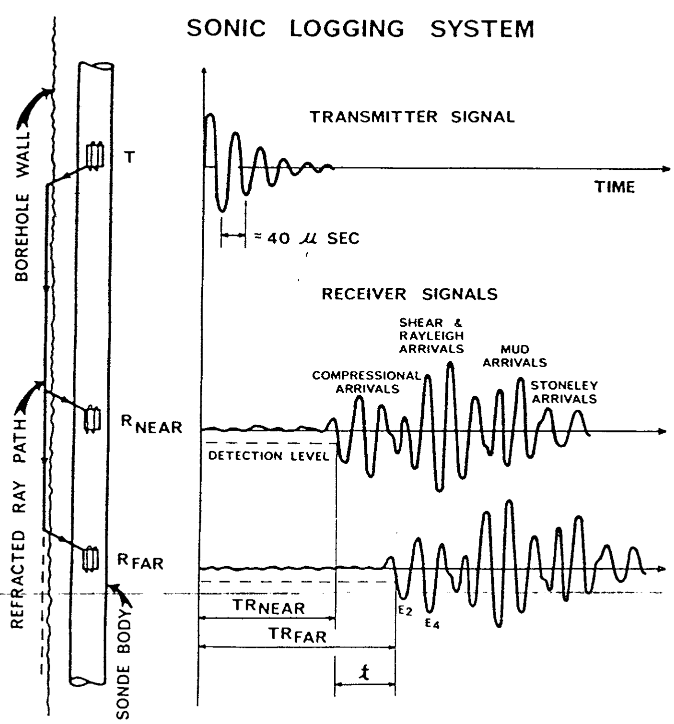


Figure 3 The basic sonic logging system.

SONIC LOGGING SYSTEM

The basic system consists of one transmitter, two receivers, and surface timing circuits. The transmitter, when fired, creates a pressure signal. The center frequency of the signal is about 25 kilohertz (kHz). One of the two receivers records all possible arrivals for one firing of the transmitter. The other receiver is recording at the next firing. At surface, compressional first arrivals at each receiver are detected. The detection is made on the second half cycle, E_2, as the first half cycle, E_1, is usually fairly small in open hole. The detection is made when the amplitude of E_2 reaches a trigger or detection level. For each sequence, the time between firing and detection is measured by a quartz clock. The time difference between far receiver and near receiver sequences is then the formation interval transit time, t (See illustration in Figure 3). In practice, to compensate for sonde tilt and hole size variations, two basic systems are combined on the same sonde to achieve Borehole Compensation (BHC)*. In that case four sequences are used for each Sonic measurement. The interval transit time measured is converted into microseconds per foot, which is the reciprocal of velocity.

Modern equipment uses automatic gain control systems to adjust, for each sequence of a measurement, the various gains by evaluation of the noise level before each firing.

Sonic measurements depend on refraction and, as such, are subject to certain limitations which will be detailed later.

CHECK SHOT TECHNIQUE

Check shots are known as Well Velocity Surveys or Well Shooting, etc.

The basic principle is to measure the time needed for a pressure pulse created at surface to reach a selected depth in the borehole.

The equipment consists of:

- A seismic source (e.g., an air gun) creating a pressure signal.
- A receiver in a downhole tool, anchored at selected depths.
- Surface equipment which records a surface signal from a detector near the source and a downhole signal from the receiver. Both signals are recorded on a time base provided by a quartz clock.

Figure 4 illustrates a typical offshore set-up and recording.

The check shot time is the elapsed time between the arrival of the surface signal and the downhole signal. Schlumberger is currently using the breaks of both signals to pick the time. This

* *Trade Mark of Schlumberger*

time is then corrected to a vertical time and referred to the Seismic Reference Datum, the horizontal plane which is the time origin for surface seismic data. The corrected check shot times are used to adjust the Sonic Log, and for that purpose are called seismic times. The assumption is that check shot times can be considered as measured on vertical straight paths; this is basically true for vertical wells, small offset of the source to the well, and little or no formation dip.

PRECISION OF SONIC INSTRUMENTATION

Several transmitter-receiver sequences are used to make an interval transit time measurement. For each sequence real time waveforms are used for detection. Each sequence utilizes the same circuitry, consisting of downhole amplifiers, cable transmission, surface amplifiers and filters, and surface counting circuits. Only the gains may be varied, by AGC (Automatic Gain Control) logic.

The resolution of the counting circuit is provided by a quartz crystal with a frequency of 2.5 megahertz (mHz), that is, O.4 microsecond/ft on each sequence. Therefore, on each measurement of transit time,the resolution is better than ± O.4 microsecond/ft. This random error reduces to zero during the integration of many measurements.

The precision of the Sonic timing circuitry depends fully on the precision of the quartz crystal. As a comparison, in ordinary quartz wrist watches, this precision is of the order of 0.0002 percent.

The transit time integration (TTI) performed in the field uses times from the clock and depth pulses from the cable movement. It should be fairly accurate, or else obviously wrong if the depth pulses are not being produced at the correct interval.

The only calibration required in Sonic Logging is the conversion of interval transit time into analog form for display. If the linearity of the display is incorrect, it may have some effect when the log is hand digitised from a print. Logs from field tapes should have no linearity problems, and the sampling rate of once every six in. is adequate for a receiver spacing of 2 ft.

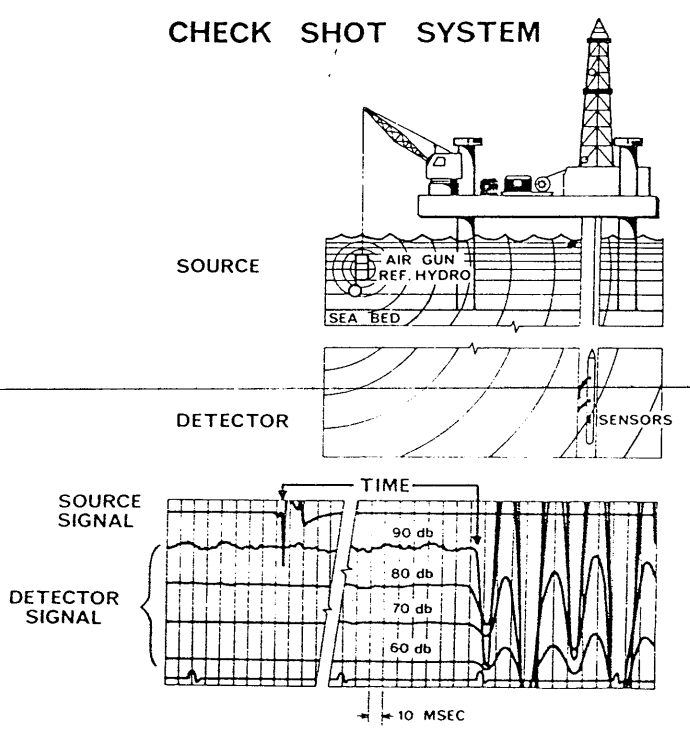


Figure 4 Check shot system.

PRECISION OF CHECK SHOT INSTRUMENTATION

The surface instrumentation records the source and the detector signal on a time base provided by a very stable quartz clock. The surface circuitry is usually identical for both channels and does not introduce relative delays.

The accuracy on check shot times can be limited, though, by extra delays on the downhole signal; delays can range at about 0.01 ms (milliseconds) in downhole amplifiers, and at about 0.1 to 0.2 ms in the logging cable. Differences may exist in the rise time of surface and downhole detectors leading to relative delays.

The scale of an analog display, or the sampling rate of a digital record, may limit the resolution on check shot times.

Disregarding the method of time pick, check shot instrumentation should be accurate to within 1 to 2 ms. This limits the use of check shots for continuous velocity measurement, as is the case for all large scale measurements. This accuracy has to be kept in mind when adjusting Sonic Logs.

DRIFT

Sonic Logs are adjusted by comparing the integrated Sonic transit time with check shot times. For that purpose we define drift as follows:

DRIFT = SEISMIC TIME - SONIC TIME. . . (1)

Seismic time is the check shot time, corrected to vertical and referred to the Seismic Reference Datum. Sonic time is the integrated Sonic transit time.

Drift has no absolute value unless Sonic times are also referred to the Seismic Reference Datum. This can be achieved by means of a check shot, which becomes a drift tie point. The tie point can be the top of the Sonic Log, or any other check shot level where the seismic time is judged more reliable.

Drift plot

A drift plot can be made by plotting the drift, in ms, at every check shot depth. Between two levels the difference between the drift of the deeper and shallower levels is the amount of time correction to be applied to the Sonic time. In other words, the amount of time correction required is the difference between the interval seismic time (difference of seismic times) and the Sonic transit time integrated between the two levels. It is not wise, though, to adjust Sonic Logs interval-by-interval between shooting levels; for example, if a level is in the middle of a formation, this practice could lead to different corrections above and below that level within the same formation. Such different corrections result in a step on the adjusted log, which produce a false reflection on a synthetic seismogram. The effect can become drastic as the distance between shooting levels becomes very small, because the relative error on interval seismic times becomes worse. If the accuracy on one check shot time is ± 1 ms, the accuracy on an interval seismic time may be judged as ± 2 ms. In terms of interval transit time, it becomes ± 2μs/ft (microseconds/ft) for an interval of 1000 ft, and ± 10μs/ft on an interval of 200 ft. This should not discourage recording levels as close as 200 ft, as more levels can make the choice of the drift curve easier and more representative.

Drift Curve

To limit the adverse effects of interval-by-interval adjustment, an interpretive drift curve is drawn on the drift plot. Currently, zones are chosen in which the character of the Sonic is about constant. In each zone, drift points are fitted by a segment of a straight line, within the accuracy of an individual check shot. From one zone to the next, these segments are joined at knees, (changes in slope) that form common boundaries between the zones.

A knee is not necessarily at the depth of a check shot, as knees should pinpoint formation changes, or changes in Sonic character. This usually can not be done by check shots, because it is better to avoid possible reflections or refractions that may occur when positioning the check shot receiver at or close to a formation change. Furthermore, hole size or hole conditions may limit the choice of levels.

The drift curve is used to adjust the Sonic Log. On the drift curve the slope of the segment of straight line joining two consecutive knees is the gradient of drift. This gradient, expressed in $\mu s/ft$, is the average correction to be applied to the Sonic transit times between the two knees.

When the slope is negative, that is, an algebraic decrease of drift with increasing depth, the average correction is negative; we say that we have "negative drift" (meaning negative drift gradient). In other words, the Sonic time is longer than the seismic time between the knees considered, or Δt measured is on average too long, or Sonic velocities are, on average, too slow.

When the slope is zero, in spite of whether the plotted points fall within the negative or positive region of the drift plot, the Sonic time is exactly equal to the seismic time, and no correction is required throughout that zone.

When the slope is positive, we say that we have positive drift. In other words, Δt measured by the Sonic tool is, on average, too short, or Sonic time is shorter than the seismic time, or Sonic velocities, on average, are too fast. Figure 5 exhibits drift plots and drift curves with negative, zero and positive drifts.

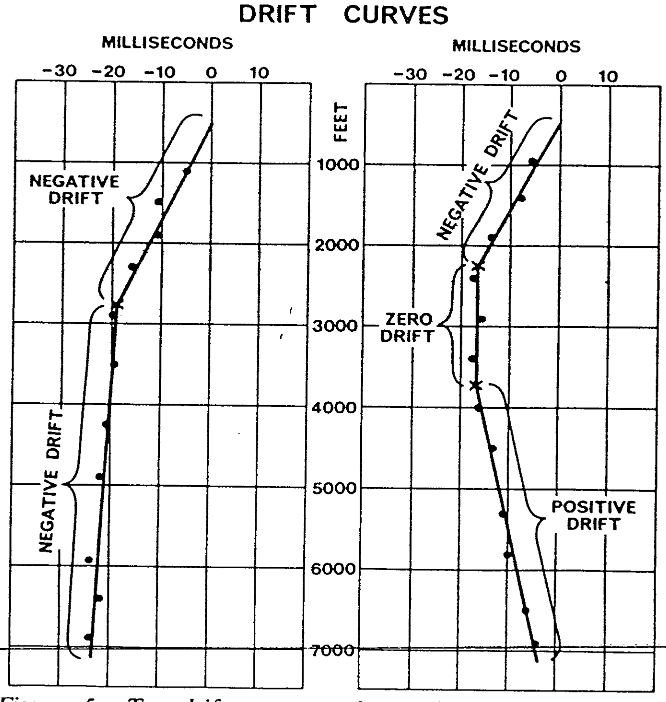


Figure 5 Two drift curves are shown. One exhibits only negative drift, the other negative, zero and positive drift.

Let us remember that the seismic time from check shots is the reference against which we adjust Sonic Logs. The adjustment of the Sonic transit times could be effected by applying a constant shift equal to the drift gradient throughout the zone between two knees. This rather primitive approach, however, produces less than optimum results, especially in the case of negative drift. It will be shown later that most large errors on the Sonic Log occur in formations exhibiting relatively long Sonic transit times. It is therefore advantageous to employ a system of adjustment that applies no correction in formations of short transit times, while applying a correction greater than average in formations with a transit time in excess of a specified value — the correction being proportional to that excess. This procedure involves a non-constant adjustment and leads to a drift curve which may not exactly follow the interpretive straight line segments drawn on the drift plot, except at the knees. In this case, care should be taken that the residual errors between the adjusted Sonic times and seismic times are within the accuracy of check shots for all levels within the non-constant adjustment zone.

SOURCES OF ERROR ON SONIC LOGS

We can identify two main cases; those in which the Sonic transit time is longer than the true formation transit time, and those in which it is shorter. As defined by the authors, our reference for true formation transit time is "the formation seismic transit time at natural seismic frequencies, along a straight line parallel to a vertical borehole through non-dipping formations, undisturbed by borehole effects".

In both cases, two main sources of error exist. One is related to the method of detection of receiver signals, by a trigger or detection level. The other is related to the principle of refraction inherent to Sonic Logging.

Case 1: Sonic Time Too Long

Noise

Noise on one near receiver can result in a long Δt. The result is usually in the form of an isolated spike and can be edited.

Stretch

In formations showing high signal attenuation, stretch can occur due to the extra attenuation on one far receiver signal as illustrated in Figure 6. A possible range of error could be $2\mu s/ft$ over such formations.

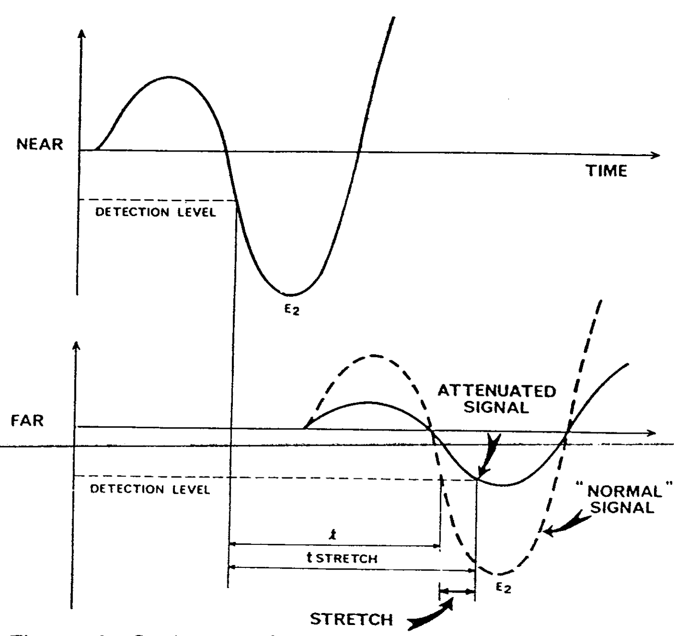


Figure 6 Sonic Δt stretch occurs when the far receiver signal becomes attenuated.

