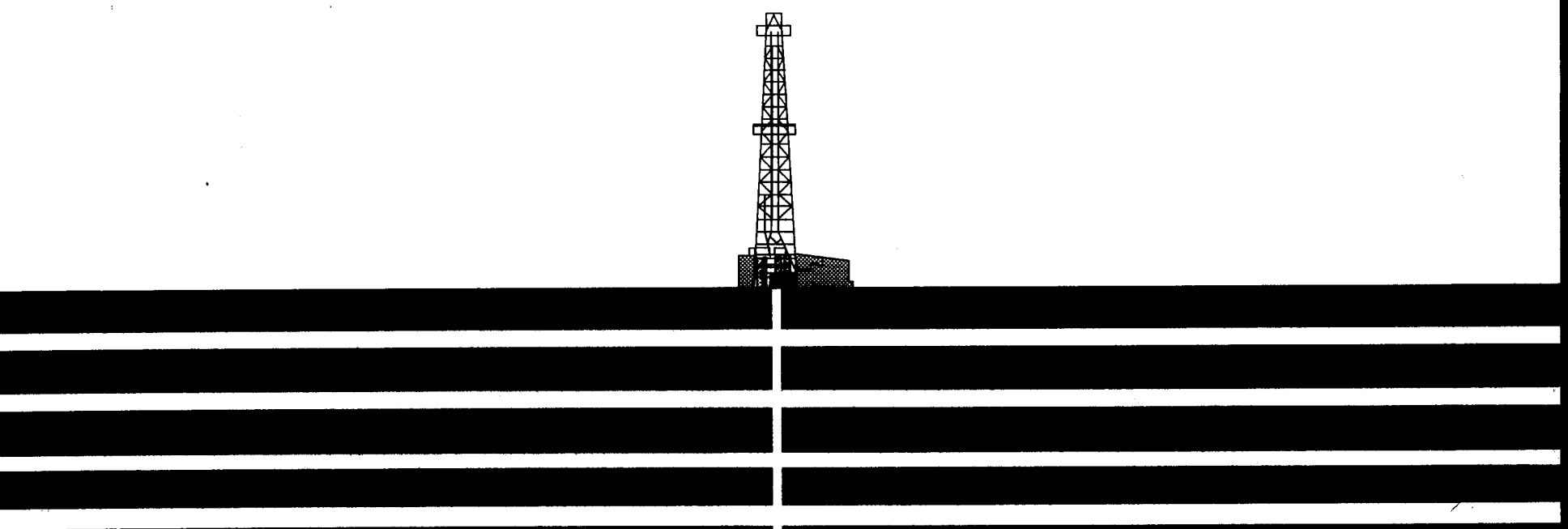
FENTON CREEK 1

Well Completion Report



Santos

A.C.N. 007 550 923

PEP 108, OTWAY BASIN
VICTORIA

SANTOS - CULTUS

COMPILED FOR

SANTOS LIMITED
(A.C.N. 007 550 923)

FENTON CREEK 1

WELL COMPLETION REPORT

Prepared By:
J.A. WATT
D. HORNER
(Consultants)
July, 1997

FENTON CREEK-1

TABLE OF CONTENTS

LOCATION MAP

PE907921

This is an enclosure indicator page.
The enclosure PE907921 is enclosed within the container PE900817 at this location in this document.

The enclosure PE907921 has the following characteristics:

ITEM_BARCODE	= PE907921
CONTAINER_BARCODE	= PE900817
NAME	= Location Map
BASIN	= OTWAY
PERMIT	= PEP 108
TYPE	= WELL
SUBTYPE	= MAP
DESCRIPTION	= Location Map (fig.1 of WCR) for Fenton Creek-1
REMARKS	=
DATE_CREATED	= 10/02/97
DATE_RECEIVED	= 12/10/97
W_NO	= W1192
WELL_NAME	= Fenton Creek-1
CONTRACTOR	=
CLIENT_OP_CO	= Santos

(Inserted by DNRE - Vic Govt Mines Dept)

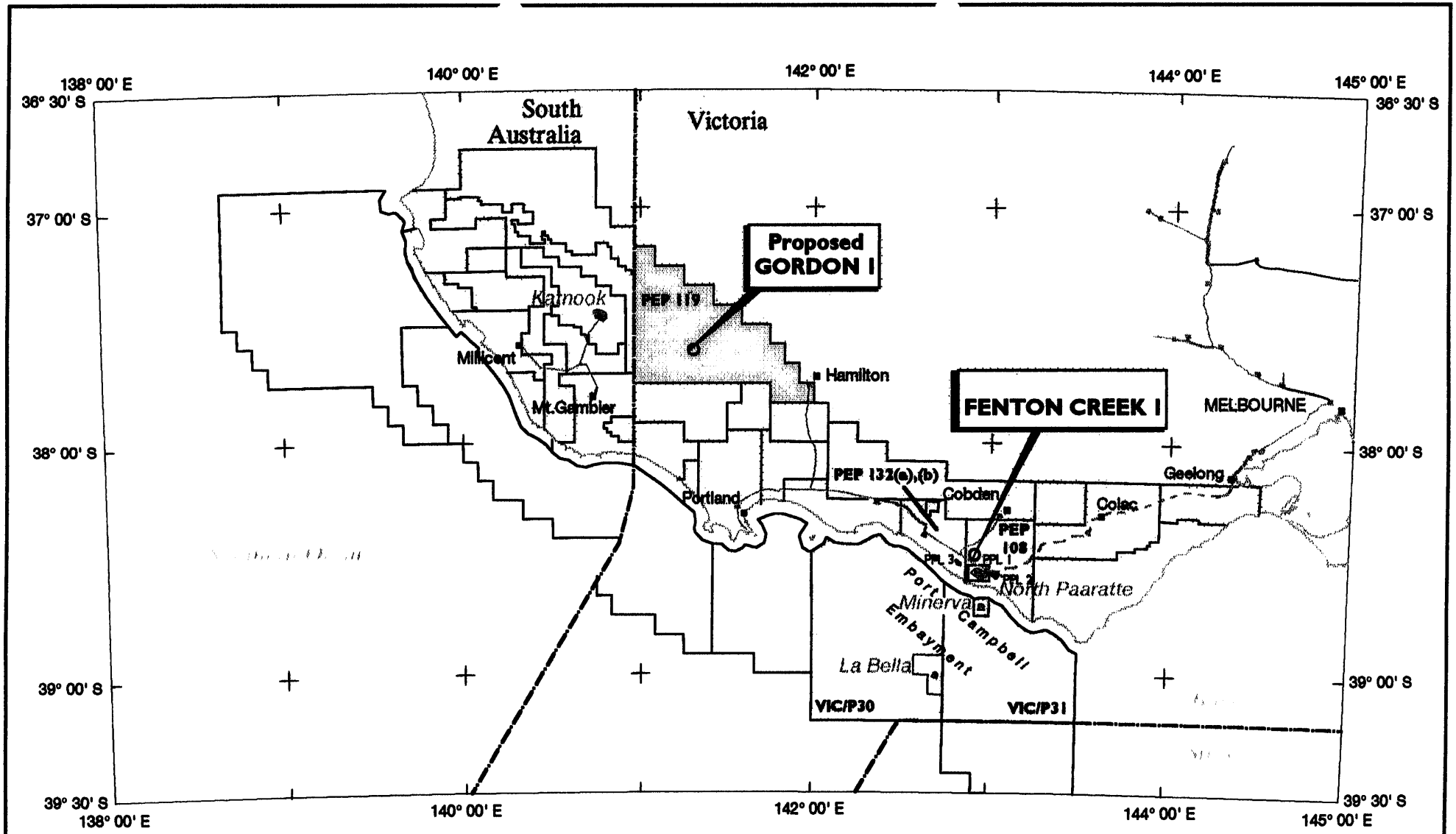

138° 00' E
140° 00' E
142° 00' E
144° 00' E
145° 00' E
36° 30' S
37° 00' S
38° 00' S
39° 00' S
39° 30' S
South Australia
Victoria
Proposed GORDON 1
FENTON CREEK 1
PEP 119
PEP 132(a),(b)
PEP 108
Katnook
Millicent
Mt.Gambier
Hamilton
Portland
Cobden
Colac
Geelong
MELBOURNE
PPL 1
PPL 2
PPL 3
Port Campbell Embayment
Minerva
North Paaratte
La Bella
VIC/P30
VIC/P31
Santos Permits
Santos ex PPA
Gas Fields
Gas Pipelines (existing)
Gas Pipeline (proposed)
DEPT. NAT. RES & ENV
PE907921
100 kilometres
UTM, ANS, CM 141°
SABU - Onshore
South Australia/Victoria
Otway Basin
Proposed
GORDON 1 &
FENTON CREEK 1