Cycle Skipping

Further attenuation on one far receiver can result in one cycle skip when the amplitude of E_2 becomes smaller than the detection level and when detection is made one cycle later, on E_4. If the transmitter signal center frequency is about 25 kHz, one cycle is 40μs If four sequences are used for one Sonic measurement, the skip of one cycle on one far receiver results in an increase in t of 10μs/ft. If the frequency of the signal at the receiver is reduced by formation absorption, the increase in t could be slightly larger. The mechanism of cycle skipping is described in Figure 7. Cycle skips could occur on both far receivers and more than one cycle could be skipped. If gas appears in the borehole, signal attenuation may become serious, resulting in very weak signal strength and spiky logs.

SONIC LOG CYCLE SKIPPING

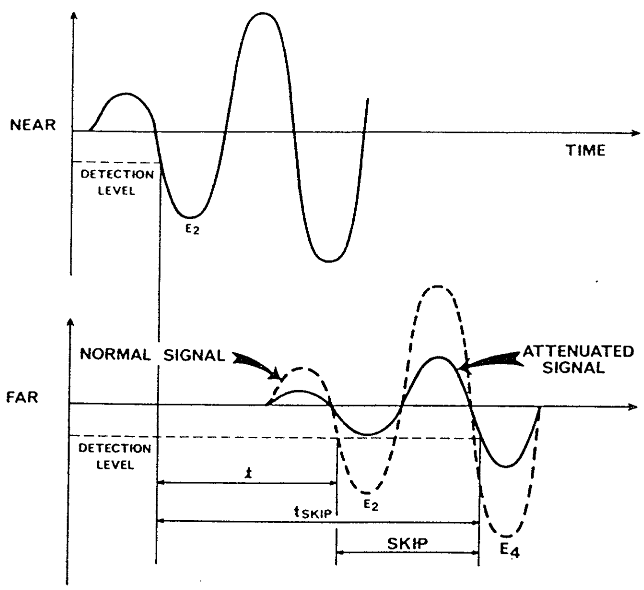


Figure 7 One cycle skip occurs when E_2 becomes smaller than the detection level and only E_4 is detected.

The use of AGC (Automatic Gain Control) tends to reduce noise, stretch and skips. In addition, modern Sonic tools utilize skip rejection logics which tend to suppress noise spikes and reduce cycle skipping.

Hole Condition, Large Holes'

Borehole rugosity can produce diffractions, which should not affect first arrivals except for a possible reduction in amplitudes. Depending on the depth of the borehole irregularities relative to the sonde spacing, rugosity in general will not affect the accuracy of the Sonic measurement. However, in the case of deep and rapid borehole wall variations, tortuosity of the Sonic ray path may lead to long transit times. Attenuation affects may also be a factor.

Changes in borehole diameter should be accommodated by borehole compensated systems (BHC).

Large boreholes can be troublesome, as the first arrival may be a mud arrival at the near receiver, or at the far receiver as well. The travel time along the direct mud path, T_o, and the refracted path, T_1, can be computed for the following parameters:

- x spacing, transmitter-to-receiver distance
- z distance from the borehole wall to the surface of the transmitter (we assume this distance to be the same for the receiver)
- t_m mud transit time
- t formation transit time

As the incidence angle for refraction is such that $\sin i = t/t_m$, we obtain,

$$T_o = x\, t_m \quad \ldots\ldots\ldots\ldots (2)$$

for the direct mud path, and,

$$T_1 = xt + 2z\sqrt{t_m^2 - t^2} \quad \ldots\ldots\ldots\ldots (3)$$

for the refracted path.

When z, t_m and t are fixed, T_o and T_1 can be plotted against spacing.

The crossover distance $= X_c = 2z\sqrt{\frac{t_m + t}{t_m - t}} \quad \ldots\ldots (4)$

is defined by the point at which $T_o = T_1$

Only when the spacing is larger than X_c is the arrival from the formation the first arrival at the receiver. Refer ahead to Figure 10.

When t_m and x are fixed, a plot of t versus z can be made. On this plot a line will isolate one area in which the fixed spacing is greater than the corresponding crossover, that is, the area in which the first arrival at the receiver is from the formation. In the other area, the first arrival at the receiver is from the direct mud path.

The plot for a centered 3ft-5ft tool is interesting. If the tool is centered, z becomes half the difference between hole diameter and transducer diameter. The plot can then be made in terms of t versus hole diameter, as in Figure 8. Below the 3ft line, a centered Sonic tool will read formation transit time. Between the 3ft and the 5ft lines, a centered Sonic tool will read a time intermediate between formation and mud transit times. Above the 5ft line, the Sonic tool reads mud transit time; for example, in a 16in. borehole a centered 3-5ft Sonic cannot read formation transit times much higher than about 140μs/ft.

MAXIMUM FORMATION t DETECTABLE WITH SONIC LOGGING TOOLS

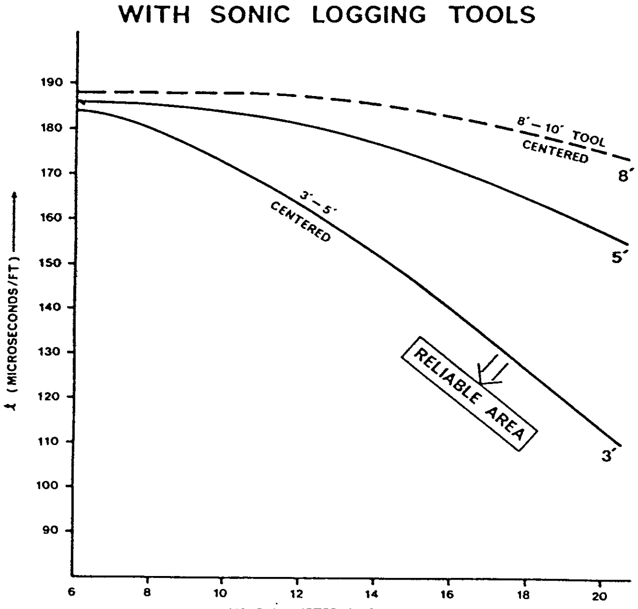


Figure 8 Effect of large hole size. For a given centered Sonic tool, the maximum t detectable is read at a given hole diameter from the curve identifying the transmitter-near receiver spacing.

In surface holes, where both large holes and slow velocity formations occur, it is better to excenter a 3-5ft tool in order to keep z, the tool stand-off, at a small value. Most formation transit times can be read, up to the mud time (minus some μs/ft due to tool stand-off). However, excentering of the tool reduces signal amplitude thus creating detectionn problems.

Longer-spacing tools, centered or not, make possible the measurement of transit times of nearly all formations with a velocity greater than that of mud.

Formation Alteration

Formation alteration can occur close to the borehole wall due to stress relaxation, mechanical damage or interaction of the drilling fluid with the formation (clay hydration, etc.).

The result is usually an increase of t close to the borehole. To make things simple, let us assume that transit times vary according to a step profile.

- t_m - mud transit time
- Z_o - distance from transducer to borehole wall
- t_d - transit time of the damaged or altered zone
- Z_1 - thickness of the damaged zone from the borehole wall
- t - transit time of the undisturbed zone

With such a profile three paths can be considered from transmitter to receiver. A direct path through the mud and two refracted paths; Path 1 in the damaged formation and Path 2 in the undisturbed formation. For Path 2 the angle incident upon the damaged formation is $\sin^{-1} t/t_m$ and the angle incident upon the undisturbed formation is $\sin^{-1} t/t_d$. Figure 9 shows Paths 1 and 2.

SONIC RAY PATHS IN THE PRESENCE OF FORMATION ALTERATION

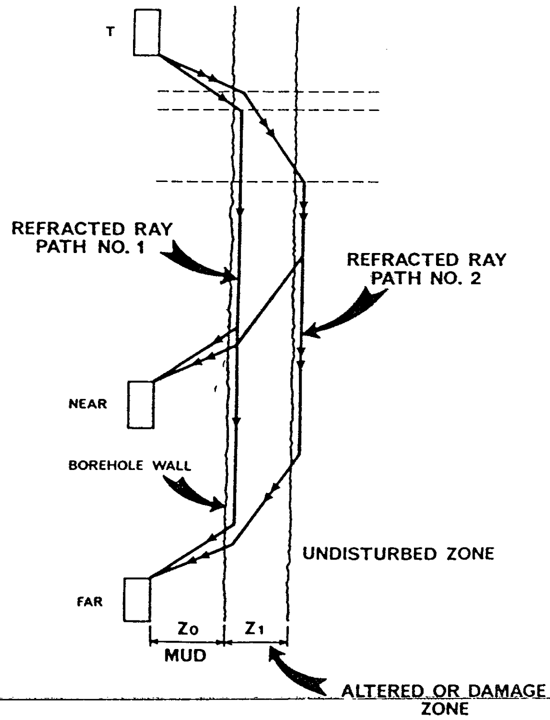


Figure 9 Two refracted paths are shown for a step profile of alteration. $t_m > t_d > t$.

Arrival times can be computed for each path.

$$TO = xt_m \quad \text{(mud path) ... (5)}$$

$$T1 = xt_d + 2Z_o \sqrt{t_m^2 - t_d^2} \quad \text{(Path 1) ... (6)}$$

$$T2 = xt + 2Z_o \sqrt{t_m^2 - t^2} + 2Z_1 \sqrt{t_d^2 - t^2} \quad \text{(Path 2) ... (7)}$$

A plot of three arrival times versus spacing can be made for fixed values of t_m, t_d, Z_o and Z_1. Only for spacing longer than the second "crossover" distance, defined by T1 = T2, are the first arrivals from the undisturbed zone. For the particular values chosen in Figure 10, only a sonde with spacings greater than 5 ft records the correct t of the undisturbed formation.

Figure 10 demonstrates another point. The transit time of a particular path is the slope of that path line on the diagram. The path triggering any particular receiver is the one that plots lowest on the time axis. The transit time measured by any receiver pair is shown by the slope of the line joining the points on the lowest line determined by the receiver locations. This proves that it is impossible, through any combination of formation alteration circumstances, to measure a t shorter than that of the fastest velocity formation (with the possible exception of rare and transitory conditions of destructive signal interference on the near receiver). When t_m, t, Z_o, and x are fixed, a plot of alteration, $(t_d - t)$ versus alteration depth, Z_1, can be made. On such a plot a line representing a given transmitter-receiver spacing separates two areas. In one area, to the left of the corresponding line, the first arrival is from the undisturbed zone. In the other area, the first arrival is from the damaged zone. Figure 11 is drawn for spacings of 3, 5, 8 and 10 ft.

TRANSMITTER - RECEIVER TIME VS SPACING

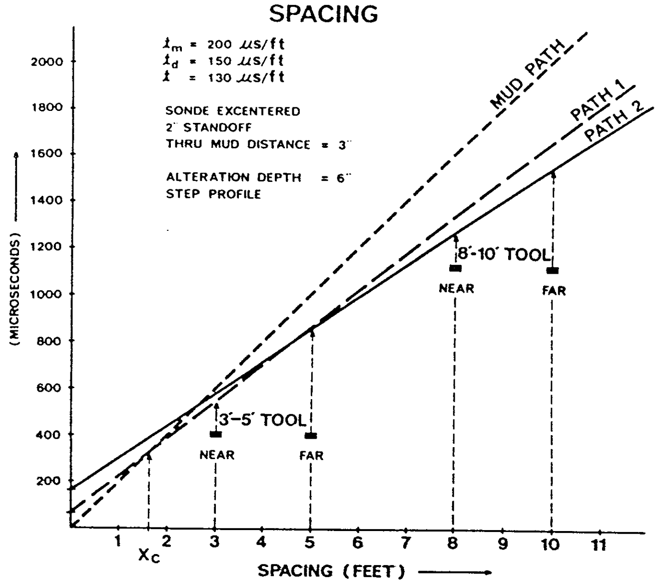


Figure 10 This diagram illustrates the fact that, for any combination of transmitter receiver spacings, the path triggering a particular receiver is the one which plots lowest on the time axis. For example, with the velocities considered here, a 3'-5' Sonic tool reads the altered zone while an 8'-10' device reads the undisturbed formation.

Figure 12 shows ranges of validity of the Sonic measurements for a few different values of t in the presence of varying degrees and depths of formation alteration. The area to the left of a given curve represents the zone of reliable measurements. This diagram also demonstrates the efficiency of a long-spacing Sonic tool in overcoming the affects of formation alteration.

Both types of plots represent what we could call "depth of investigation" of Sonic tools in front of damaged zones, but let us remember we are assuming a step profile of damage.

All the previous considerations are in favour of long-spacing Sonic tools, which should better cope with large holes and shale alteration, provided amplitudes at receivers are still sufficiently large. Figure 13 shows the drift curves obtained in the same well

EFFECTS OF FORMATION ALTERATION ON SONIC MEASUREMENTS

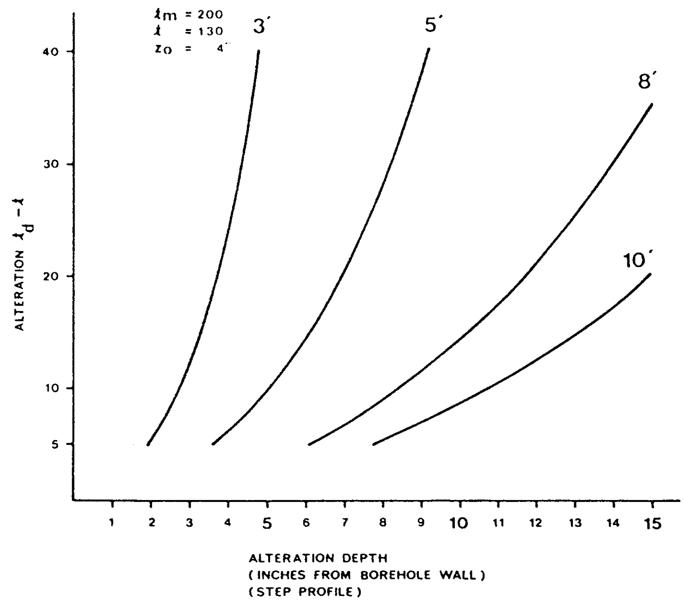


Figure 11 *For t_m = 200, t = 130, Z_O = 4", the depth of investigation, (in the presence of a damaged zone) of 3', 5', 8', 10' spacings is plotted versus the amount of alteration t_d − t. An 8' spacing can tolerate about 12 inches of 20µs/ft alteration before the altered zone affects the measurement.*

EFFECTS OF FORMATION ALTERATION ON SONIC MEASUREMENTS

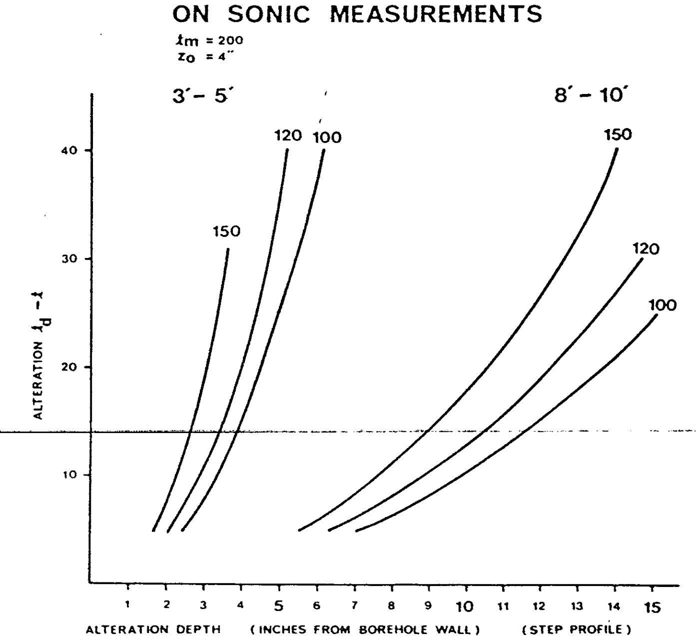


Figure 12 *For t_m = 200, Z_O = 4", the depths of investigation of 3'-5' and 8'-10' tools are plotted against alteration depth for various values of t. At a degree of alteration equivalent to 20µs/ft, a centered 3'-5' tool in a 10" hole can cope with 5" depth of invasion at t = 100, but only 3" at t = 150.*

DRIFT CURVES

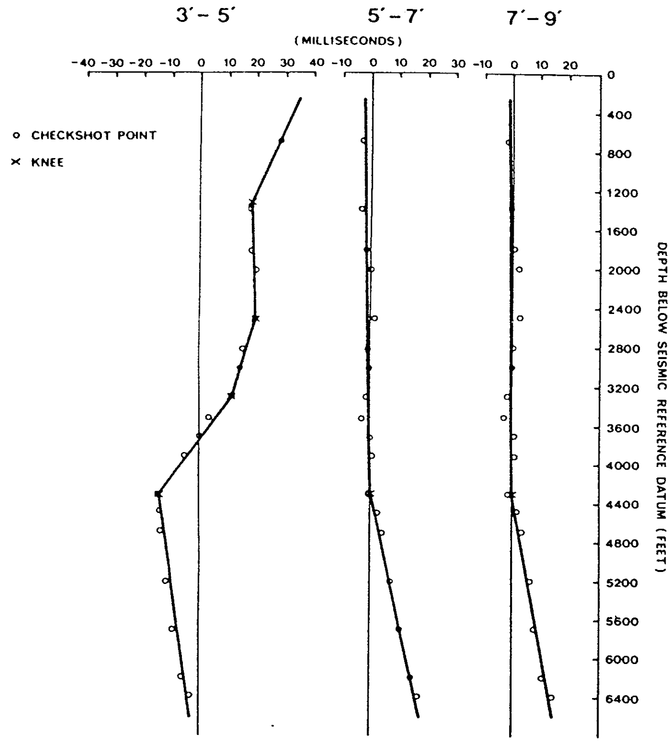


Figure 13 *These drift curves, on the same well, demonstrate the efficiency on long-spacing sonic devices in eliminating negative drift due to formation alteration and large hole effects.*

FORMATION ALTERATION

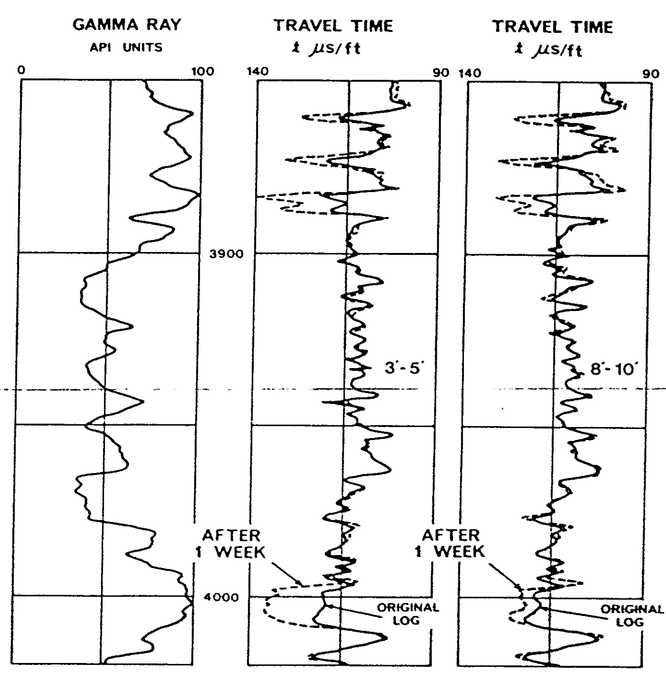


Figure 14 *Effects of alteration on 3'-5' and 8'-10' Sonic tools, each run at a one week interval in the same well.*

with a 3-5ft BHC system and experimental tools, not borehole compensated, of 5-7ft and 7-9ft spacings. The strong negative drift apparent on the 3-5ft drift curve above 4000ft is due to formation alteration and large hole size. This negative drift is eliminated on both long-spacing drift curves.

Figure 14 is an example of the increase of formation alteration with time. At a depth of about 4000 ft both 3-5 ft and 8-10 ft Sonic tools read about 120μs/ft on the first logging run (hole open one day). One week later, the 3-5 ft tool reads about 135μs/ft while the 8-10 ft tool reads about 125μs/ft. With the assumption of a step profile of alteration this would imply that the depth of alteration from the borehole wall is more than 10 to 11 in. as the 8 ft spacing (at least) seems affected. In zones of lower Gamma Ray readings both 3-5 ft and 8-10 ft logs agree and are consistent in time.

We can remark that if we do not assume a step profile of alteration, but; for example, a linear variation, signals following curved paths from the altered zone may arrive sooner than those following paths from the undisturbed zone. This leads to a crossover distance longer than that for a step profile. The depth of alteration implied from the above example would then be shallower than 10 in.

Case 2: Sonic Time Too Short

Noise

Noise, on a far receiver only, can result in a t too short. Again, it should appear only as spikes on the log.

Negative Stretch

If one of the near receivers has a signal output much weaker than that of the far receivers, stretch could appear on the near receiver, resulting in a t too short.

Cycle Skipping

Further reduction of amplitude on a weak near receiver can result in a cycle skip on the near receiver and a short t.

All of the above conditions should be reduced by Automatic Gain Control, skip rejection logics, and normalization of all receivers in the Sonic sonde.

Formation t Longer Than Mud

If the formation t is, longer than that of the mud, no refraction is possible and the Sonic tool will measure t_m. This condition can occur in formations such as gas-bearing shales, where gas is trapped in the shale; in shallow gas reservoirs; or in some formations close to the surface. In this last case, perhaps the best approach would be check shots recorded at close intervals.

Velocity Inversion Near the Borehole

Velocity inversion is the case in which the invaded or damaged zone close to the borehole wall is faster than the undisturbed formation and both are faster than the mud. Under these circumstances, the best a Sonic tool can do is to measure the invaded or damaged-zone transit time, which is shorter than the true formation transit time.

One such case could be the invasion of a permeable water-bearing formation by a mud filtrate more dense than the formation water. This is probably restricted to well-consolidated formations, in which a linear velocity-porosity relationship can apply. It is further restricted to shallow formations, as the effect of the fluid in the formation appears to be reduced by depth. Nevertheless, if the above is true, a mud filtrate of a transit time shorter by 5μs/ft than that of the formation water in a 30 percent porosity formation would cause a positive drift gradient of 1.5μs/ft over the corresponding depth interval. In general, this effect is expected to be negligible.

An increase of pore pressure due to an overbalanced mud may have some effect. Which effect this might cause is not clear. The velocity may be increased because the increased pore pressure improves fluid-to-grain contact, or because the fluid elasticity (stiffness) is improved, or the velocity may be reduced because grain-to-grain contact is impaired as pore pressure increases.

Gas

A specific case of velocity inversion near the borehole may be generated by gas-bearing formations that have been invaded by drilling fluids. It should be remembered that check shots will be sensitive mainly to the undisturbed zone, whereas the Sonic Log responds primarily to the flushed zone.

A special situation is that in which the formation has no relative permeability to gas, and therefore gas saturation does not vary with distance from the borehole. Provided t is shorter than t_m, the Sonic Log should read true formation transit time t, and drift should be zero. Generally, the presence of gas may be expected to severely affect formation transit time.

Domenico (1976) performed some measurements (at 200 kHz) which tend to show the following:

> A gas saturation of 15 percent reduces drastically the velocity with respect to a water-saturated formation. From 0 to 15 percent a small variation in gas saturation can cause a huge change in velocity. For gas saturations above 15 percent the velocity is little affected by a change of saturation. These results are displayed in Figure 15.

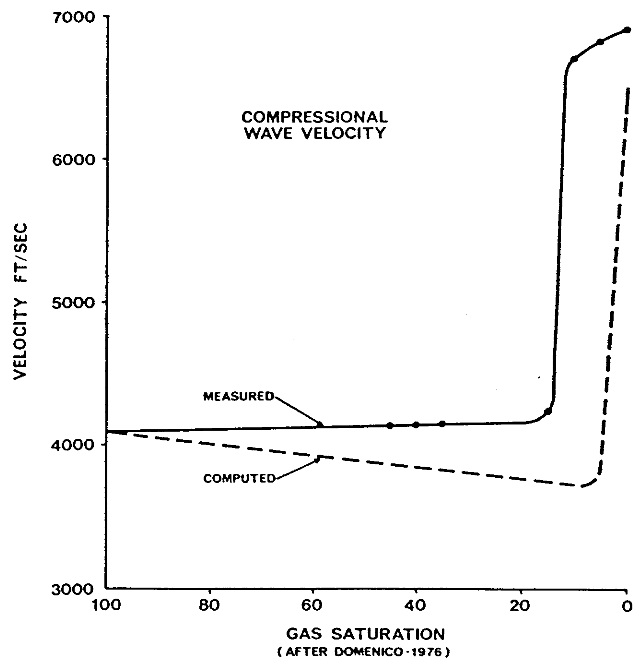


Figure 15 Effect of gas saturation on velocity in a shallow sandstone (After Domenico, 1976).

According to these observations, we can summarize the effect of gas in Table 1, where t is the undisturbed formation transit time, and t_w is the equivalent water-bearing formation transit time.

The limitation by t_m may be significant in shallow reservoirs. In all cases, if gas enters the borehole, t_m is increased, amplitudes reduced, and a spiky log may be inevitable.

Small gas saturations (below 15 percent) may exist in thick, water-bearing formations, as evidenced by dry wells drilled on unquestioned bright spots. In such formations the relative permeability to the gas, at least horizontally, may not be nil and invasion could explain positive drift over such intervals. The amount of positive drift would depend on depth or degree of

Table 1		
Undisturbed Formation Gas Saturation	Invaded Zone Gas Saturation	Sonic
$S_g \geq 15\%$	$\geq 15\%$	Sonic = t if $t < t_m$ Sonic = t_m if $t \geq t_m$ Sonic is spiky if gas enters the borehole
$S_g \geq 15\%$	$< 15\%$	$t_w \leq$ Sonic $\leq t$ (upper limit t_m again)
$S_g < 15\%$	$= S_g$	Sonic = t (upper limit t_m)
	$< S_g$	$t_w <$ Sonic $< t$

compaction and on relative gas saturation in the undisturbed and invaded zones.

Practical use of equations such as those Domenico (1974, 1976) used for his computed results, could be difficult as they require the knowledge of formation moduli. Ausburn (1977) works out two examples to compute t in gas-bearing formations, knowing t in the same water-bearing formations; a 32 percent porosity sandstone varies from 123 to 186 μs/ft and a 20 percent porosity limestone from 71 to 80 μs/ft.

High Dips

In the presence of high dips (relative to the well bore) the Sonic signal may travel along refracted paths more than along the borehole, leading to shorter transit times. In addition, fast formations appear thicker on the Sonic Log because first arrivals, from whichever side of the hole, are detected and therefore, the recorded signal is preferentially that transmitted by the faster formation. This effect should be minimal, especially with excentered tools.

Frequency Dependent Velocities

Acoustic velocities appear to be dependent on the frequency of the signal. One would then expect that Sonic velocities are faster than check shot velocities, as we are comparing a Sonic signal of a frequency in excess of 20 kHz with one of roughly 50 Hz.

The propagation of particle movements through porous formations is not fully understood, but some models have been hypothesized and computations have been made. Strick (1971) uses an absorption model, introducing a "pedestal effect", to account for the positive drifts of 1.7 μs/ft observed in Canada by Gretener (1961). Pedestal is the time between the visual onset of the signal and the first break of a theoretical infinite frequency signal. Some of his conclusions are that the amount of positive drift could be larger in formations in which seismic signals are prone to losses and the same pedestal effect could appear on the Sonic with longer spacings. According to this, using longer-spacing Sonic tools could reduce but not suppress positive drift.

Other authors (Geerstma, 1961) seem to relate velocity to frequency. Anstey in various publications supports the frequency, dependence of velocities; to him, the concept of minimum phase itself implies this dependence.

To us, frequency dependent velocity appears to be a fact, even though the various models used to describe absorption, dispersion, or loss mechanisms for any type of formation, may be criticized and even though one can debate on which velocity is to be considered (phase, group etc.,). Partial support for our belief could be found in Figure 16. Here, Ward and Hewitt

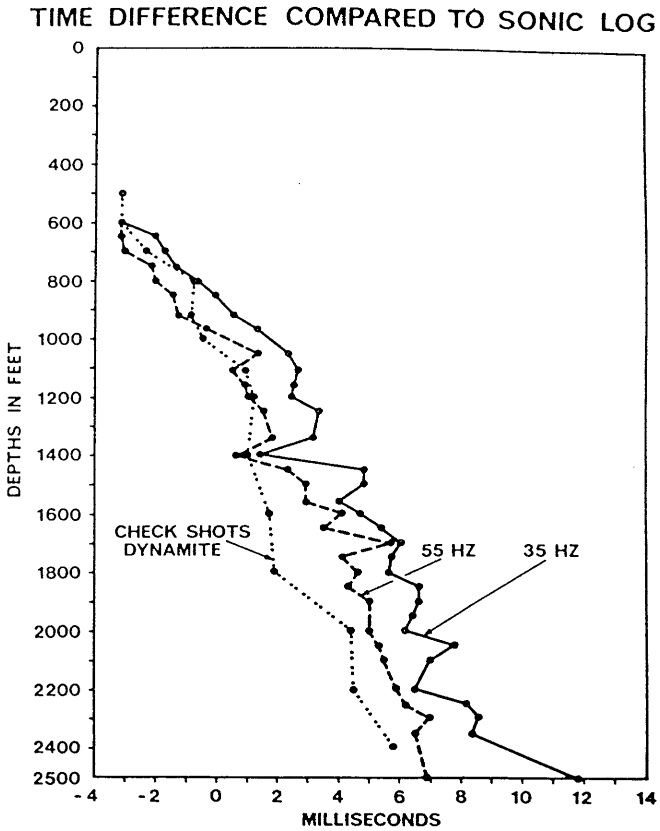


Figure 16 Drift plots obtained in the same well with a dynamite and two monofrequency velocity surveys. (After Ward and Hewitt, 1977).

(1977) compare Sonic Log times to check shot times from dynamite and from monofrequency vibrator signals. The dynamite was shot below the weathering and thus we would expect a wide frequency content. We note that all three methods show positive drift, and that the lower the source frequency, the more drift there is.