FIGURE 1

WELL CARD

WELL: Fenton Creek-1	**WELL CATEGORY:** WILDCAT (WCNF) **WELL INTENT:** GAS	**SPUD:** 27/03/97, 22:30hrs **TD REACHED:** 04/04/97, 09:00hrs
		RIG RELEASED: 11/04/97, 08:30hrs **CMPLT:**
		RIG: ODE Rig 30
LAT: 38 deg 30' 48.72 S	**LONG:** 142 deg 56' 00.54 E	**STATUS:** Suspended gas well (SUG)
SEISMIC STATION: Waarre 3D: Xline 990, Inline 7200		**REMARKS:**New field discovery from Waarre Sandstone
ELEVATION GND: 82.2m amsl	**RT:** 86.9m	
BLOCK/LICENCE: PEP 108, Onshore Otway Basin, Victoria		
TD 1841m (Logr Ext) 1840m (Drlr)		
PBTD M (Logr) M (Drlr)		
TYPE STRUCTURE: Tilted fault block		
TYPE COMPLETION: Suspended		
ZONE(S): Waarre Sandstone "Unit C"		

CASING SIZE	SHOE DEPTH	TYPE
16" (406mm)	10m	Conductor
9.625" (244mm)	415m	K55 - 36lb
7" (178mm)	1835.6m	K55 - 26lb

AGE	FORMATION OR ZONE TOPS	DEPTH (M)		THICKNESS (m)	HIGH (H) LOW (L)
		LOGGERS	SUBSEA		
Middle to Late Miocene	Port Campbell Limestone	4.7	+82.2	58.3	
Early to Middle Miocene	Gellibrand Marl	63	+23.9	250	
Early Oligocene-Early Miocene	Clifton Formation	313	-226.1	42	16.3 (H)
Late Eocene to Early Oligocene	Narrawaturk Marl	355	-268.1	62.5	
Middle Eocene-Early Oligocene	Mepunga Formation	417.5	-330.6	135.5	51.8 (H)
Eocene	Dilwyn Formation	553	-466.1	125.5	5.7 (L)
Early Eocene to Late Palaeocene	Pember Mudstone	678.5	-591.6	73.5	2.8(H)
Late Palaeocene	Pebble Point Formation	752	-665.1	141.5	12.3(H)
Maastrichtian to Campanian	Paaratte Formation	893.5	-806.5	305	99.2 (L)
Santonian	Skull Creek Mudstone	1198.5	-1111.6	125.5	26.2 (L)
Santonian	Nullawarre Greensand	1324	-1237.1	93	38.7 (L)
Santonian to Coniacian	Belfast Mudstone	1417	-1330.1	107.5	38.7 (L)
Turonian	Flaxman Formation	1524.5	-1437.6	28	13.8 (H)
Turonian	Waarre Formation, Unit "C"	1552.5	-1465.6	60.0.	5.8(H)
"	Unit "B"	1612.5	-1525.6	11.5	
"	Unit "A"	1624	-1537.1	31.	
Late Albian	Eumeralla Formation	1655	-1568.1	186+	13.3(H)
	T.D.	1841	-1754.1		

LOG INTERPRETATION (Interval Averages)					
INTERVAL(ft)	Ø %	SW %	INTERVAL(ft)	Ø %	SW %
Waarre/Flaxman Fm.					
1552-1592m (34.5m)	19	23.6			

PERFORATIONS (4 shots/ft)	
FORMATION	INTERVAL
None	

CORES				
FORM	NO.	INTERVAL	CUT	REC
None				

LOG	SUITE/ RUN	INTERVAL (M)	BHT/TIME/ REMARKS Degrees C	LOG	SUITE/ RUN	INTERVAL (M)	BHT/TIME/REMARKS Degrees C
GR	1/1	1832.0-22.0	65C/10hrs	CNS	1/2	1834.0-1350.0	66 C /16.5 hrs
SP	1/1	1816.0-415.0		PDS	1/2	1834.0-1350.0	66 C /16.5 hrs
CAL	1/1	1835.0-415.0	"	GR	1/2	1829.0-1350.0	
MLS	1/1	1830.0-415.0	"	CAL	1/2	1835.0-1350.0	
DLL	1/1	1835.0-415.0	"	RFT	1/3	1526-1703	66 C/24hrs, 25 pts, 2 samples, 5 s/f
MLL	1/1	1830.0-415.0	"	SCG	1/4	1824.5-1118	Cut: 48, Rec: 45
Sonic	1/1	1824.0-415.0	"				

*Logger Contractor - BPB

FORMATION TESTS

NO.	INTERVAL (m)	FORMATION	FLOW (mins)	SHUT IN (mins)	BOTTOM GAUGE IP/FP (psia)	SIP	MAX SURF PRESS (psia)	FLUID TO SURF (mins)	TC / BC	REMARKS
1 1S	1699-1714 (L) 1698-1713 (D)	EUMERALLA FM	6 182	39 180	103/122 75/84	904 611	19 9	GTS 20 min		GTS in 20 min @ RTSTM.,Rec: 1 bbl rathole mud
2 1S	1574-1584 (L) 1573-1583 (D)	WAARRE FM. UNIT "C"	6 120	39 134	2150/2150 2150/2150	2150/ 2150	810 1240	2 IMM.		Q : 6.0 MMCFD, 43 BCPD (71 deg API @ 60 deg C)

SUMMARY:

Fenton Creek-1 is situated in Southern Victoria, in the onshore portion of the well known hydrocarbon bearing area of the Port Campbell Embayment in the Otway Basin. The well is located in the south western corner of the PEP 108 Licence, just to the north of Petroleum Production Licences PPL1 and PPL2, which include the North Paaratte, Wallaby Creek, Skull Creek and Iona Fields. The wellsite lies approximately 5km south west of the town of Timboon, 2km north north east of the Mylor-1 well and 4.7km north west of North Paaratte-1.

The Fenton Creek structure is a tilted fault block closure, on the northern flank of the Port Campbell Embayment. It was defined by the Waarre 3D seismic program and has a mapped area of 123 acres (p 10).

The primary objective of Fenton Creek-1 was the Waarre Sandstone, and the secondary objective, sandstones in the Eumeralla Formation.

The geological section penetrated was as on prognosis. Formation tops down to the Paaratte Formation were generally intersected high to prognosis, except the Dilwyn Formation (3.1m low) whilst below they were found to be mainly lower than predicted. The top of the Flaxman Fm was close to prognosis, 13.8m low, and the top of the primary objective, the Waarre, was only 5.8m high (at 1552.5m). The top of the Eumeralla (1655m) also came in very close to that predicted, at 13.3m high.