SOURCES OF ERROR ON CHECK SHOTS

As a reference, we use the identical definition as for the Sonic Log. Formation transit time is "the formation seismic transit time at natural seismic frequencies, along a straight line parallel to a vertical borehole through non-dipping formations, undisturbed by borehole effects"

Case 1: Check Shot Time Too Long

Filtering Circuitry

Any noise filtering on the downhole signal, before it arrives at surface, will cause an extra delay with respect to the surface reference signal. This delay is about constant and does not appear on drift curves.

Amplifier DC Offset

Any DC offset applied to the signal amplifiers to suppress noise results in longer first-break times. This error would be slightly frequency (and therefore depth) dependent.

Technique of Reading Records

The technique of picking the check shot time makes a difference too. Picking time on the first trough rather than on the first break or onset is easier, but will produce longer times. The difference will be a function of depth, as the width of the first cycle usually increases with depth. Anstey (1977) suggests that check shot time on processed records be picked after zerophasing.

The detection of the surface signal may introduce some inaccuracy. If a command to fire is used as a time origin, some jitter may exist between the command and the actual firing.

Case 2: Check Shot Time Too Short

Dip Relative to the Borehole

With the use of airguns, which do not require big offsets, check shot times are considered as vertical times — in practice, a correction is made for the small gun offset.

Refraction due to hole deviation or the presence of dip relative to the borehole changes the picture; check shot times are from refracted paths, shorter than integrated Sonic times along the borehole. Figures 17 and 18 compare refracted check shot times with Sonic times.

EFFECT OF DIP

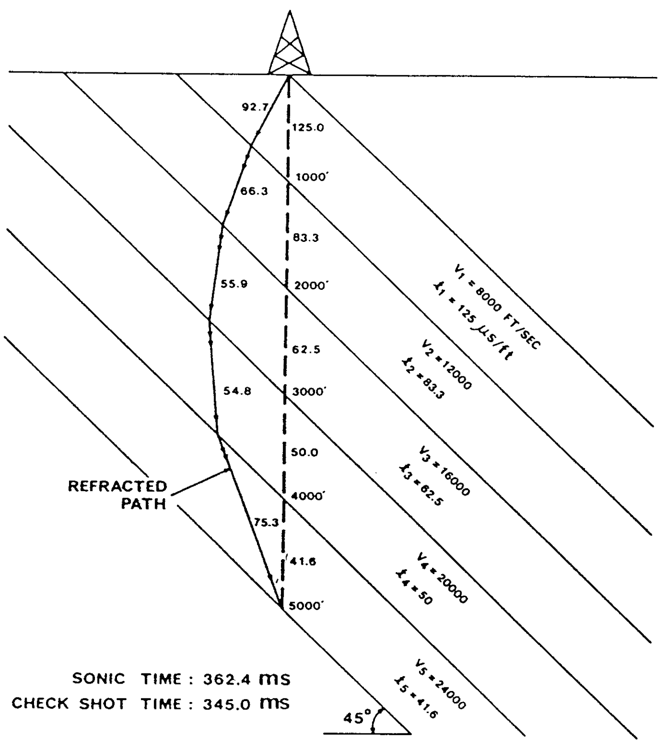


Figure 17 *Comparison of check shot refracted time and Sonic time in a vertical well and formation dip of 45°.*

Lateral Formation Changes

Refraction due to lateral formation changes creates an acoustic short circuit. This can occur in the case of wells drilled close to salt domes, faults, volcanic dykes, or massive reefs. Check shot times, measured on first arrivals, can lead to large discrepancies with Sonic times.

Moderate Hole Deviation

Boreholes commonly change deviation angle or deviation direction, sometimes in one smooth arc, but usually in a wobbling or spiralling manner. The result is that the path measured along the borehole will be longer than the straight line joining the ends. Ignoring refraction for the moment, check shot signal paths will follow the straight line, while depths, of necessity, must be measured along the borehole. For accurate results, true vertical depth (TVD) projections must be made (separately) for both the measured depths and the check shot times (assuming a straight path for the check shots). In practice, TVD projections are often ignored if deviations do not exceed, say, 5 degrees. In many exploration wells a substantal deviation may build up. Depending on the geometry of the borehole path, this may lead to an error in apparent depth, or check shot times too short relative to measured depths.

EFFECT OF DEVIATION

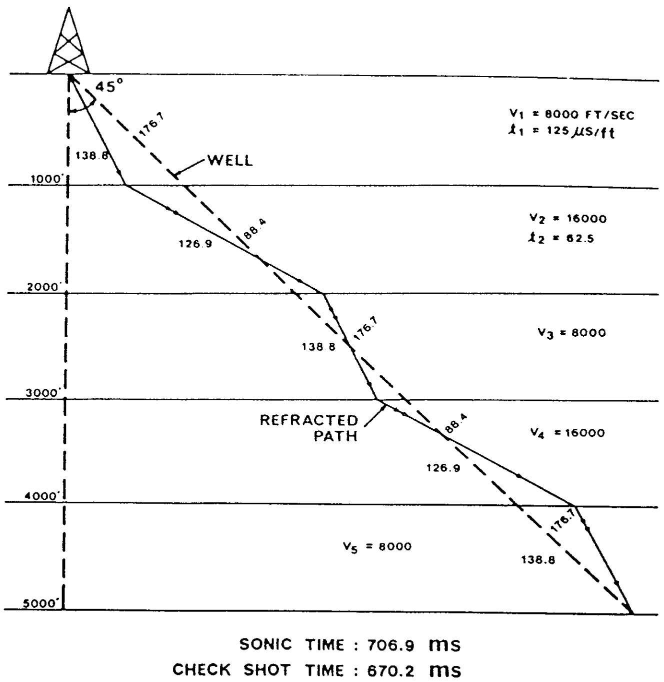


Figure 18 *Comparison of check shot refracted time and Sonic time in a deviated well without formation dip.*

Operational Errors

Operational problems can lead to check shot times being apparently, too short. If, during the survey, the airgun is lowered (by a crane operator for example), and this fact goes unnoticed, the corrected check shot times will be wrong as the correction takes into account the original position of the gun. Offshore, a gun movement of 25 ft during shooting results in a change in check shot times of 5 ms — after gun movement. This should be apparent on time-depth curves and on drift curves. In swamps or areas where the velocity at surface is low, a variation of source position can be even more serious.

FIELD OBSERVATIONS

Statistical data have been gathered from a large number of wells in the Far East. The average values of drift have been plotted on two histograms, one for shallow intervals, down to 3000 to 4000 ft and one for deeper intervals from 3000 to 4000 ft down (Figure 19).

For shallow intervals, the results are quite dispersed, with an average predominance of negative drift. For deeper intervals, the distribution appears more regular, but centered on positive drift.

Because we have used a variety of sources, all the samples are not really consistent. Some of the wells used were surveyed quite a few years ago, with older equipment. It was very difficult to separate some parameters like: source type, Sonic type, premliminary manual editing of Sonic Logs, nature and compaction of formations. Variations in the amount of manual editing of Sonic Logs in shallow formations could explain the dispersion of the related histogram.

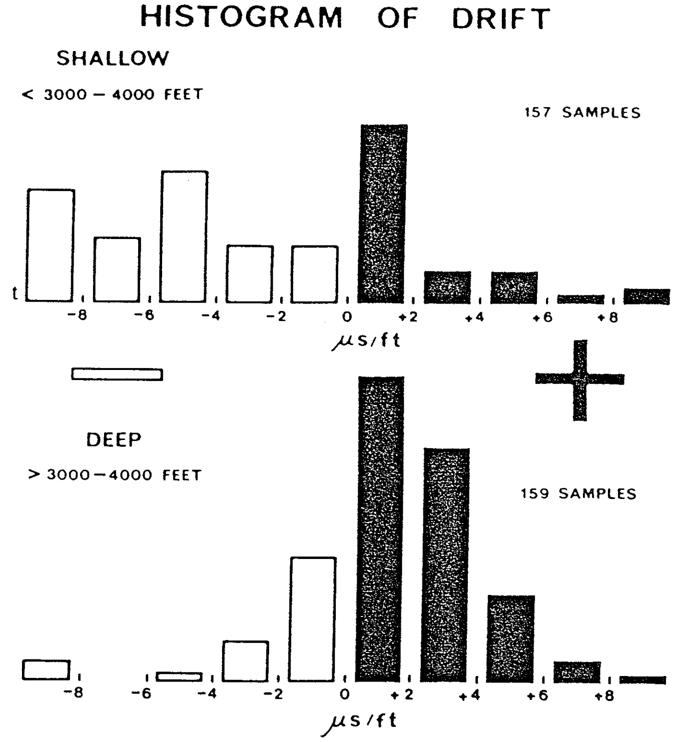


Figure 19 Histogram of drift. At shallow depths drift is predominantly negative, while at deeper depths drift is mostly positive.

DISCUSSION OF POSITIVE DRIFT

Although perhaps not fully satisfactory, the histogram shows that positive drift is not an exception and, in fact, looks more like the rule in formations deeper than 3000 to 4000 ft. The predominantly negative drift at shallow depths is not an unexpected result, as the effects of formation alteration and large holes are most influential at these depths. Furthermore, some negative drift would be expected at greater depths as well, because of the persistence, to varying degrees, of these same influences:

One may wonder why this occurrence of positive drift appears to be a new fact. It is possible that seismic interpreters are now more critical of log information, as precision seismic requires good calibration from well data.

Developments in seismic techniques have been paralleled by improvements of Sonic Logging systems that provide better triggering and better signal amplitudes. Automatic gain control makes triggering less dependent on the alertness of the logging engineer; stretch and skips tend to be reduced, but excessive noise can still be a problem. Better transmitters and receivers result in an increase of amplitude at the receiver, by roughly a factor of 3.

Editing of Sonic Logs before computations tends to reduce negative drift.

All the above elements, which tend to reduce negative drift, appear to have unveiled the fact that positive drift is the norm.

Because the Sonic Log reads primarily in the flushed zone, while check shot paths traverse mainly the undisturbed formations, it may be thought that the presence of gas reservoirs contributes to positive drift. However, on the average, it is likely that most gas reservoirs will retain a residual gas saturation in the flushed zone in excess of 15 percent. Therefore, in keeping with the results found by Domenico, it is unlikely that the presence of gas is a large contributor to positive drift.

CONCLUSIONS

It is our belief that positive drift is related to frequency dependent absorption, or in other words, frequency dependent velocity is the major cause of positive drift.

Further experience with long-spacing Sonic Logs may confirm that positive drift is the rule. The availability of Sonic waveforms on tape will make the experience more meaningful, as it will provide a means to check Sonic transit times, monitor amplitudes, frequency contents, etc.

Possibly, the amount of positive drift, at least in consolidated and weakly absorptive formations, will be small enough to allow direct use of the long-spacing Sonic for seismic calibrations.

Check shots then will be needed not so much as a Sonic adjustment tool, but rather could be used at their full potential; for example, waveform analysis and vertical profiling.

ACKNOWLEDGEMENTS

Field data have been provided by:

Atlantic Richfield Indonesia Inc.
Continental Oil Company of Indonesia
Delhi International Oil Corp.
Esso Australia Limited
Hematite Petroleum Pty Ltd.
P.T. Stanvac Indonesia
Total Indonesie

We wish to express our appreciation for the cooperation of all these companies.

SELECTED REFERENCES

Anstey, N.A., 1977, Seismic interpretation, the physical aspects: International Human Resources Development Corporation, Boston, p. 637.

Anstey, N.A., 1970, Seismic prospecting instruments, vol 1: Geopublication Associates, Gebruder Borntraeger, Berlin, p. 56-62.

Ausburn, B.E., 1977, Well log editing in support of detailed seismic studies: SPWLA 18th Annual Symposium.

Bruckshaw, J. McG., Mahanta, P.C., 1954, The variation of the elastic constants of rocks with frequency *in* Petroleum: Leonard Hill Technical Group, London, January.

Dobrin, M.B., 1976, Introduction to geophysical prospecting: McGraw Hill, New York, p. 292-313.

Domenico, S.N., 1974, Effect of water saturation on seismic reflectivity of sand reservoirs encased in shale: Geophysics, vol. 39, no. 6., p. 759-769.

Domenico, S.N., 1976, Effect of brine gas mixture on velocity in an unconsolidated sand reservoir: Geophysics, vol. 41, no. 5., p. 882-894.

Dupal, L., Gartner, J., and Vivet, B., 1977, Seismic applications of well logs: Fifth European Logging Symposium (SAID).

Geerstma, J., 1961, Velocity log interpretation — the effect of rock bulk compressibility: Soc. Petrol. Eng. J. vol. 1, p. 234-248.

Gretener, P.E.F., 1961, An analysis of the observed time discrepancies between continuous and conventional well velocity surveys: Geophysics, vol. 26, p. 1-11.

Schlumberger, 1972, Log interpretation principles, vol. 1. p. 113.

Strick, E., 1971, An explanation of observed time discrepancies between continuous and conventional Well Velocity surveys: Geophysics vol. 36, no. 2. p. 285-295.

Ward, R.W., and Hewitt, M.R., 1977, Monofrequency borehole traveltime survey: Geophysics, vol. 42, no. 6. p. 1137-1145.

APPENDIX 12.

BIOSTRATIGRAPHIC REPORT AND SOURCE ROCK EVALUATION

CONTENTS

APPENDIX 1
==========

Glossary of semiquantitative source rock parameters recorded using palynological techniques.

APPENDIX 2
==========

Vitrinite reflectance results on samples from Paynesville-1.

ENCLOSURE 1
===========

Micropalaeontological distribution chart for Paynesville-1.

TABLE 1
=======

Summary of the source rock and maturity data from Paynesville-1.

1. ABSTRACT

Paynesville-1 was drilled to 709m KB in PEP 98, onshore Gippsland Basin. Sidewall core samples from 442.0m to 630.0m have been examined for calcareous nannoplankton, foraminifera and palynomorphs and indicate the following stratigraphic subdivision.

DEPTH (mkB)	UNIT	ZONE	AGE
442-492	Gippsland Lst	NN4-NN5 (F-G)	Early Miocene
561	Lakes Entrance Fm ('upper member')	G	Early Miocene
571-574.5	Lakes Entrance Fm ('lower member')	NP25, <u>P. tuberculatus</u>	Oligocene
576.5-579	Lakes Entrance Fm or Latrobe Group	<u>P. tuberculatus</u>	Early Oligocene
586-597	Lakes Entrance Fm or Latrobe Group	Middle <u>N. asperus</u> - <u>P. tuberculatus</u>	Late Eocene-Early Oligocene
605	Lakes Entrance Fm or Latrobe Group	Middle-Upper <u>N. asperus</u>	Late Eocene
608.5-630	Indeterminate		

The environment of deposition from 442m to 571m is inner to middle neritic and from 574.5m to 576.5m is undifferentiated marine. The samples from 579m to 605m also appear to be deposited in a marine environment but the indications may, however, be drilling mud contaminants.

Moderate organic contents in the samples from 571m to 576.5m proved to have only a poor source rock potential. Spore fluorescence of light yellow correlates with mean reflectances of 0.35% to 0.37% indicating the section is immature.

VII SOURCE ROCK POTENTIAL AND MATURITY

Three samples at 571.0m, 574.5m and 576.5m were examined for source rock potential and organic maturity. Data on kerogen components in these samples are shown in Tables 1A, 1B and 1C, and the methods and terms used are explained in Appendix No. 1.

All three samples yielding around 1.0ml/10g organic matter suggest a good source rock potential. However, the percentage of liptinite was low, that of fluorescing liptinite being even lower which contradicts a good source rock potential. Most of the palynomorphs were oxidised and non-fluorescing. The fluorescence colours were light yellow to yellow as against yellow to light orange spore colours. These data would suggest the maturity level of very early oil to early oil generating capabilities.

Vitrinite reflectance determinations were made on two samples (Appendix 2). Five determinations from 571m indicate a mean reflectance of 0.35% with a range of 0.31%-0.40%. At 574.5m 27 determinations indicate a mean of 0.37% and a range of 0.28%-0.53%. This agrees with the light yellow fluorescence colours noted above indicating the section is immature.

VIII. REFERENCES

CARTER, A.N., 1964. Tertiary foraminifera from Gippsland, Victoria and their stratigraphic significance. Geol. Surv. Vict., Mem. 23.

EDWARDS, A.R., 1971. A calcareous nannoplankton zonation of the New Zealand Paleogene. In : FARINACCI, A. (Ed). 2nd plank. Conf., Roma 1970., Proc. 1 : 381-419.

JENKINS, D.J., 1971. New Zealand Cenozoic foraminifera. N.Z. Geol. Surv. Bull. 42 : 278p.

MARTINI, E., 1971. Standard Tertiary and Quaternary calcareous nannoplankton zonation. In : FARINACCI, A., (Ed.). 2nd plank. Conf., Roma 1970., Proc. : 739-785.

RAINE, J.I., 1984. Outline of a palynological zonation of Cretaceous to Paleocene terrestrial sediments in West Coast Region, South Island, New Zealand. N.Z. Geol. Surv., Report No. 109.

SIESSER, W.G., 1979. Oligocene-Miocene calcareous nannofossils from the Torquay Basin, Victoria, Australia. Alcheringa, 3 : 159-170.

STOVER, L.E., and PARTRIDGE, A.D., 1973. Tertiary and Late Cretaceus spores and pollen from the Gippsland Basin, Southeastern Australia. Proc. R. Soc. Vict., 85(2) : 237-286.

FIGURE 1 : SUMMARY CHART, PAYNESVILLE-1

DEPTH (mkB)	LITHOLOGY *	UNIT	NANNOFOSSIL ZONE	PLANK FORAM ZONE	PALYNOLOGY ZONE	AGE	ENVIRONMENT
442.0	* Calcarenite	Gippsland Limestone	NN4-NN5	F	Not studied	Early Miocene	Inner neritic
492.0	* Calcarenite		NN4-NN5	G	Not studied	Early Miocene	Inner/middle neritic
log break at 530.0m							
561.0	* Calcisiltite	Lakes Entrance Fm ('upper member')	Indeterm.	G	Not studied	Early Miocene	Middle neritic
log break at 569.0m							
571.0	* Sandy glauconitic marl	Lakes Entrance Formation ('lower member')	NP25	Indeterm.	P. tuberculatus	x Late Oligocene	Middle neritic
574.5	* Slightly glauconitic fine grained sandstone		Indeterm.	Indeterm.	P. tuberculatus	Early Oligocene	o Marine
log break at 576.0m							
576.5	* Oxidised glauconitic sandstone		Indeterm.	Indeterm.	P. tuberculatus	Early Oligocene	o Marine
579.0	?	Lakes Entrance Formation (basal sandy member) or Latrobe Group (coarse clastics)	Not studied	Not studied	P. tuberculatus	Early Oligocene	o Marine
586.0	?		Not studied	Not studied	Middle N. asperus - P. tuberculatus	Late Eocene - Early Oligocene	? Marine (+)
597.0	= Sandstone		Not studied	Not studied	Middle N. asperus - P. tuberculatus	Late Eocene - Early Oligocene	? Marine (+)
605.0	= Sandstone		Not studied	Not studied	Middle N. asperus - lower part of Upper N. asperus	Late Eocene	? Marine (+)
608.5	= Sandstone		Not studied	Not studied	Indeterm.	Indeterm.	Indeterm.
log break at 616.0m							
617.0	(economic basement)		Not studied	Not studied	Indeterm.	Indeterm.	Indeterm.
630.0			Not studied	Not studied	Indeterm.	Indeterm.	Indeterm.

TD 709m KB

* Lithology based on washed residue
= Lithology based on wireline log character.

o Environment based on palynomorph data.
x Age based on calcareous nannoplankton.
\+ Dinoflagellates (greater than 25%) may be drilling mud contaminants.

ECL AUSTRALIA PTY.LTD.

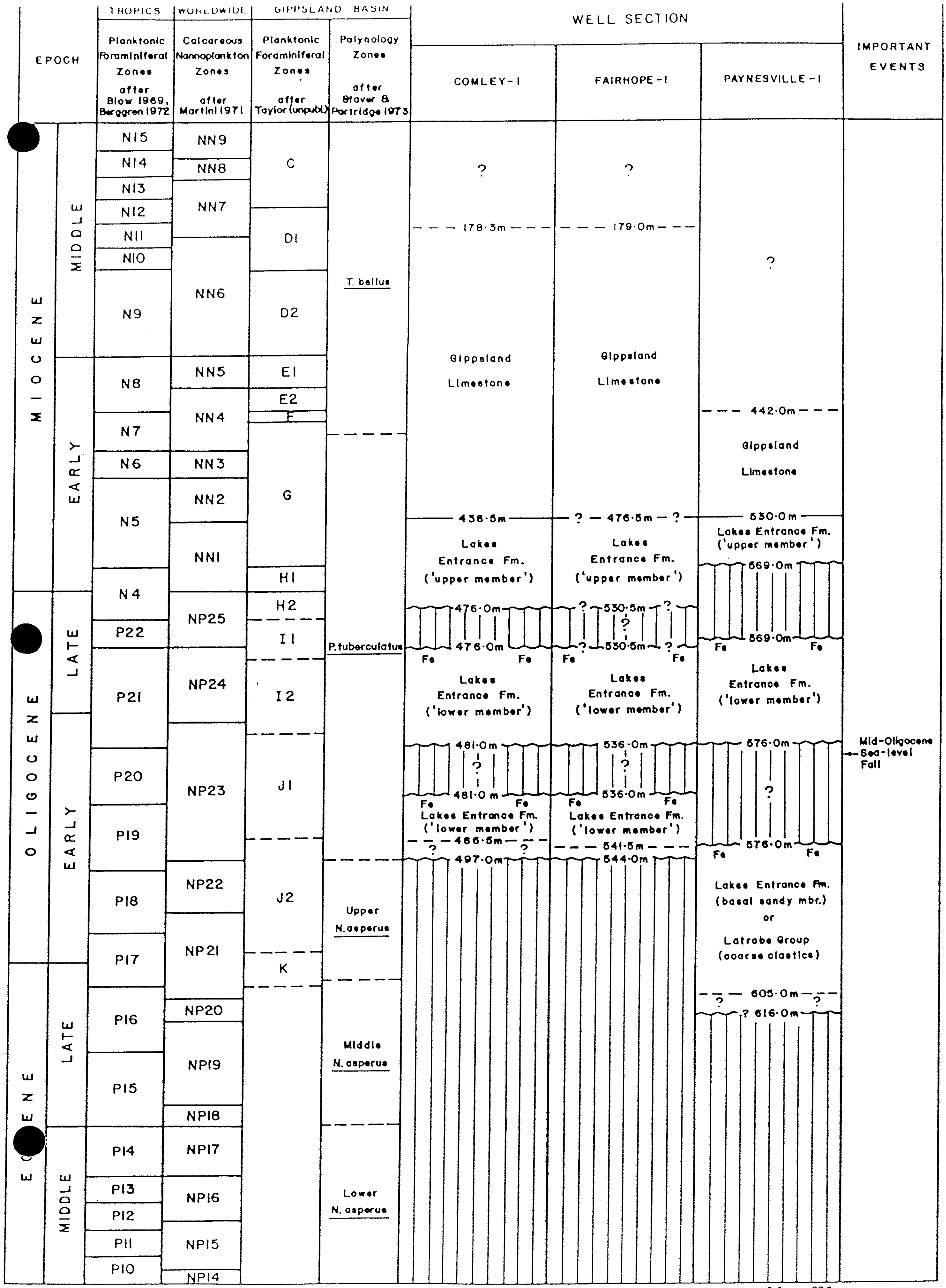
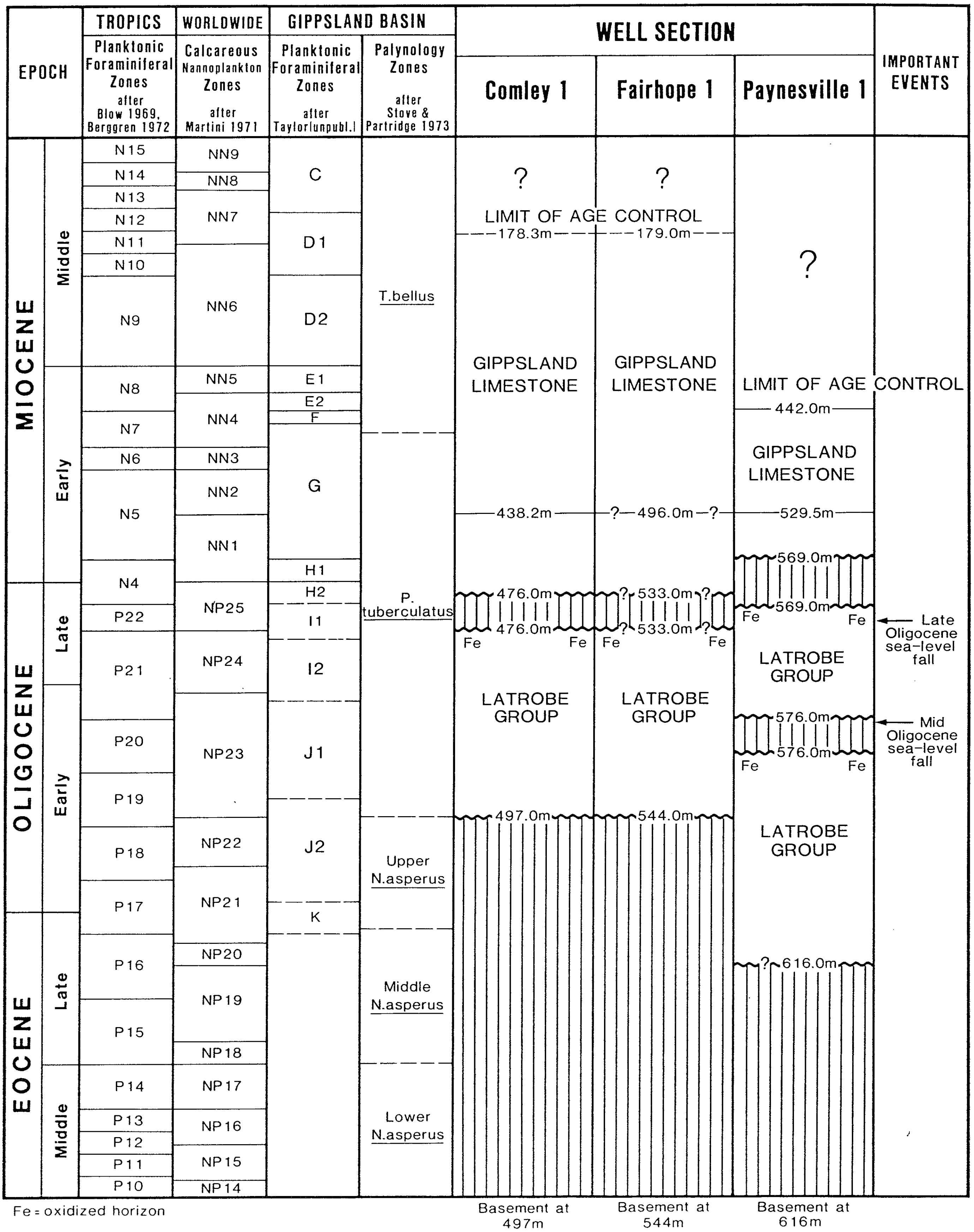


Fig. 2 Tentative chronostratigraphic correlation between Comley-1, Fairhope-1, & Paynesville-1 wells, onshore Gippsland Basin.

Tentative chronostratigraphic correlation between COMLEY 1, FAIRHOPE 1 & PAYNESVILLE 1 wells, onshore Gippsland Basin - revised by Ampol Exploration Ltd



Fe = oxidized horizon

FIGURE 3

Spores and pollen recorded in Paynesville-1

KEY:

x present
c common
cf compared with

	571.0m	574.5m	576.5m	579.0m	586.0m	597.0m	605.0m
Alisporites varius			x	x		x	x
Araucariacites australis	x	x	x	x			x
Baculatisporites comaumensis		x	x				
Banksieaeidites arcuatus	x						
Camarozonosporites sherlockensis				x			
Cingutriletes comaumensis		x		x			
Cyathidites australis	x	x	x	x	x	x	x
Cyathidites minor	x	x	x	x	x	x	x
Cyathidites subtilis	x	x	x	x			
Dacrycarpites australiensis	x	x	x	x		x	
Foveotriletes balteus			?				
Foveotriletes palaequetrus			?				
Gleicheniidites circinidites			x				
Gleicheniidites senonicus	x	x	x	x	x	x	
Haloragacidites harrisii	x	x	x	x	x	x	x
Herkosporites elliottii	x	x					
Ischyosporites gremius	cf	cf				x	
Laevigatosporites major	x		x	x	x	x	x
Laevigatosporites ovatus	x	x	x	x	x	x	x
Lygistepollenites florinii	x	x	x	x	x	x	x
Malvacipollis subtilis		x		x			
Matonisporites mullerii			x				x
Matonisporites ornamentalis		cf					
Monoporites annulatus	x						
Myrtaceidites verrucosus			x		x		
Nothofagidites asperus						x	
Nothofagidites deminutus	x	x	x	x			
Nothofagidites emarcidus	x	x	x	x	x	x	x
Nothofagidites falcatus	x	x				x	
Nothofagidites flemingii	x	x	x				
Nothofagidites goniatus		x	x	x			
Nothofagidites heterus	x	x	x	x	x	x	x
Nothofagidites incrassatus				x			
Nothofagidites vansteenisii			x		x		
Osmundacidites wellmanii	x		x				
Parvisaccites catastus		x	x		x	x	x
Phyllocladidites mawsonii							x
Phyllocladidites verrucatus	x	x					
Podocarpidites ellipticus	x	x	x	x		x	
Podocarpidites microreticulatus	x						
Polypodiaceoisporites tumulatus							x
Propylipollis annularis		cf	x				
Propylipollis beddoesii		x	x	cf			
Propylipollis latrobensis							x
Proteacides recavus	cf	cf					
Proteacidites adenanthoides	x	x					
Proteacidites obscurus					x		
Proteacidites pseudomoides			x				
Proteacidites stipplatus	x						
Proteacidites tenuiexinus	cf	cf				x	
Retitriletes austroclavatidites	x	x					
Rhoipites sphaerica		x	x	x	x		
Rugulatisporites micraulaxus				x		x	
Tricolporites leuros		x	cf				
Tricolporites scabratus			x				
Triletes ornamentalis					x		x
Triletes tuberculiformis				x	x	x	x
Verrucatosporites confragosus				x		x	
Verrucosisporites cristatus	x						x
Verrucosisporites kopukuensis		cf					x

FIGURE 4

Dinoflagellates and acritarchs recorded in Paynesville-1

KEY:

x = present
c = common
cf = compared with

	571.0m	574.5m	576.5m	579.0m	586.0m	597.0m	605.0m
Achomosphaera alcicornu				x			
Areosphaeridium polypetellum				cf			
Ascostomocystis granulatus	x						x
Cleistosphaeridium spinulastrum		x					
Cordosphaeridium gracilis				x			
Cribroperidinium apione				x			
Dapsilidinium pastielsii				x		x	
Eatonicysta n.sp.	x			x			
Eatonicysta ursulae	x						
Hafneasphaera sp.				x			
Hystrichokolpoma rigaudae		x					
Hystrichokolpoma salacium		x					
Kallosphaeridium biarmatum	x			x			
Leiosphaeridia sp.	x			x			
Lingulodinium funginum				x			
Lingulodinium machaerophorum		x		x			
Melitasphaeridium choanophorum	x						
Micrhystridium sp.	x	x	x				
Millioudodinium sp.	x			x		x	
Operculodinium bellulum	x	x	x	x			x
Operculodinium centrocarpum	x	x	x	x	x	x	x
Operculodinium israelianum	x						
Operculodinium microtriainum				x			x
Operculodinium nanaconulum	x						
Pterodinium cingulatum	x					x	
Selenopemphix nephroides			x				
Senoniasphaera n.sp.				x			x
Spiniferites membranaceous	x		x				
Spiniferites mirabilis	x	x		x			
Spiniferites pachydermus	x	x	x	x			
Spiniferites pseudofurcatus	x						x
Spiniferites ramosus gracilis	x	x	x	x		x	x
Spiniferites ramosus granomembranaceous				x			
Spiniferites ramosus granosus	x						
Spiniferites ramosus multibrevis	x	x	x				
Spiniferites ramosus ramosus	x	x	x	x	x	x	x
Spiniferites ramosus reticulatus							x
Spiniferites spp.	x	x	x	x	x	x	x
Tuberculodinium sp.	x	x					

APPENDIX NO.1.