During drilling, excellent gas shows of up to 422 units were detected in the upper portion of the Waarre, with levels decreasing below 1590m. In the upper part of the Eumeralla a thin sandstone displayed a poor to fair oil show. Between 1685m to 1740m gas shows of up to 380 units were recorded.

Wireline logging was carried out by BPB Services at total depth and consisted of the following: Suite 1/Run 1: Resistivity-Sonic-GR; Run 2: Density-Neutron-GR; Run 3: Repeat Formation Tester (25 points) and Run 4: Sidewall Cores (Cut 48, Rec. 45)

Log analysis and formation pressure data indicate a gross gas column of 39m with 34.5m of net pay in the Waarre. The Eumeralla Sandstones however, yielded only low permeabilities over the most promising interval.

Two open hole DST's (pre-logging conventional off-bottom) were run in Fenton Creek-1, the first in the Eumeralla Formation, between 1699 - 1714m. There was GTS after initial open flow, but RTSTM, with very lazy flare, and recovering 1 BBL slightly condensate cut rathole mud. DST 2 was in unit "C" of the Waarre Formation, between 1574 - 1584m. There was GTS in 2 min with a flow rate of 6.0 MMCFD and 43 BCPD, through a 0.5" choke.

Fenton Creek-1 reached a total depth of 1840m (D), 1841m (L) and has been cased to 1835.6m with 7" production casing.

Fenton Creek-1 is a new field gas discovery and has been suspended as a future gas producer.

AUTHOR: A. PIETSCH, J.A. WATT

DATE: MAY, 1997

GEOLOGY

1. GENERAL DATA

Well Name	Fenton Creek-1
Well Classification	Exploration (Wildcat)
Interest Holders	SANTOS 50.00% CULTUS 50.00%
Participating Interests	SANTOS 50.00% CULTUS 50.00%
Operator	SANTOS
Block/Licence	PEP 108, Onshore Otway Basin, Victoria
Surface Location	Latitude: 38 deg 30' 48.72" South Longitude: 142 deg 56' 00.54" East
Surveyed Elevation	Ground Level: 82.2m Rotary Table: 4.7m
Seismic Survey	Waare 3D
Seismic Location	Xline 990, Inline 7200
Total Depth	Driller: 1840m Logger: 1841m
Completion	147 joints of 7" 26 ppft K55 LT&C casing, set at 1835.6m
PBTD	Well plugged and suspended. (SUG)
Status	Suspended Gas Well.

2. DRILLING DATA

Date Drilling Commenced	2230 hours, 27th March, 1997
Date Drilling Completed	0900 hours, 04th April, 1997
Date Rig Released	0830 hours, 11th April, 1997
Contractor	Oil Drilling and Exploration Pty. Ltd. (ODE)
Rig	ODE Rig #30
Rig Specifications	(Refer to Appendix X)

3. DRILLING SUMMARY

a) Drilling Summary (All Depths Driller's KB)

Fenton Creek-1 was spudded at 2230 hours on the 27th of March, 1997. Tables I and II summarise the major drilling operations in this hole. A more comprehensive summary is appended to this report (Appendix IX: Drilling, Casing, and Abandonment Summary).

TABLE I: Casing, Hole, and Cement Details

BIT SIZE	DEPTH	CSG SIZE	CSG DEPTH	JNTS	CSG TYPE	CEMENT
12.25"	417m	9 5/8"	415m	32	36ppf K55 LTC	256sx, 96 bbls 3%gel Class 'G' plus 130sx, 27bbls "G" tail , with 2%CaCl
8.5"	1840m	7"	1835.6m	147	26ppf K55 LTC	315sx "G" with 2.5% PHG, plus 203sx "G" with 1% Halad 322

TABLE II: Summary of Mud Systems

MUD TYPE	INTERVAL (m)
Spud Mud (Gel/Water) KCL/PHPA/Polymer	Surface - 420 420 - 1840

b) Lost Time

Lost time at Fenton Creek-1 – Please refer to Appendix IX : Drilling, Casing and Abandonment Summary.

c) Water Supply

Make up water (1000 ppm Cl, hardness 96 mg/l, pH 7.2) was hauled from the mains.

d) Mudlogging

Mudlogging services were provided by Halliburton Australia Pty Ltd. (Unit 27). Samples were collected, washed, and described at 10m intervals from the surface to 9 5/8" casing point, 415m, then at 5m intervals from 9 5/8" casing shoe to 1300m, and then at 3m intervals to total depth at 1840m. All samples were checked for oil shows using ultraviolet fluorescence. Gas levels were monitored from the surface casing shoe to TD using a total gas detector and other parameters monitored included rate of penetration, weight on hook and mud pit levels.

e) Testing

The following table summarises DSTs:

TABLE III: SUMMARY OF DRILL STEM TESTS

DST	INTERVAL	TYPE	TESTING CO	RESULTS
	Eumeralla Fm.			
1	1699-1714m (L) 1698-1713m (D)	Conv. Off Bottom	Australian DST	GTS in 20 min @ RTSTM. Rec: 1 bbl rathole mud.
	Waarre Fm.			
2	1574-1584m (L) 1573-1583m (D)	Conv. Off Bottom	Australian DST	Q=6.0 MMCFD, 43 BCPD (71 deg API @ 60 deg)

f) Coring

No cores were cut in Fenton Creek-1.

g) Electric Logging

One suite of electric logs was run in Fenton Creek-1, as detailed below:

TABLE IV: ELECTRIC LOG SUMMARY

TYPE OF LOG	SUITE/RUN	INTERVAL	BHT/TIME
GR	1/1	1832m-sfc	65 deg C/ 10 hrs
CAL-		1835-415m	
SP		1816-415m	
Sonic		1824-415m	
MLL		1835-415m	
ML		1835-415m	
PDS	1/2	1834-1350m	66 deg C/ 16.5 hrs
CNS		1831-1350m	
GR		1829-1350m	
CAL		1835-1350m	
RFS-D	1/3	1526-1703m	66 deg/24 hrs, 25 pts., 2 samples, 5 s/f
SCG	1/4	1824.5-1118m	Cut: 48, Rec: 45
*Note: Wireline logging contractor: BPB WIRELINE SERVICES			

h) Geothermal Gradient

A measured static bottom hole temperature of 67°C at 1841m is calculated. This gives a geothermal gradient of 2.55°C/100m. An ambient temperature of 20 °C was employed Data used for calculations is as follows:

65 °C at 1835.8m after 10 hours from Run 1, Suite 1 GR-SP-CAL-MLL-ML-DLL-Sonic logging run.

66 °C at 1835.8m after 16.5 hours from Run 2, Suite 1 GR-CAL-PDS-CNS logging run.

66 °C at 1835m after 24 hours from Run 3, Suite 1 RFS-D.

i) Hole Deviation

The Fenton Creek-1 well is a vertical hole. Non directional surveys indicate a maximum deviation from vertical of 3.5° at 1828m.

j) Velocity Survey

No velocity survey was run in Fenton Creek-1.

k) Completion Summary

Fenton Creek-1 was cased and suspended.

GEOLOGY

1. PRE-DRILLING SUMMARY (after Well Proposal)

Fenton Creek-1 was proposed as a gas exploration well, located at Xline 990, Inline 7200, on the Waarre 3D Seismic Survey, in the southern part of the Otway Basin in Victoria. The structure is a tilted fault block closure, defined by the 3D seismic and showed a mapped area of 123 acres (P10). The Fenton Creek prospect was deemed to be an attractive project with a mean prognosed success case of 7.5 BCF OGIP.