Explanation of the source rock parameters recorded using palynological techniques.

INTRODUCTION

A rapid and reliable technique for estimating the abundances of the various kerogen components and relating these back to the source rock potential of the sediments has been developed.

Samples that are to be examined for palynology and source rock potential are processed using standard techniques that include acid digestion in cold HCl, cold HF and then boiling HCl. Any remaining mineral matter is removed by flotation of the organic material in a Zn2Br solution of SG 2.10. The heavy liquid is removed by washing and the volume of organic material (VOM, see below) recovered is measured in a 10ml conical centrifuge tube after spinning at 3000 rpm for 5 minutes. A measured proportion by volume of the organic residue (kerogen) is dried on a coverslip with PVA and is then mounted on to a microscope slide with a plastic resin (Elvacite or Eukit).

Counts of the various kerogen components are made on the kerogen slide using modified point-counting procedures and the results related back to the weight of rock processed. For example, a kerogen slide may represent the residue from 1/25g (0.04g) of the sediment. It has been measured that the field of view of the 20X objective on a Nikon microscope used by ECL is 1/4000 (1/4E3) of the total area of the kerogen slide. If, on average, there are 4 palynomorphs observed in each field of view when scanning the slide, then the number of palynomorphs estimated per gram of sediment is 4x25x4E3 = 4E5/g (400,000 per gram). This would be regarded as a good yield that could provide a significant contribution to the source rock potential of the sediment.

Each of the measured kerogen components usually show a wide size range that also must be taken into consideration during the counts. In an effort to reduce the subjective element of the estimates, the same microscope objective is used to count the same parameter where this is possible. It is not feasible to directly relate the measured number of particles of a particular kerogen component or their area to an estimated volume or mass for that component. However, an empirical relationship between the abundance estimates and source rock potential has been determined based on the examination of known source rock sequences. To facilate the display of the abundance data and discussion of these results, a simplified four point scale has been developed based on comparisons with source rocks from a wide variety of locations. For example, palynomorph abundances vary from less than 1000(1E3)/g in poor source rocks to more than 1000000(1E6)/g in very good source rocks.

GLOSSARY

1. PALYNOMORPH YIELD

   The estimated number of palynomorphs per gram of sediment expressed in terms of low (=1), moderate (=2), high (=3) and very high (=4) when compared with other source rocks (1=<1E3/g; 2=1E3-<3E4/g; 3=3E4-1E6/g; 4=>1E6/g; 20X Objective).

2. PRESERVATION

   Estimate of the general preservation level of the palynomorphs, recorded in terms of poor (=1), moderate or fair (=2), good (=3) and very good (=4).

3. SPORE-POLLEN AND MICROPLANKTON DIVERSITY

   The estimated number of different species in the sample expressed in terms of low (=1), moderate (=2), high (=3) and very high (=4) when compared with other source rocks (1=1-5; 2=6-15; 3=16-25; 4=>25).

4. PERCENT MICROPLANKTON

   The estimated proportion of dinoflagellates, acritarchs and other algal cysts expressed as a percentage when compared with the total palynomorph assemblage.

5. CUTICLE ABUNDANCE

   The estimated number of cuticle fragments (large and small) per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E2/g; 2=1E2-<3E3/g; 3=3E3-1E5/g; 4=>1E5/g; 10X Objective).

6. PERCENTAGE OF LIPTINITES

   The proportion of the unfiltered kerogen (as observed on a kerogen slide) that comprises palynomorphs (spores, pollen and algal cysts) and cuticle fragments is estimated and expressed as a percentage of the total organic matter. Only the larger, properly identifiable liptinites can be included in this category. Finely degraded liptinites (less than 1 micron) are regarded as part of the sapropel group of macerals except when distinguishable by UV fluorescence.

7. PERCENTAGE OF FLUORESCENT LIPTINITES

The proportion of the unfiltered kerogen (as observed on a kerogen slide) that comprises fluorescing palynomorphs (spores, pollen and algal cysts) and fluorescing cuticle fragments is estimated and expressed as a percentage of the total organic matter. This includes the finely degraded liptinites that are regarded as Amorphous Sapropel (see below). Those liptinites that are unoxidised and able to autofluoresce are regarded as the most oil-prone fraction of the organic matter.

8. HYLOGEN ABUNDANCE

The estimated number of partially translucent woody or lignitic fragments per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E3/g; 2=1E3-<3E4/g; 3=3E4-1E6/g; 4=>1E6/g; 20X Objective). Broadly equivalent to vitrinite and previously referred to as fusain or fusinite.

9. MELANOGEN ABUNDANCE

The estimated number of opaque and angular woody fragments per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E3/g; 2=1E3-<3E4/g; 3=3E4-1E6/g; 4=>1E6/g; 20X Objective). Broadly equivalent to inertinite. As there is usually a gradation between melanogen and hylogen the two components can be difficult to distinguish,

10. GRANULAR SAPROPEL YIELD

The estimated number of clumps of granular sapropel per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E4/g; 2=1E4-<3E6/g; 3=3E6-1E7/g; 4=>1E7/g; 40X Objective). Granular sapropel is regarded as the very fine, fluffy, degraded and oxidised organic matter that shows no fluorescence and is usually a darker colour than the amorphous sapropel. The measurement of "clumps" of sapropel is highly subjective but provides a good order of magnitude estimate that is relatively consistent provided the sample processing is constant and the same objective is used.

11. AMORPHOUS SAPROPEL YIELD

The estimated number of clumps of amorphous sapropel per gram of sediment expressed in terms of low (=1) to very high (=4) when compared with other source rocks (1=<1E4/g; 2=1E4-<3E6/g; 3=3E6-1E7/g; 4=>1E7/g; 40X Objective). Amorphous sapropel is here regarded as weakly fluorescing, finely degraded liptinitic material. It appears to consist of fragments of palynomorphs eg. algae, and cuticles but may also include adsorbed hydrocarbons onto the organic debris, however, the particles are usually too small to be resolved by the microscope. The measurement of "clumps" of sapropel is highly subjective but provides a good order of magnitude estimate that is relatively consistent provided the sample processing is constant and the same objective is used.

12. PERCENTAGE OF SAPROPEL

The proportion of the unfiltered kerogen (as observed on a kerogen slide) that comprises sapropel, here regarded as very fine, (less than 1 micron) degraded organic matter is estimated and expressed as a percentage of the total organic matter. This includes both Granular and Amorphous Sapropel (see above).

13. SAPROPEL COLOUR

The overall colour of the dispersed organic matter and was the original parameter observed to estimate Thermal Alteration Index (TAI). Generally the most dominant colour is that of the granular sapropel which usually has a darker colour than the amorphous sapropel. Not usually recorded as it reflects both the environment of deposition and the maturation level.

14. SPORE COLOUR

The colour of the spore or pollen exines in transmitted white light. Variables that can affect the colour (apart from maturation) are the species type and exine thickness as well as any exposure to oxidising environments during and after deposition. The darkest colours of the least oxidised exines are taken as being the most significant. The change in colour from yellow to orange is regarded as indicating the onset of oil generation. Gas generation is suggested as becoming significant as the colours change to brown. Oil generation appears to cease as the spore colours approach dark brown and when they become black significant gas generation also probably ceases.

15. UV LIPTINITE FLUORESCENCE COLOUR

The dominant colour of the unoxidised liptinites (exines, cuticle and some amorphous sapropel) in reflected UV light observed with a Nikon EF-D UV330-380/4000M/420K filter combination and a 20x UV-Fluor objective. Liptinites that have been oxidised prior to deposition (mostly by recycling) show reduced intensities. The fluorescent colours observed are a complex mixture not comparable to normal colours as seen with white light. The hues range from light blue to white to light yellow with increasing maturity. The colours change to yellow at the beginning of the oil window (as here interpreted) and change to gold, dull yellow, orange and dull orange to dull red at the base of the oil window. The maturation level of sediments near the base of the oil window and deposited in an oxidising environment can be difficult to interpret.

16. VOLUME OF ORGANIC MATTER (VOM)

The measured volume of organic matter (VOM) left after removal of the mineral matter in the sample (see Introduction above) provides a rapid and reliable indication of the organic richness of the samples. From experience it has been found that the values of VOM when expressed as ml/10g approximate the %TOC determinations. Generally, <0.5 ml/10g is regarded as a poor (lean) source rock, 0.5-<2.5 ml/10g is moderate, 2.5-4.5 ml/10g is good (rich) and >4.5 ml/10g is very good (very rich). However, the abundance of unoxidised liptinites in the kerogen must also be considered in assessing the oil source rock potential of the sediments.

17. VOLUME OF FLUORESCENT LIPTINITES

The total amount of potential oil generating liptinites is calculated by multiplying the Volume of Organic Matter (VOM/10g) with the percentage of fluorescent liptinites observed in the sample (see above). The results are expressed as microlitres per gram. On an empiric basis, values greater than 200 are regarded as good source rocks.

18. OIL INDEX

An estimate of the overall abundance of liptinitic material in the kerogen expressed on a scale of 1-4 (being equivalent to poor, moderate, good and very good). This provides a broad indication of the potential of the sample to generate oil or condensate. The OIL INDEX is calculated by averaging the values for Palynomorph Abundance, Cuticle Abundance and Amorphous Sapropel Abundance (see above) and rounding the result to one digit.

19 GAS INDEX

An estimate of the overall abundance of that part of the organic matter in the kerogen that is regarded as being capable of generating gas if a high enough maturation level is reached. The estimate is expressed on a scale of 1-4 (being equivalent to poor, moderate, good and very good). The GAS INDEX is calculated by averaging the values for Palynomorph Abundance, Cuticle Abundance, Amorphous Sapropel Abundance, Granular Sapropel Abundance and Hylogen Abundance (see above) and rounding the result to one digit.

SELECTED REFERENCES

Brooks, J., 1981.
Organic maturation of sedimentary organic matter and petroleum exploration: A review, in Brooks, J. (Ed.), Organic maturation studies and fossil fuel exploration. Academic Press, London.

Bujak, J.P., Barss, M.S., & Williams, G.L., 1977.
Offshore East Canada's organic type and color and hydrocarbon potential. Oil & Gas Journ., Part I, pp.198-202, Part II, pp. 96-100.

Staplin, F.L., et al., 1982.
How to Assess Maturation and Paleotemperatures. Soc. Econ. Paleont. Mineral. Short Course Number 7. P.O. Box 4756, Tulsa, OK74104.

Van Gijzel, P., 1981.
Applications of geomicrophotometry of kerogen, solid hydrocarbons and crude oils to petroleum exploration, in Brooks, J. (Ed.), Organic maturation studies and fossil fuel exploration. Academic Press, London.

II. INTRODUCTION

ECL Geological Laboratory was contracted by Ampol Exploration Ltd to undertake laboratory studies of sidewall core samples from the well Paynesville-1. The well is located in onshore exploration Permit PEP 98, Gippsland Basin, Victoria, and was drilled to a total depth of 709m KB.

Sidewall core samples from the interval 179.0 to 541.5m were analysed for calcareous nannoplankton, foraminifera, palynomorphs, source rock potential and maturity. The objective of this study was to provide biostratigraphic zonations, interpretation of depositional environment and information on hydrocarbon habitat for geological evaluation of the well section.

III. ROCK-STRATIGRAPHIC NOMENCLATURE

(A) Basal Siliciclastics - Upper Member of Latrobe Group or Lower Member of Seaspray Group

Palynological and wireline log character evidence indicates uncertainty whether the clastic sequence (including clean quartz sands) between 576m and 616m in Paynesville-1 represent a facies of the upper part of the Latrobe Group or a facies of the lower part of the Seaspray Group (Lakes Entrance Formation). Palynological evidence indicates that the interval is Middle N. asperus to P. tuberculatus in age (Late Eocene-Early Oligocene). The common occurrence of dinoflagellates in samples between 579m and 605m indicates that the siliciclastics are marine and probably represent the basal part of the Early Oligocene Lakes Entrance Formation transgression. On the basis of wireline log character, however, the siliciclastic sequence (greater than 50% clean sands between 576m and 616m) appears to be more characteristic of the Latrobe Group (non-marine to marginal marine siliciclastics). It is possible that dinoflagellates recorded in these sands represent downhole contaminants from the glauconitic and marly facies higher in the well. Because of the uncertainty whether these dinoflagellates are in situ, the siliciclastic sequence between 576 and 616m in Paynesville-1 is interpreted to represent a sand facies of the upper part of the Latrobe Group or the lower part of the Seaspray Group.

(B) Lakes Entrance Formation (Lower Member)

In this investigation Early-Late Oligocene glauconitic sandstone, oxidized glauconitic sandstone/siltstone and glauconitic marl, are referred to informally as the "lower member" of the Lakes Entrance Formation. The "lower member" includes the following formal onshore stratigraphic units : Colquhoun Sandstone Member, Cunninghame Greensand Member, Metung Marl Member, Giffard Sandstone Member and Seacombe Marl Member.

(C) Lakes Entrance Formation (Upper Member)

In this investigation Late Oligocene-Early Miocene marls (relatively clean carbonate with subordinate amounts of glauconite and quartz) are referred to informally as the "upper member" of the Lakes Entrance Formation in Paynesville-1.

(D) Gippsland Limestone

In Paynesville-1 Early-Middle Miocene clean skeletal limestone and calcarenites with common bryozoan fragments are referred to as the Gippsland Limestone.