The primary objective of Fenton Creek-1 was clean sandstones, Unit "C", of the Upper Cretaceous Waarre Formation. Lithic sandstones of the underlying Lower Cretaceous Eumeralla Formation formed the secondary objective. The well was expected to intersect a thick reservoir section in the Waarre with a mean net pay estimated at 25m.

2. DRILLING RATIONALE (after Well Proposal)

Fenton Creek-1 is located in the south western corner of PEP 108, within which lie PPL 1 and 2, production licences, just to the south of the site. The well is situated approximately 5 km southwest of the small town of Timboon, 2km NNE of the successful Mylor-1 well, and 4.7km NW of North Paaratte-1. Fenton Creek lies on the northern flank of the well known, hydrocarbon-bearing Port Campbell Embayment of the Otway Basin. Within PPL 1 and PPL2 are the North Paaratte, Wallaby Creek, Skull Creek and Iona fields. All these fields have their gas accumulations reservoired within the upper part of the Waarre Formation. Oil was also recovered from the Waarre in an RFT in the Mylor-1 well.

The top section of the Waarre Formation, defined as "Unit C" by Buffin (1989) is a well-developed quartz arenite unit. The sandstone is typically medium to coarse-grained, well sorted, clean, porous and with good permeability, and displays good to excellent reservoir qualities. It represents the hydrocarbon-bearing sands occurring in the gas fields of the Port Campbell Anticline. The sandstones exhibit a variety of sedimentary features that indicate deposition in a channel sand facies, part of a tidal beach-barrier complex environment, to tidal channels, ebb and flood tidal delta bars, open bays, and subtidal flats (Buffin, 1989). It has been sugggested that all of the Waarre units contain marine microplankton thus they were deposited in open marine environments, not fluvial or estuarine (Foster and Hodgson, 1995). "Unit C" is thought to have been deposited in a shallow marine upper shoreface region, due to its medium to coarse grain size and poorly sorted nature. A shale unit (4m thick, from 1564-1568m) within Unit "C" is interpreted to have been laid down in a very shallow marine to brackish marginal marine environment (Partridge, 1997a). The sandstones make up excellent reservoirs with their lack of matrix (as compared to the Eumeralla), and low cement content. Average *in situ* porosities are between 20 to 24% and permeabilities generally surpass 1.5 Darcies. The net to gross of the Waarre commonly exceeds 85%. The Fenton Creek-1 well is expected to intersect a good reservoir section, with a mean net pay of 25m.

The structural style of most of the Port Campbell Embayment is of fragmented fault blocks. The Fenton Creek prospect itself is a tilted fault block, lying between a major down to basin normal fault, the Fenton Creek Fault and a prominent northward dipping fault, the Wallaby Creek Fault.

Seal for the Fenton Creek prospect is expected to be provided by the Belfast Mudstone acting as both a top seal and a lateral seal against the bounding fault.

The presence of oil at the location is a possibility, but was not included in any economics. Spill from Mylor may be in the direction of Fenton Creek. Mylor has a potential oil leg of about one metre, located at about spill level (Fenton Creek-1 D & E Programme). The Mylor field (2 km NNE of location) is significant for being the first field in which an oil leg (approximately 2.5m thick) was confirmed in a Waarre reservoir (Foster and Hodgson, 1995).

The Fenton Creek location is well situated for possible production should any sizable amounts of hydrocarbons be discovered, due to the proximity of developed fields.

3. RESULTS OF DRILLING

(a) Stratigraphy

The following table lists the formations intersected in Fenton Creek-1, together with subsea elevations and thicknesses. All depths are Logger's Depths.

TABLE VI: STRATIGRAPHY IN THE FENTON CREEK-1 WELL

AGE	FORMATIONS	DEPTH (m)	ELEV (m)	THICK
	Heytesbury Group			
Middle-Late Miocene	Port Campbell Limestone	4.7	+82.2	58.3
Early-Middle Miocene	Gellibrand Marl	63	+23.9	250
Late Oligocene	Clifton Fm	313	-226.1	42
	Nirranda Group			
Late Eocene-Early Oligocene	Narrawaturk Marl	355	-268.1	62.5
Middle Eocene-Early Oligocene	Mepunga Fm	417.5	-330.6	135.5
	Wangerrip Group			
Early Eocene	Dilwyn Fm	553	-466.1	125.5
Late Paleocene-Early Eocene	Pember Mudstone	678.5	-591.6	73.5
Late Palaeocene	Pebble Point Fm	752	-665.1	141.5
	Sherbrook Group			
Maastrichtian-Campanian	Paaratte Fm	893.5	-806.5	305
Santonian	Skull Creek Mudstone	1198.5	-1111.6	125.5
"	Nullawarre Greensand	1324	-1237.1	93
Santonian-Coniacian	Belfast Mudstone	1417	-1350.1	107.5
Turonian	Flaxman Fm	1524.5	-1437.6	28
"	Waarre Fm	1552.5	-1465.6	102.5
	Otway Group			
Late Albian	Eumeralla Fm	1655	-1568.1	186+
	Total Depth	1841	-1754.1	

Cuttings samples were collected, washed, and described at 10m intervals from the surface to 9 5/8" csg pt. (415m), thereafter at 5m intervals from 415m to 1300m and at 3m intervals from 1300m to the total depth of 1841m.

A brief summary of the formations penetrated in Fenton Creek-1, their ages and their interpreted environments of deposition follows:- (For more detailed lithological descriptions refer to **Appendix I.**

Total depth for Fenton Creek-1 was reached at 1841m (D) or -1754.1m ss, in the Early Cretaceous **Eumeralla Formation,** of the **Otway Group**. The well intersected 186m of the Eumeralla, the top coming in at 1655m (maximum recorded thickness in the Otway Basin is 2743m, in the Fergusons Hill-1 well). The formation consists of interbedded argillaceous sandstone and silty claystone, with very minor coal. The sandstones are off-white to light and medium greenish-grey, and range in size from very fine to coarse, but are dominantly medium-grained. They are angular to subangular, poorly to moderately sorted, better sorted towards the base, contain weak to moderate silica and calcareous cements and have a common to abundant white argillaceous matrix; in part the sandstone is matrix supported. Characteristically, the Eumeralla contains a high percentage of volcanic rock fragments (38-53%--Abele *et al*, 1995) and in Fenton Creek there are common to abundant grey and green, and trace to common red and brown lithics, with common partially altered feldspar grains. There is trace black coaly detritus in part, trace green and brown mica flakes in part, and a trace of pyrite. The sandstone varies from friable to moderately hard but only exhibits a very poor to poor porosity. Fluorescence/shows were recorded between 1658-62m, 1686.5-1740m and 1785-88m.

The claystone comprises approximately a quarter to a third of the section drilled and is off-white to medium brownish-grey, in part light brown, and below 1686m is off-white to light bluish-grey and light to medium greenish-grey. At the top it is moderately to very silty, whereas below 1686m decreases to slighty silty, but in the last few metres increases to moderately. Coaly detritus is abundant near the top, but appears as a trace throughout the remainder of the formation, with amber forming a trace component, also at the top. The claystone is soft to firm and slightly subfissile to subfissile. A black platy coal occurs at 1650.5m in SWC 18 interbedded with claystone and is brownish-black, slightly silty with common micromica. In cuttings it appeared as black, platy to subconchoidal, earthy to dominantly subvitreous in lustre, with a trace of amber and pyrite.

The Eumeralla was deposited in a high-energy fluviatile environment, probably in a major braided stream system where there was an abundant supply of sand-sized volcanic detritus. The source of the volcanic material is unknown, but due to results from age dating, it appears that volcanism was contemporaneous with sedimentation (Abele *et al*, 1995). Two sidewall cores analyzed near the base of the well yielded palynomorphs which indicated an age of Late Albian, and represented deposition in a fluviatile environment (Partridge, 1977a). The remaining twelve cores from above (1790m to 1655m) were not age dated as they were either barren or had very low recoveries of spores and pollen. In the eastern portion of the Otway Basin the Eumeralla has been dated to be Aptian to Albian.

The Upper Cretaceous **Sherbrook Group** overlies the Lower Cretaceous Eumeralla in the Otway Basin. The **Waarre Formation** makes up the oldest formation of the group and is dated to be Turonian in age (Partridge, 1997). The formation was divided up into 4 units by Buffin (1989), however the youngest, "Unit D", has been renamed the Flaxman Formation, after Flaxman-1, by Bain (1961). The oldest units, "A" and "B" were not formally interpreted at the wellsite, however, later they were recognized to be present by the biostratigrapher Allan Partridge (1997a). "Unit C", the primary objective was well represented. Its top was intersected at 1552.5m (-1465.6m ss), and was 60.0m thick. Of the approximate 52m of good 'clean' sand in the Waarre, 34.5m is expressed as net pay (with a gross gas column of 39m). (See Appendix III for Log Analysis). The sandstone is off-white to light brownish-grey to light grey, very fine to grit, but dominantly fine to medium in size, though slightly more coarse at the base. The grains are angular to subrounded, very poorly to poorly sorted, contain a weak to moderate silica cement, and a trace of pyrite cement to 1602m. There is trace to common white argillaceous matrix throughout, clear to opaque quartz grains, and common black coaly detritus decreasing to trace near the base. The sandstone is friable to moderately hard, has a fair visible porosity, but did not exhibit any fluorescence.

The sandstone packages are from 3 to 12m thick and are generally blocky in shape, although a couple of 3m sands fine upward. Deposition for this part of the formation is interpreted to have been in shallow marine upper shoreface, lower coastal plain and delta plain environments (Partridge, 1997). The basal 30m of the Waarre is interpreted to be shallow marine to marginal marine with indications that deposition occurred landward of the paleoshoreline in lagoons or estuaries. A sample from the top of the Waarre pointed to deposition of sediments in a shallow marine inner shelf environment (Partridge, 1997a). After the transgression in the lower part of the Waarre, the formation became more regressive, depositing the best reservoir sands in the lower coastal and delta areas.

The Waarre Formation was transgressed by another flooding event (conformably overlain) by the **Flaxman Formation.** In the Fenton Creek well it was intersected at 1524.5m (-1437.6m), thus is 28m thick. It consists of a medium brownish-grey to medium grey, moderately silty to very silty claystone, with common dispersed very fine to pebble size quartz grains in part with orange staining. It contains common very fine, partially altered feldspar grains, in part, with a trace of pyrite and black coaly detritus, common micromica, is firm and slightly subfissile. The Flaxman is dated as being Turonian (Partridge,1997) in age, and is defined as the initial marine transgressive unit of the Sherbrook Group (Finlayson, 1994). A nearshore to offshore marine environment is indicated by dinoflagellates, but the presence of pyrite and coaly material points to a lagoonal or shallow estuarine location. Samples analyzed from the Flaxman contained the highest abundance and diversity of microplankton seen in the well, from which Partridge, 1997a, concludes an environment of an outer shelf in fairly deep water. This formation and the overlying Belfast Mudstone are considered part of the regional seal for the Waarre Formation.

The **Belfast Mudstone** conformably overlies the Flaxman Formation. Its top came in at 1417m (-1350.1m ss), and was 107.5m thick. The formation is largely made up of a medium to dark grey, medium olive- to medium brownish-grey claystone with only three thin (1-4m) beds of sandstone (very fine to coarse, [one 1m bed with strong calcareous cement] common to abundant matrix, moderately hard, very poor to poor porosity). The claystone is

moderately silty, has common glauconite, with a trace of very fine sandstone laminae in part, trace to rare medium brown cryptocrystalline dolomite and very fine partially altered feldspar grains in part, a trace to common carbonaceous detritus and flecks, and a trace of pyrite and micromica. It is firm and subfissile. The Belfast is dated as being mainly Turonian to Campanian (Abele *et al.*, 1995), but perhaps only Coniacian to Santonian (Partridge, 1997). It was deposited below storm wave base in a low-energy marine conditions in a prodelta situation.

The **Nullawarre Greensand** overlies the Belfast with a conformable contact, between 1324m (-1237.1m ss) and 1417m, thus is 93m in thickness. It is predominantly made up of a medium green, in part orangey-brown, very fine to coarse, mainly medium-grained sandstone with very minor medium green, partly orangey-brown <0.5-1m thick interbeds of claystone. The sandstone is angular to subrounded, moderately sorted, with weak silica cement in the top 10m and weak to moderate orangey-brown iron oxide cement below 1333m. There is abundant medium green argillaceous matrix (matrix supported) to 1333m, and below, orangey-brown, becoming more green with depth, with orange to dominantly green stained quartz grains, increasing with depth. There are also abundant brown iron oxide pellets from 1333m, decreasing with depth, common glauconite especially at the top, and trace mica flakes. The sandstone is friable to moderately hard and has a poor to fair porosity. No shows were registered.

The Nullawarre is regarded as being Santonian to Campanian in age and a marine deposit formed above storm wave base. It may be a sheet sand which accumulated on the upper part of the shelf (Abele *et al*, 1995). Two samples analyzed, just above the Nullawarre at 1320m and just below at 1422m, contained assemblages of dinoflagellates, spores and pollen which are representative of the Late Santonian, and the microplankton are indicative of an offshore marine environment, with deposition in moderate water depths (Partridge, 1997a). Unfortunately the Nullawarre itself was not sampled.

In this locality, the **Skull Creek Mudstone,** (sometimes considered part of the Paaratte Formation), conformably overlies the Nullawarre Greensand. The top of the mudstone was encountered at 1198.5m (-1111.6m ss), and is 125.5m thick. It comprises a medium grey to brownish-grey, moderately silty, claystone with very minor, 2-3m thick, interbedded sandstone lenses, in the upper portion. The claystone has common dispersed very fine quartz, and partially altered feldspar grains, trace:- black coaly detritus, medium brown cryptocrystalline dolomite, and micromica, with common pyrite. It is soft, sticky and slightly subfissile. Sandstone lenses, well formed between 1229-32m and 1222-3m, slightly coarsening up, are very light brownish-grey, very fine to medium, moderately sorted, white argillaceous matrix, with very poor to fair porosity. A pro-delta environment of deposition is interpreted for the Skull Creek and an age of Santonian has been attributed to it.

The top of the youngest formation of the Sherbrook Group, the **Paaratte Formation,** was interpreted to lie at 832m, but was revised to 893.5m (-806.5m ss) following biostratigraphic analysis. The formation is 305m thick and is made up of thin (1-5m) to fairly thick (10-35m), sandstone packages, interbedded with claystone, 1-3m thick, and minor siltstone. The sandstone is very light brownish-grey to very light grey, and towards the base becomes off-white to light brown. Grain size is predominantly coarse to very coarse, though ranges from

very fine to pebbly to 1040m, and decreases to fine to very fine in the basal 40m. The grains are angular to subrounded, are very poorly sorted, though improve to moderate at the base. In the top 100m there is weak pyrite and silica cement, below 928m, merely weak silica cement, and in the last 40m a weak to moderate silica and calcareous cement. A trace of argillaceous and silty matrix occurs at the top, and again at the base where it is common to abundant. Common, decreasing to trace, grey, green and red volcanogenic lithics are found to 1161m, and below, abundant altered feldspar grains were noted. Trace to common coaly detritus occurs throughout, in part associated with pyrite. The sandstone is friable, except between 1161-98m where it becomes moderately hard in part, and it has good to very good porosity, decreasing to no, very poor, but in part fair, visible porosity at the base. No fluorescence was noted.