IV. GEOLOGICAL COMMENTS

The Late Eocene-Early Oligocene siliciclastics in Paynesville-1 between 576.0 and 616.0m are inferred to be disconformably overlain by the "lower member" of the Lakes Entrance Formation. An oxidized horizon (observed in sidewall core sample at 576.5m) occurs at the top of the siliciclastic sequence between 576m and 577m. This oxidized horizon was also present in Comley-1 (481-482m) and Fairhope-1 (536-537m) and is interpreted to have resulted from subaerial exposure during the mid-Oligocene major global fall in relative sea-level at 30 Ma. Vail et al. (1977) indicate this event to occur near the top of Zone NP23.

The "lower member" of the Lakes Entrance Formation between 569.0 and 576.0m comprises non-calcareous glauconitic sandstone between 576 and 573.5m (characterised by high gamma ray log character) and sandy glauconitic marl between 573.5 and 569m. Calcareous nannoplankton indicate a Late Oligocene (Zone NP 25) age for the sample at 571.0m. The basal glauconitic sandstone between 576 and 573.5m is interpreted to be younger than the 30Ma mid-Oligocene event although this cannot be confirmed on palaeontological grounds. The thickness of the Lakes Entrance Formation ('lower member') between the mid-Oligocene and late-Oligocene disconformities in Paynesville-1 is 7m and is nearly identical to that recorded in Comley-1 (5m) and Fairhope-1 (5.5m).

The "upper member" of the Lakes Entrance Formation is considered to disconformably overlie the "lower member" of the Lakes Entrance Formation at 569m in Paynesville-1. An oxidized horizon is interpreted to occur between 569m and 570.5m on the basis of wireline log character. The hiatus between the 'lower member' and 'upper member' of the Lakes Entrance Formation in Paynesville-1 spans the basal Early Miocene. The occurrence of Zone G planktonic foraminifera at 561.0m (8m above disconformity) indicates the likely absence of basal Early Miocene sediments (Aquitainian) in the well.

The Gippsland Limestone is interpreted to conformably overlie the Lakes Entrance Formation at approximately 530m. The log break at 530m is based on log correlation with Comley-1 where there is better sample control across the Lakes Entrance Formation - Gippsland Limestone boundary.

V. MICROPALAEONTOLOGY

A total of 7 sidewall core samples from the interval 442.0-586.0m were analysed for foraminifera and calcareous nannoplankton. Calcareous microfossil species identified in the well section, interpreted zonation and depositional environment subdivision have been plotted on the micropalaeontological distribution chart (Enclosure 1).

The planktonic foraminiferal letter zonal scheme of Taylor (in prep.) and the NP-NN calcareous nannoplankton letter scheme of Martini (1971) are used in this investigation. Foraminiferal studies by Carter (1964) and Jenkins (1971), and calcareous nannoplankton investigations by Edwards (1971) and Siesser (1979) have also been consulted.

(A) Calcareous Nannoplankton Biostratigraphy

i) 442.0-492.0m : Zones NN4-NN5 (Upper Early Miocene)

The occurrence of *Sphenolithus heteromorphous* in the interval indicates assignment to Zones NN4 or NN5.

ii) 561.0m : Indeterminate

The assemblage from 561.0m is not age-diagnostic.

iii) 571.0m : Zone NP25 (Late Oligocene)

The rare occurrence of *Dictyococcites bisectus* without *Chiasmolithus oamaruensis* is indicative of Zone NP25. The assemblage also equates with the *Discoaster deflandre* Zone of Edwards (1971).

iv) 574.5-586.0m : Indeterminate

The interval is barren of calcareous nannoplankton.

B) Planktonic Foraminiferal Biostratigraphy

i) 442.0m : Zone F (upper Early Miocene)

The rare occurrence of Globigerinoides sicanus without members of the Orbulina - Praeorbulina group indicates that the sample at 442.0m is assignable to Zone F.

ii) 492.0-561.0m : Zone G (Early Miocene)

The occurrence of Globigerinoides trilobus without its descendant G. sicanus indicates that the interval is assignable to Zone G.

iii) 571.0-576.5m : Indeterminate

The sample at 571.0m contains rare planktonic foraminifera of little biostratigraphic value while the samples at 574.5 and 576.5m are barren. The sample at 571.0m contains the benthonic foraminiferal species Almaena gippslandica which in Comley-1 and Fairhope-1 is restricted to the nannofossil zone NP25. The presence of this species at 571.0m confirms the Late Oligocene nannofossil age-dating.

C) Environment of Deposition

i) 442.0m : Inner neritic

The association of Amphistegina lessonii with rare Brizalina spp., and the absence of Uvigerina spp., indicates an inner neritic environment of deposition for the sample at 442.0m. The common occurrence of bryozoan fragments in the sample confirms this environmental interpretation.

ii) 492.0m : inner-middle neritic

The common occurrence of bryozoan fragments, the very low yield of planktonic foraminifera, and the presence of common Cassidulina subglobosa with rare Euvigerina and Brizalina, indicates that the sample at 492.0m was deposited in an inner to middle neritic environment.

iii) 561.0-571.0m : middle neritic

Moderate numbers of Sphaeroidina bulloides and Brizalina spp., together with low numbers of planktonic foraminifera, indicates that the interval was deposited in a middle neritic environment.

iv) 574.5-576.5m : Indeterminate

Samples from the interval are either barren or contain very impoverished foraminiferal faunas which are no environmental value.

VI. PALYNOLOGY

Ten sidewall core samples ranging in depths from 571.0m to 630.0m in Paynesville-1 were palynologically examined. The upper seven samples yielded moderate to very rich organic residues with rich to very rich palynomorph contents. The lower three samples were poor in organic contents and barren of palynomorphs.

The rich palynomorph yields consist mostly of relatively long-ranging species which mask the rare age-significant species. Also, the dinoflagellates recorded mostly have ranges beyond the interval dated by spore-pollen assemblages and only a few species were biostratigraphically useful.

The sampled interval is palynostratigraphically classified as follows according to the scheme of Stover and Partridge (1973), updated by Raine (1984) and ECL file data.

A) 571.0m-579.0m : Proteacidites tuberculatus Zone (Early Oligocene)

The interval is not older than the Proteacidites tuberculatus Zone of Oligocene age due to the occurrence of Cyathidites subtilis which has its basal occurrence in the zone. Dinoflagellate cyst Kallosphaeridium biasmatum occurring at the top and the bottom of the interval is known to be restricted to the Early Oligocene. Also, Operculodinium israelianum and Tuberculodinium are not known from rocks older than the Oligocene, and the acritarch Ascostomocystis granulatus is not known to be younger than the Oligocene.

The occurrence of Rugulatisporites micraulaxus at 579.0m is considered to be by contamination as it does not occur in any overlying sample.

ii) 586.0m-597.0m : Middle Nothofagidites asperus-Proteacidites tuberculatus Zones (Late Eocene-Early Oligocene)

Rhoipites sphaerica and Verrucatosporites cristatus occurring in the interval have their basal occurrences in the Middle Nothofagidites asperus Zone of Late Eocene age, while Nothofagidites asperus and Myrataceidites verrucosus have their top occurrences in the Proteacidites tuberculatus Zone of Oligocene age. In this case, the interval can not be younger than the Early Oligocene.

The occurrence of R. micraulaxus at 597.0m is considered to be by contamination.

iii) 605.0m : Middle-lower part Upper Nothofagidites asperus Zone (Late Eocene)

The sample at 605.0m is dated Late Eocene on the basis of the occurrences of Verrucosisporites cristatus with its base in the Middle N. asperus Zone, and Propylipollis latrobensis with its top in the lower part of the Upper N. asperus Zone, also of Late Eocene age.

The occurrence of Polypodiaceoisporites tumulatus is considered to be by contamination as the species does not occur in any overlying samples.

iv) 608.5m-630.0m : Indeterminate

The interval is barren of palynomorphs. The rare occurrences of palynomorphs recorded are considered to be by contamination.

(B) Environment of Deposition

The interval between 571.0m and 605.0m is considered marine on the basis of moderate to abundant and diverse dinoflagellate cyst assemblages and foraminiferal chamber-linings. The underlying interval between 608.5m and 630.0m is barren of palynomorphs and the environment of deposition is indeterminate.

TAYLOR, D.J., (in prep). Observed Gippsland biostratigraphic sequences of planktonic foraminiferal assemblages.

VAIL, P.R., MITCHUM R.M, AND THOMPSON, S., 1977. Global cycles of relative changes of sea level. In PAYTON, C.E. (Editor), Seismic Stratigraphy - Applications to Hydrocarbon Exploration. Am. Assoc. Pet. Geol., Mem., 26 : 83-97.

PE900763

This is an enclosure indicator page.
The enclosure PE900763 is enclosed within the container PE902396 at this location in this document.

The enclosure PE900763 has the following characteristics:

ITEM_BARCODE = PE900763
CONTAINER_BARCODE = PE902396
NAME = Micropalaeontological Chart
BASIN = GIPPSLAND
PERMIT = PEP98
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Micropalaeontological Distribution Chart for Paynesville-1 : 442.0 - 586.0m
REMARKS =
DATE_CREATED =
DATE_RECEIVED =
W_NO = W911
WELL_NAME = PAYNESVILLE-1
CONTRACTOR = ECL AUSTRALIA PTY LTD
CLIENT_OP_CO = AMPOL EXPLORATION LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

TABLE 1

Summary of the source rock and maturity data from Paynesville-1

TABLE 1A

DEPTH (m)	PALYNOLOGICAL ZONE	AGE	ENVIRONMENT OF DEPOSITION	OIL POTENTIAL	MATURITY
571.0	Upper N. asperus (upper part)	Early Oligocene	Marine	Poor	Immature
574.5	Upper N. asperus (upper part)	Early Oligocene	Marine	Poor	Immature
576.5	Upper N. asperus (upper part)	Early Oligocene	Marine	Poor	Immature

TABLE 1B

DEPTH (m)	SAMPLE NO.	WEIGHT (g)	VOM (ml)	PRESER VATION (0-4)	% MICRO- PLANKTON	MICRO- PLANKTON DIVERSITY	SPORE- POLLEN DIVERSITY	PALYN YIELD (0-4)	CUT- ICLE (0-4)	HYL -OGEN (0-4)	MELAN -OGEN (0-4)	GRANULAR SAPROPEL (0-4)	AMORPHOUS SAPROPEL (0-4)
571.0	45	10	1.0	3	80	4	4	1	1	3	3	2	2
574.5	30	10	1.1	3	40	3	4	1	1	3	3	2	2
576.5	44	10	0.8	3	50	2	4	1	1	3	3	2	2

TABLE 1C

DEPTH (m)	VOM ml/10g	%SAPRO -PEL	%LIPT INITE	%FLUORESCENT LIPTINITES	VOL. FLUOR. LIPTINITES microlitres	OIL INDEX (0-4)	GAS INDEX (0-4)	SPORE COLOUR	UV LIPTINITE FLUORESCENCE COLOUR
571.0	1.00	90	5	3	30	1	2	Yellow - Lt orange	Lt yellow - yellow
574.5	1.10	85	5	4	44	1	2	Yellow - Lt orange	Lt yellow - Yellow
576.5	0.80	90	5	3	24	1	2	Yellow - Lt orange	Lt yellow - Yellow

PAYNESVILLE NO. 1

K.K. No.	Depth (m)	$\bar{R}_v$max	Range	N	Exinite Fluorescence (Remarks)
x2966	571 SWC	0.35	?0.31-0.40	5	Rare phytoplankton, greenish yellow, rare fluorinite, green. (Calcareous siltstone. Dom rare, E>I>V. All macerals rare. Shell fragments present. Pyrite abundant.)
x2967	574.5 SWC	0.37	0.28-0.53	27	Rare phytoplankton/sporinite, greenish yellow, rare cutinite, yellow, rare fluorinite, green. (Siltstone>> sandstone. Dom sparse, V>E>I. Vitrinite sparse, exinite and inertinite rare. Rare small yellow fluorescing droplets of ?oil. Pyrite abundant.)
	$\bar{R}_I$	0.81	0.79-0.83	2	

APPENDIX 13.

HEADSPACE GAS ANALYSIS FROM DITCH CUTTINGS

AMDEL HEADSPACE ANALYSIS

Client: AMPOL EXPLORATION
Well: PAYNESVILLE-1

DEPTH	METHANE	ETHANE	PROPANE	TOTAL GAS
		ppm		
440-470	888	38	11	937
470-500	6978	12	2	6992
500-530	18615	5	2	18622
530-560	7746	3	2	7751
560-590	5272	2	<1	5275
590-620	128	<1	<1	130
620-650	193	<1	<1	195
650-680*	7	ND	ND	7
680-700	<1	<1	<1	3

*Not detected.

APPENDIX 14.

HORNER TEMPERATURE PLOT

HORNER TEMPERATURE PLOT

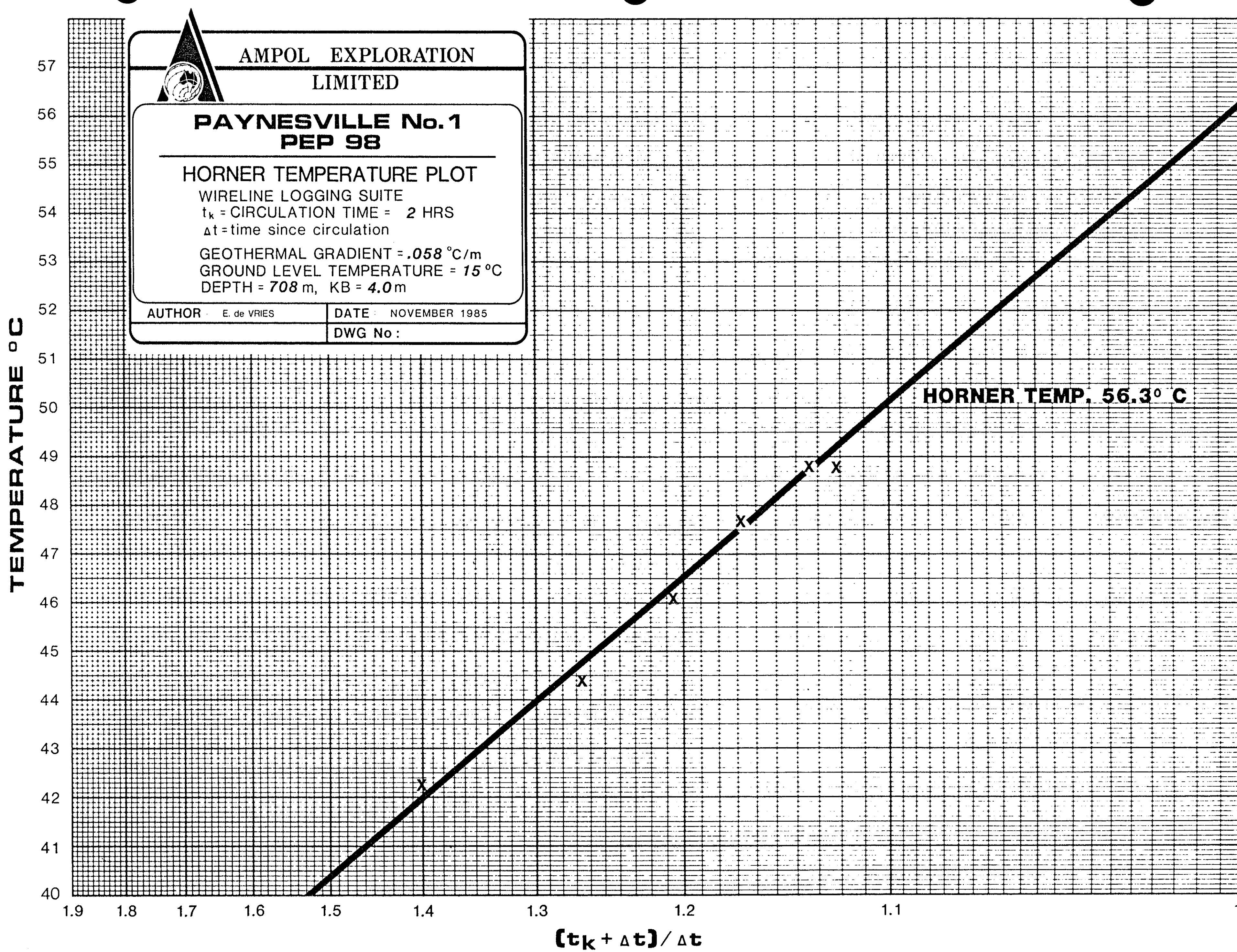
The following data was used to estimate the geothermal gradient in Paynesville #1.