The minor thinly interbedded claystone is medium to dark grey to medium brownish-grey, moderately to very silty, in part finely arenaceous, trace to common pyrite, trace to common black carbonaceous flecks and detritus, in part associated with pyrite, trace micromica, soft, in part very dispersive and slightly subfissile.

The Paaratte Formation was deposited in a deltaic environment, in this case, presumably delta plain, and has been dated to be Santonian to Maastrichtian in age in the Otway Basin. In the Fenton Creek-1 well, the only sample analyzed was from 1118m and was dated to be Early Campanian. The environment is considered to be marine but probably shallow water and fairly nearshore (Partridge, 1997a).

Unconformably overlying the Paaratte Formation is the oldest unit in the **Wangerrip Group**, the **Pebble Point Formation**. At Fenton Creek, the Pebble Point is 141.5m thick, from 752m (-665.1m ss) to 893.5m. (At the wellsite the Pebble Point was interpreted to be 80m thick to 832m. The topmost 20m of the formation consists of interbedded silty claystone and argillaceous, silty sandstone; the middle section, 30m, a coarse grained sandstone package; and the lowermost 30m an interbedded section predominantly of claystone with argillaceous sandstone).

Sandstone in the upper and midddle sections is light to medium brownish-grey to medium greenish-grey, very fine to grit, but dominantly coarse. It is angular to subangular, poorly sorted, with weak silica cement, trace to abundant medium brown to medium greenish-grey argillaceous and silty matrix, decreasing with depth. There are common orangey-brown quartz grains, glauconite in part, decreasing with depth, trace black coaly detritus and trace to common pyrite. The sandstone is friable, has very poor to good, inferred porosity--in general improving with depth, and no fluorescence. Interbedded claystone is medium greenish-grey to medium brownish-grey, moderately to very silty with abundant dispersed very fine to grit-sized quartz grains and abundant glauconite, in part, decreasing with depth. It is slightly calcareous in part with trace to common pyrite, soft, sticky and non fissile.

Below 800m claystone predominates, and is orangey-brown to orangey-green, moderately to very silty, iron oxide rich, with abundant dispersed very fine to mainly grit-sized iron oxide stained quartz grains, trace:- glauconite, iron oxide pellets, fossil fragments and pyrite. It is soft, sticky and non fissile. The sandstone is orangey-brown, very fine to grit, mainly grit,

angular to subrounded, very poorly sorted with weak iron oxide cement and abundant orangey-brown argillaceous and silty matrix (matrix supported). There are common orange iron oxide stained quartz grains, trace:- dark brown iron oxide pellets, black carbonaceous matter, pyrite and no visible porosity.

The environment of deposition for the Pebble Point is interpreted to be shallow water, nearshore, restricted marine with periodic influxes of coarse detrital material. Various megafossils and microfossils have been identified in the formation that indicate an age ranging from Maastrichtian for the oldest strata, to Palaeocene, and even Late Palaeocene (Abele *et al* , 1995).

[**Note**: At the wellsite, during the drilling and subsequent to logging, it was considered that the Pebble Point Formation was overlain by the Pember Mudstone. Since the completion of the palynological analysis by A. Partridge (1997a), it has been interpreted that the Wiridjil Formation lies between 862-893.5, the 'K/T Boundary Shale' is from 851.5-862m, and then the Pebble Point occurs at 832.5-851.5, then overlain by the Pember Mudstone at 799-832.5m. This author will at present remain with the initial interpretation for the purpose of the completion report].

Conformably overlying the Pebble Point is the **Pember Mudstone**, between 678.5m (-591.6m ss) and 752m, thus is 73.5m thick. A light to medium brown to medium greenish-grey claystone predominates, with a minor amount of off-white to light brown fine-grained sandstone. The claystone is moderately to very silty with abundant dispersed very fine to fine quartz grains in part, common glauconite especially at the top. There is trace:- black carbonaceous flecks, micromica, pyrite and it is soft, sticky and non fissile. The minor sandstone is laminated, finely interbedded and has gradational contacts with the claystone, and is angular to subangular, moderately sorted with weak silica cement and abundant off-white argillaceous and silty matrix (in part matrix supported). It carries a trace of glauconite and pyrite, is friable and has very poor to poor inferred porosity.

The Pember Mudstone was deposited in a marine environment where there was restricted circulation and low energy conditions, probably below or close to storm wave base. It has been given an age of Late Palaeocene to Early Eocene (Abele *et al*, 1995) as a result of enclosed palynomorphs.

The **Dilwyn Formation** conformably overlies the Pember Mudstone at this location, and was encountered between 553m (-466.1m ss) and 678.5m, therefore is 125.5m thick. The uppermost and lowermost third of the formation is made up predominantly of sandstone with the middle section (approximately 35m) interbedded silty claystone with minor sandstone. The sandstone is a very light brownish-grey, very fine to in part grit, though mainly medium-sized, angular to subrounded, poorly sorted with very weak silica and calcareous cements. It contains common to abundant medium brown argillaceous and silty matrix (matrix supported in part), clear to opaque and some orangey-brown quartz grains, trace greenish-grey cherty lithics and black carbonaceous detritus and trace to common pyrite. The sand is friable to unconsolidated with porosity ranging from very poor to very good and is interbedded and in part grades to a medium brown claystone. It is moderately to very silty with abundant, in part, dispersed very fine to grit-sized, quartz sand grains, stained brown, and in part grading to argillaceous sandstone. The claystone is slightly calcareous in part, with trace to common pyrite and is very soft, very dispersive and non fissile.

Individual sand packages vary from 1m to 3m in the mid section and from 4m to 15m above and 6m to 23m below. A couple of the beds display a coarsening upwards shape.

Both macrofossils and microfossils from the Dilwyn have been dated to be Early Eocene. The environment of deposition is interpreted to be shallow marine, with the cleaner sandy portion representing shoreface deposits of a coastal barrier system and the interbedded section possibly back beach lagoonal sediments, with some breaching occurring. Another interpretation is that the Dilwyn could have formed in a lower delta plain area with the sands, distributary channels and mouth bars, and the clays, the interdistributary bay fills (Abele *et al.*, 1995).

The Dilwyn Formation is the youngest unit of the Wangerrip Group, and is disconformably overlain by the **Mepunga Formation**, the oldest formation of the **Nirranda Group**. In the Fenton Creek well the Mepunga was intersected just below the 9 5/8" casing shoe at 417.5m (-330.6m ss) and is 135.5m thick. The top 35m is a medium brown, fine to medium-grained sandstone, below which is approximately 20m of argillaceous sandstone to silty claystone, and the last 80m or so is made up of interbedded sandstone (1-12m thick) and claystone. Most of the sands exhibit a coarsening-upwards base.

The sandstone is medium brown to 478m and very light brownish-grey below, very fine to medium, in part, common coarse to grit-sized, angular to subrounded (dominantly subangular), moderately sorted to 478m, poor below, with in part, strong calcareous cement (in general decreasing with depth, and weak below 478m), abundant medium brown argillaceous and silty matrix (matrix supported in places), and abundant brown-stained quartz grains, decreasing to common with depth. There is trace glauconite at the top, trace fossil fragments and coarse muscovite flakes noted to 478m, and the sand is unconsolidated to hard in part, and has a very poor, to in part, very good visible porosity.

The interbedded claystone is medium brown, slightly to very silty in part, with abundant dispersed very fine to grit-sized brown-stained quartz grains in places. It is slightly calcareous in part, with a trace of glauconite at the top, trace to common pyrite and is very soft, very dispersive and non fissile.

According to dating of forams, molluscs and palynomorphs discovered within the Mepunga, an age of Middle Eocene to Early Oligocene has been given. The sandstones have been interpreted as being deposited in beach and nearshore locations as barrier islands, whereas the claystones regarded as estuarine and some as deep lagoonal in origin (Abele *et al,* 1995).

The **Narrawaturk Marl** overlies the Mepunga Formation with a conformable contact. The marl was encountered at 355m (-268.1m ss), and is 62.5m thick. (Solely the Gamma Ray wireline log was run over this section, above the 9 5/8' casing). The formation is made up of a medium brown to medium olive grey marl and contains abundant fossil fragments, including bryozoa, forams, shell fragments, echinoid spines and sponge spicules. It has a trace pyrite, trace to common very fine, clear quartz grains, rare glauconite and is very soft, sticky and non fissile.

The fossil fragments have been dated to be Late Eocene to Early Oligocene, but no older than Oligocene in age. The marl was deposited in an open marine environment, mostly below storm wave base.

The Narrawaturk represents the youngest formation of the Nirranda Group, and overlying it with a regional disconformity is the **Clifton Formation**, the oldest unit of the **Heytesbury Group.** The Clifton is a 42m thick formation of calcarenite, found from 313m (-226.1m ss) to 355m in the Fenton Creek well. The limestone is white to orange and dark brown, very iron oxide rich with abundant iron oxide pellets and common iron oxide replaced fossil fragments (decreasing with depth). It contains common to abundant very coarse, rounded, brown, iron oxide-stained quartz grains, common fine clear quartz grains, abundant fossil fragments, trace glauconite increasing to abundant with depth, all set in a cryptocrystalline to calcarenitic matrix. The limestone is friable with an inferred poor porosity.

Fossils found within the calcarenite have been dated to be Late Oligocene, and it is thought to represent a shallow marine unit, a carbonate sand, deposited above fair weather base under fairly energetic conditions (Abele *et al*, 1995).

The Clifton Formation grades vertically, and in places laterally into the **Gellibrand Marl.** Here, the marl is 250m thick, from 63m (+23.9m ss) to 313m. It is a medium olive grey with common to abundant fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules, has a trace of very fine, to in part, coarse clear quartz grains, and below 137m, rare black carbonaceous detritus. There is a trace of pyrite above 137m, below rare, appearing as fossil replacement in places, trace of glauconite and it is very soft, sticky and non fissile.

The Gellibrand is richly fossiliferous, with an age of Early to Middle Miocene attributed to it. The formation was deposited in low-energy, continental shelf environment, with a minimum water depth of 60m, due to the presence of glauconite (Abele *et al*, 1995).

The Fenton Creek-1 well spudded into the **Port Campbell Limestone**, the topmost formation of the Heytesbury Group, (overlying the Gellibrand with a transitional contact), appearing from spud to 63m in depth. The calcarenite is light grey, fine-grained with a moderate to strong calcareous cement. It contains trace to common fossil fragments, trace glauconite and is friable to hard with a very poor to poor intergranular porosity. A light to medium grey marl appears as trace to 20%, (increasing with depth) which contains common to abundant very fine to fine calcarenitic fragments, with a trace of glauconite and is soft and sticky.

The Port Campbell Limestone is Middle to Late Miocene in age and was deposited in a moderate-energy, continental shelf environment, above fair weather wave base.

For further details concerning the formations encountered in Fenton Creek-1, refer to **Appendix I** of this report.

(b) Stratigraphic Prognosis (after Well Proposal)

The Fenton Creek-1 well is situated within a tilted fault block, with a simple three way closure, that was defined by the Waarre 3D Seismic Survey. This structure forms a typical type of play found in the Otway Basin, and lies in close proximity (2km NNE), of the Mylor-1discovery. Spill from Mylor may be in the direction of Fenton Creek.

All formations were encountered as predicted, and were intersected close to prognosis. With the exception of the Dilwyn Formation which was 5.7m low, down to the top of the Paaratte, formations were 2.8 - 51.8m high to that predicted. The five formations from the Paaratte down to the top of the Flaxman were 26.2 - 99.2m low to prognosis. This disparity is partly ue to adjustments in depths subsequent to age dating of palynomorphs, following the drilling of the well. Wellsite lithological picks were closer to prognosis, between 2.1 and 35.1m low. The top of the primary objective, the Waarre Formation, was very close to that predicted, being only 5.8m high, while the secondary objective, the Eumeralla Formation was also close at 13.3m high. (The top of the Eumeralla Formation tends to be hard to pick on seismic in this region.)

Formations intersected in Fenton Creek-1 were as predicted on prognosis.

Actual versus predicted formation tops and thicknesses for Fenton Creek-1 are tabled below (all depths quoted are Logger's Depths):

TABLE VIII: ACTUAL VERSUS PREDICTED DEPTHS AND THICKNESSES FENTON CREEK-1

FORMATION	PROG SS DEPTH	ACTUAL SS DEPTH	DEPTH DIFF	PROG THICK	ACTUAL THICK	THICK DIFF
Port Campbell Lst	-	+82.2m	-	-	58.3m	-
Gellibrand Marl	-	+23.9m	-	-	250.0m	-
Clifton Fm	-245m	-226.1m	18.9mH	140m	42.0m	-98.0m
Narrawaturk Marl	-	-268.1m	-	-	62.5m	-
Mepunga Fm	-385m	-330.6m	54.4mH	78m	135.5m	+57.5m
Dilwyn Fm	-463m	-466.1m	3.1mL	134m	125.5m	-8.5m
Pember Mdst	-597m	-591.6m	5.4mH	83m	73.5m	-9.5m
Pebble Point Fm	-680m	-665.1m	14.9mH	30m	141.5m	+115.5m
Paaratte Fm	-710m	-806.5m	35.1mL	378m	305.0m	-73.0m
Skull Creek Mdst	-1088m	-1111.6m	23.1mL	113m	125.5m	+12.5m
Nullawarre Greensand	-1201m	-1237.1m	35.1mL	93m	93.0m	0m
Belfast Mdst	-1294m	-1330.1m	31.1mL	160m	107.5m	-52.5m
Flaxman Fm	-1454m	-1437.6m	2.1mL	20m	28.0m	+8.0m
Waarre Fm	-1474m	-1465.6m	7.9mH	110m	102.5m	-7.5m
Eumeralla Fm	-1584m	-1568.6m	25.9mH	171m	186.0m+	
T.D.	-1755m	1754.1m				

(c) Hydrocarbon Summary

Total gas was recorded from the surface to total depth (1840m KB) using an FID total gas detector run by Halliburton Services, Unit No. 27. One unit of gas is equal to 200 ppm methane equivalent. Chromatographic analysis was determined using an FID chromatograph and these values are quoted as percentages (C1 - C4). Ditch cuttings were collected at 10m intervals from the surface to 9 5/8' casing point, at 415m, at 5m intervals to 1300m, and then at 3m intervals from there to T.D. at 1840m. All samples were washed, described and checked for fluorescence using ultraviolet light.

Surface to top Dilwyn Formation (spud to 553m)

No gas was detected through the Port Campbell Limestone, Gellibrand Marl, Clifton Formation, or Narrawaturk Marl. In the Mepunga Formation background gas was merely 0.2 of a unit, maximum only 0.4, and C1 measured 100%. No hydrocarbon fluorescence in the drill cuttings were recorded within these formations.

Dilwyn Formation (553m - 678.5m)

Background total gas within the Dilwyn Formation had very low readings with the background at 0.5units, maximum 1.3units, C1 100%, with a trace of C2.. No significant total gas peaks were recorded within the formation. No hydrocarbon fluorescence was noted. The formation is water saturated.