Log Run	Depth	Temp.	Time after last circulation
DLL-MSFL-GR	708m	42.2°C	5 hrs
LDT-CNL-GR	708m	44.4°C	7 hrs 30 mins
BHC-GR	707m	46.1°C	9 hrs 45 mins
NGT	708m	47.7°C	12 hrs
HDT	708m	48.8°C	15 hrs

This data gave an extrapolated BHT of 56.3°C @ 708m, a geothermal gradient of 0.0587°C/m.

The temperature from the DST was 56.7°C @ 706.8.

A surface temperature of 15°C was assumed.



AMPOL EXPLORATION LIMITED
PAYNESVILLE No.1
PEP 98
HORNER TEMPERATURE PLOT
WIRELINE LOGGING SUITE
t_k = CIRCULATION TIME = 2 HRS
Δt = time since circulation
GEOTHERMAL GRADIENT = .058 °C/m
GROUND LEVEL TEMPERATURE = 15 °C
DEPTH = 708 m, KB = 4.0 m
AUTHOR E. de VRIES
DATE NOVEMBER 1985
DWG No:
HORNER TEMP. 56.3° C
TEMPERATURE °C
57
56
55
54
53
52
51
50
49
48
47
46
45
44
43
42
41
40
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
$(t_k + \Delta t)/\Delta t$

APPENDIX 15.

VELOCITY SURVEY

PAYNESVILLE-1

PEP-98, Gippsland Basin, Victoria.
S.P. 293, GM83A-20

K.B.= 30.0 m. A.S.L.
G.L.= 26.0 m. A.S.L.
Gun Depth = -1.5 m. (Rel. to G.L.)
Gun Offset = 45.0 Azimuth = 30 Deg. from N.
Seismic Datum = 0.0 m. A.S.L.
Surface Velocity 742 m/s

Datum-Gun Depth = -24.5 m. Source - Airgun
Datum-Gun Time = -33.0 msec. Contractor-Schlumberger X2 = TWT

Shot No.	Depth (K.B.)	Subsea Depth	Subdatum Depth	Subgun Depth	Observed Time	Vertical Time	Corrected Time	Average Velocity	Depth Interval	Time Interval	Interval Velocity
21	75.5	-45.5	-45.5	-70.0	64.6	54.3	21.3	2132	-	-	-
20	120.5	-90.5	-90.5	-115.0	85.8	79.9	46.9	1930	45.0	25.6	1761
19	177.5	-147.5	-147.5	-172.0	111.8	108.2	75.2	1962	57.0	28.3	2017
18	234.5	-204.5	-204.5	-229.0	137.8	135.2	102.2	2001	57.0	27.1	2107
17	275.0	-245.0	-245.0	-269.5	154.9	152.8	119.8	2045	40.5	17.6	2305
16	306.0	-276.0	-276.0	-300.5	169.2	167.3	134.3	2055	31.0	14.5	2131
15	331.0	-301.0	-301.0	-325.5	181.0	179.3	146.3	2057	25.0	12.0	2090
14	365.5	-335.5	-335.5	-360.0	196.3	194.8	161.8	2074	34.5	15.5	2227
13	392.5	-362.5	-362.5	-387.0	208.9	207.5	174.5	2077	27.0	12.7	2123
12	440.5	-410.5	-410.5	-435.0	230.0	228.8	195.8	2097	48.0	21.3	2256
11	482.5	-452.5	-452.5	-477.0	249.0	247.9	214.9	2106	42.0	19.1	2197
10	498.5	-468.5	-468.5	-493.0	256.0	254.9	221.9	2111	16.0	7.0	2272
9	518.0	-488.0	-488.0	-512.5	264.9	263.9	230.9	2114	19.5	8.9	2180
8	537.5	-507.5	-507.5	-532.0	273.3	272.3	239.3	2121	19.5	8.4	2310
7	549.5	-519.5	-519.5	-544.0	278.1	277.2	244.2	2128	12.0	4.8	2487
6	569.0	-539.0	-539.0	-563.5	287.8	286.9	253.9	2123	19.5	9.7	2003
5	596.5	-566.5	-566.5	-591.0	300.5	299.6	266.6	2125	27.5	12.7	2158
4	613.0	-583.0	-583.0	-607.5	306.9	306.1	273.1	2135	16.5	6.4	2567
3	642.0	-612.0	-612.0	-636.5	315.3	314.5	281.5	2174	29.0	8.5	3431
2	688.5	-658.5	-658.5	-683.0	326.5	325.8	292.8	2249	46.5	11.3	4123
1	707.0	-677.0	-677.0	-701.5	331.0	330.3	297.3	2277	18.5	4.5	4086

Comments: The surface velocity was calculated using the static correction applied to the seismic section. All the near surface and datum shots were to poor to use.

APPENDIX 16.

SURVEYOR'S REPORT

Crowther & Sadler Pty. Ltd.
LICENSED SURVEYORS
P.O. BOX 722, BAIRNSDALE, 3875
TELEPHONE (051) 52 5011

Our Ref. 4710

Your Ref.

1st November, 1985

Ampol Exploration Limited,
P.O. Box 907,
NORTH SYDNEY, 2060

Dear Sir,

Please find listed below co-ordinates as requested for the drill sites situated to the south of Bairnsdale.

The co-ordinates are as follows:-

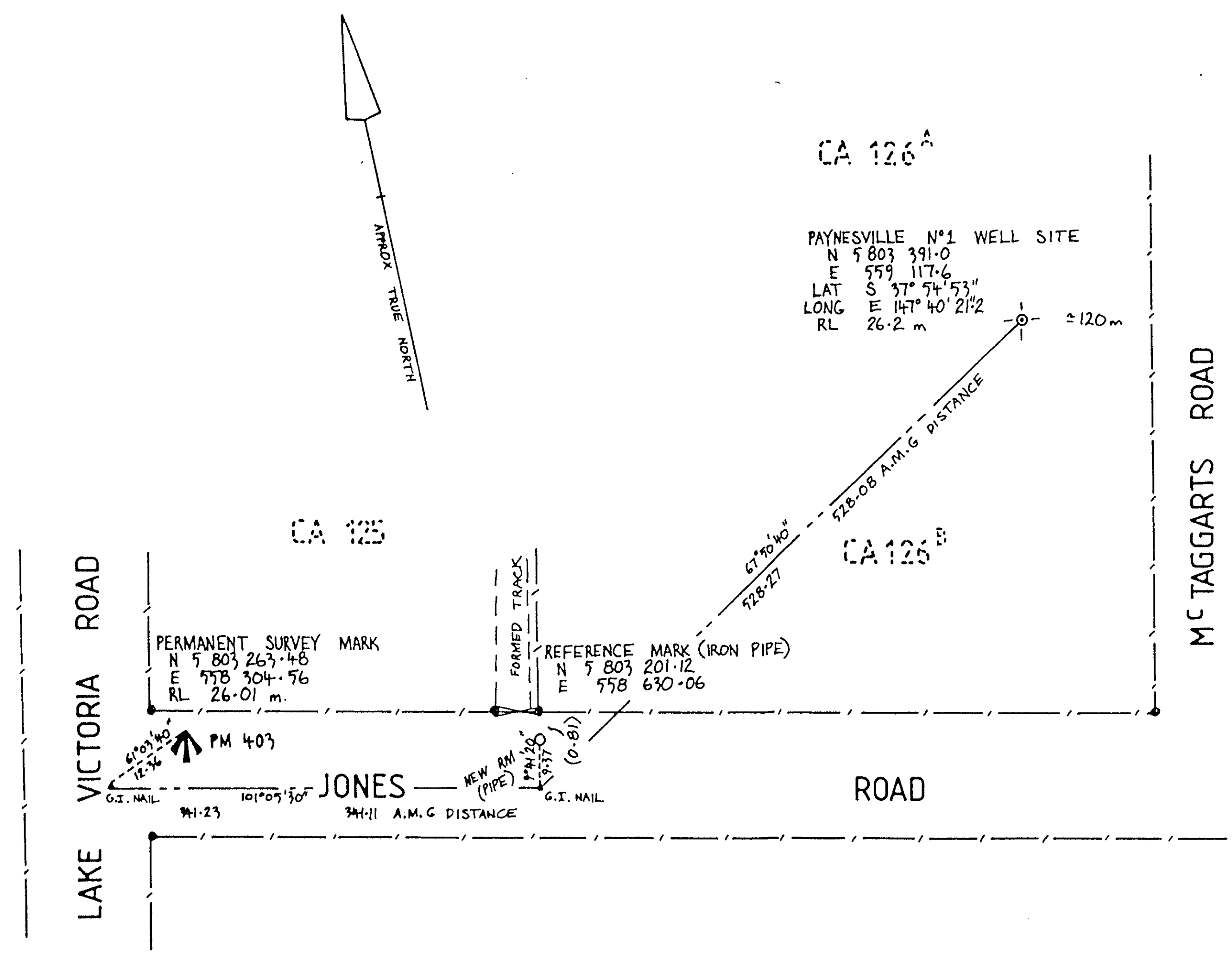
Comley No. 1	A.M.G. Zone 55	E 549 017·52
		N 5 805 004·45
	Latitude	S 37°54'03".717
	Longitude	E 147°33'27".181
Fairhope No. 1	A.M.G. Zone 55	E 551 675·366
		N 5 803 613·188
	Latitude	S 37°54'48".327
	Longitude	E 147°35'16".37
Paynesville No. 1	A.M.G. Zone 55	E 559 117·6
		N 5 803 391·00
	Latitude	S 37°54'53"
	Longitude	E 147°40'21".2

If you require any additional information please do not hesitate to contact me.

Yours faithfully,

L. Walton

CROWTHER & SADLER PTY. LTD.



NOTATIONS

CO-ORDINATES ARE A.M.G
LEVELS ARE TO A.H.D
DATUM OF LEVELS PM 403 26·01m
LEVELS TAKEN ON TOP OF CASING

WELL LOCATION DIAGRAM
REFERENCE MARK PLAN

COUNTY TANJIL
PARISH OF BAIRNSDALE

PAYNESVILLE N°1

CROWTHER AND SADLER PTY LTD
2/66 M^cCULLOCH STREET, PO BOX 722
BAIRNSDALE 3875
(051) 52 5011

4710

ENCLOSURES

ENCLOSURES

PE601151

This is an enclosure indicator page.
The enclosure PE601151 is enclosed within the container PE902396 at this location in this document.

The enclosure PE601151 has the following characteristics:

ITEM_BARCODE =	PE601151
CONTAINER_BARCODE =	PE902396
NAME =	Composite Well Log
BASIN =	GIPPSLAND
PERMIT =	PEP/98
TYPE =	WELL
SUBTYPE =	COMPOSITE_LOG
DESCRIPTION =	Composite well log (enclosure from WCR) for Paynesville
REMARKS =	
DATE_CREATED =	9/07/85
DATE_RECEIVED =	12/12/85
W_NO =	W911
WELL_NAME =	Paynesville-1
CONTRACTOR =	Ampol Exploration Ltd
CLIENT_OP_CO =	Ampol Exploration Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE601152

This is an enclosure indicator page.
The enclosure PE601152 is enclosed within the container PE902396 at this location in this document.

The enclosure PE601152 has the following characteristics:

ITEM_BARCODE = PE601152
CONTAINER_BARCODE = PE902396
NAME = Merged Playback Feild Log
BASIN = GIPPSLAND
PERMIT = PEP/98
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Merged Playback Feild Log , D500, (enclosure from WCR) for Paynesville-1
REMARKS =
DATE_CREATED = 20/07/85
DATE_RECEIVED = 12/12/85
W_NO = W911
WELL_NAME = Paynesville-1
CONTRACTOR = Schlumberger
CLIENT_OP_CO = Ampol Exploration Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE601153

This is an enclosure indicator page.
The enclosure PE601153 is enclosed within the container PE902396 at this location in this document.

The enclosure PE601153 has the following characteristics:

ITEM_BARCODE =	PE601153
CONTAINER_BARCODE =	PE902396
NAME =	Mud Log - Masterlog Evaluation
BASIN =	GIPPSLAND
PERMIT =	PEP/98
TYPE =	WELL
SUBTYPE =	MUD_LOG
DESCRIPTION =	Mud Log - Masterlog Evaluation (enclosure from WCR) for Paynesville-1
REMARKS =	
DATE_CREATED =	8/07/85
DATE_RECEIVED =	2/12/85
W_NO =	W911
WELL_NAME =	Paynesville-1
CONTRACTOR =	Geoservices Overseas S.A.
CLIENT_OP_CO =	Ampol Exploration Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE902397

This is an enclosure indicator page.
The enclosure PE902397 is enclosed within the container PE902396 at this location in this document.

The enclosure PE902397 has the following characteristics:

ITEM_BARCODE =	PE902397
CONTAINER_BARCODE =	PE902396
NAME =	Time V's Depth Curve
BASIN =	GIPPSLAND
PERMIT =	PEP/98
TYPE =	WELL
SUBTYPE =	VELOCITY_CHART
DESCRIPTION =	Time V's Depth Curve (enclosure from WCR) for Paynesville-1
REMARKS =	
DATE_CREATED =	9/07/85
DATE_RECEIVED =	12/12/85
W_NO =	W911
WELL_NAME =	Paynesville-1
CONTRACTOR =	Schlumberger
CLIENT_OP_CO =	Ampol Exploration Ltd

(Inserted by DNRE - Vic Govt Mines Dept)

PE601154

This is an enclosure indicator page.
The enclosure PE601154 is enclosed within the container PE902396 at this location in this document.

The enclosure PE601154 has the following characteristics:

ITEM_BARCODE =	PE601154
CONTAINER_BARCODE =	PE902396
NAME =	Cyberdip Feild Log
BASIN =	GIPPSLAND
PERMIT =	PEP/98
TYPE =	WELL
SUBTYPE =	WELL_LOG
DESCRIPTION =	Dipmeter Cyberdip Feild Log (enclosure from WCR) for Paynesville-1
REMARKS =	
DATE_CREATED =	8/07/85
DATE_RECEIVED =	12/12/85
W_NO =	W911
WELL_NAME =	Paynesville-1
CONTRACTOR =	Schlumberger
CLIENT_OP_CO =	Ampol Exploration Ltd

(Inserted by DNRE - Vic Govt Mines Dept)