Pember Mudstone (678.5 - 752m)

Background total gas within the Pember Mudstone was 1.0units, maximum was 1.3units, with C1 100% and C2 a trace. No hydrocarbon fluorescence or significant total gas peaks were recorded.

Pebble Point Formation (752 - 893.5m)

Background total gas within the formation was low, ranging from 0.02-0.05units, maximum from 0.04-0.1units, C1 100% and C2 a trace. No hydrocarbon fluorescence or significant total gas peaks were noted.

Paaratte Formation (893.5 - 1198.5m)

Background total gas within the Paaratte Formation ranged from 0.1 to 0.5units of 100% C1, (maximum 0.9units) to 1040m, and background of 0.03-0.04, with a C1 of 82%, C2 of 18% from 1040-1198m. No significant total gas peaks were recorded. No hydrocarbon fluorescence was observed.

Skull Creek Mudstone (1198.5 - 1324m)

Again, low values were recorded within the Skull Creek with background total gas 0.03units, C1=88%, and C2=12%.

Nullawarre Greensand (1324 - 1417m)

Readings for the Nullawarre were exactly the same as for Skull Creek Mudstone for the top few metres to 1330m with the exception that C1=100%, and below, C1=90%, and C2=10%. No fluorescence was seen in the samples.

Belfast Mudstone (1417 - 1524.5m)

Within the Belfast Mudstone were the first high readings of gas in the well. To 1477m background total gas was 10 units, maximum was 20 units, C1=90%, C2=8% and C3 =2% (90/8/2) . From 1477-1522m background total gas increased to 24units, and maximum was 33.5 units and 87/6/5/2. From 1522-1527m were the highest values, with maximum total gas at 440 units and 81/12/5/2. Between 1527-1524.5m background was 39 units, maximum was 48 units and 93/4/2/1.

Flaxman Formation (1524.5 - 1552.5m)

Higher readings were recorded at the top of the Flaxman, with a maximum total gas of 422 units and C values being 81/13/5/1. These first significant values were recorded from 1522-27m in a fine to coarse grained sandstone with an inferred poor porosity, but had no discernible fluorescence.

Waarre Formation (1552.5 - 1655m)

The primary objective of the Fenton Creek-1 well was the Waarre Formation. The formation was intersected very close to the depth predicted, only 5.8m high. The Waarre yielded significant values throughout. At the wellsite, during the drilling it was assessed as being gas saturated, and that it would flow gas at economic recovery rates. Between 1553-1557m maximum total gas was 422 units, and C values were 82/9/5/3/1. From 1557-1565m maximum was 392 units, and C values 73/15/8/3/1 and between 1567-1582m there was 402 units, and 81.5/13/4/1/0.5. From 1582-1594m maximum gas was 350 units with 81/13/5/1/trace. No oil fluorescence was documented at the wellsite, though an estimation of a gross net pay of 44m, and net gas pay of 32m was made. Log analysis and formation pressure data indicate a gross column of 39m with 34.5m of net pay.

Average porosity calculated in the interval from 1533-1592m was 19% and average water saturation 23.6%. DST 2 tested the interval 1574-1584m, resulting in a flow rate of 6.0 MMCFD gas, with 43 BCPD of condensate with an API gravity of 71 degrees at 60 degrees Celsius. Mudlog gas peaks and shows, log evaluation, combined with test results confirm that the Waarre sand has good potential at this location.

Eumeralla Formation (1655 - 1841m TD)

A secondary objective of Fenton Creek-1 was the Eumeralla Formation. The formation was intersected 13.3m high, close to that on prognosis. Sand development was not as good in the Eumeralla as within the Waarre Formation, as it tended to contain abundant argillaceous matrix with varying degrees of both silica and calcareous cements. It was in this section however, that the only fluorescence was documented in the well. At the top of the formation,

in the first 4m, maximum total gas was 330 units, with C values recording 95/5/tr/tr, however porosity was very poor with no fluorescence. From 1658-62m, immediately below, maximum total gas was 423 units, with 90/6/2/2/tr, and the off-white fine grained sandstone displayed a 30-40% pinpoint dull to moderately bright pale yellowish-white fluorescence with a weak dull white crush cut, and a thin pale yellowish-white ring residue, but again only had a very poor visible porosity. In the sandstone section from 1686.5-1740m, maximum gas recorded was 371 units with 89/7/3/1/tr, but it exhibited had poor porosity. Fluorescence was noted within the interval, from 1695-1715m, as trace to 10% bright pinpoint pale yellowish-white, with a very dull milky white crush cut and trace pale yellowish-white scum residue.

A thin 3m sandy interval from 1785-88m, yielded a maximum gas reading of 438 units with 83/12/4/1/tr. Porosity was poor, but unlike the section above, showed no fluorescence.

DST 1 tested the interval 1699-1714m, resulting in GTS at RTSTM and a recovery of 1 barrel of slightly condensate cut rathole mud to surface. Log evaluation, combined with poor test results and mudlog shows, indicate that the Eumeralla Formation sands have low permeability and not are productive at the Fenton Creek site.

The Fenton Creek-1 well has been classed as a new field gas discovery and has been suspended as a future gas producer.

4. SUMMARY

Fenton Creek-1 was drilled as a Wildcat (WCNF) gas exploration well within PEP 108, at Xline 990, Inline 7200, located on the Waarre 3D Seismic Survey. The Fenton Creek structure is situated near the northern border of the Port Campbell Embayment of the Otway Basin, in southern Victoria. The structure is a tilted fault block with three way dip closure. It is located close to the gas production area of the Port Campbell region, in close proximity to Petroleum Production Licences 1 and 2, including several fields producing natural gas and carbon dioxide currently.

The primary objective of Fenton Creek-1 was the Late Cretaceous Waarre Formation of the Sherbrook Group, and the secondary objective the older Early Cretaceous Eumeralla Formation of the Otway Group.

Drilling of Fenton Creek-1 was terminated 186m into the Eumeralla Formation. Formation tops were intersected high to prognosis, to the top of the Paaratte Formation with the exception of the Dilwyn Formation at 5.7m low. From the top of the Paaratte at 893.5m, including the intervening Skull Creek Mudstone and Nullawarre Greensand, to the top of the Belfast Mudstone at 1417m, the four formations were all low by 26.2-99.2m to that expected. The Flaxman, Waarre and Eumeralla were all very close to prognosis, at 13.8m, 5.8m and 13.3m high, respectively.

Electric logging at total depth of 1841m consisted of the following; Run 1: Resistivity-Sonic-Gamma Ray; Run 2: Density-Neutron-Gamma Ray; Run 3: Formation Pressure Survey; Run 4: Sidewall Cores - cut 48, recovered 45. No full hole cores were cut in Fenton Creek-1.

Two open hole DSTs (conventional off-bottom) were run in Fenton Creek-1, the first testing the best shows, near the top of the Eumeralla Formation in a 15m section of argillaceous sand from 1699-1714m. Pressure tests indicated slow buildup, while gas to surface (GTS) in 20 minutes at rate too small to measure (RTSTM) was recorded, with a recovery of 1 barrel of slightly condensate cut rathole mud.

In the upper 85m (1655-1740m) of the Eumeralla, maximum total gas readings ranged from 330 units to 438 units, though there was patchy fluorescence, seen in the intervals 1658-62m and 1695-1715m, a total of 24m. As there was only very poor to poor porosity seen, with abundant argillaceous matrix, permeability was very low, which was corroborated by formation pressure tests and log analysis.

The second DST was run in the prospective Unit "C" of the Waarre Formation, testing the interval 1574m to 1584m, in a light grey fine-grained sandstone with fair porosity. It was a successful test producing gas to surface at a rate of 6.0 MMCFD, and 43 BCFD condensate with an API gravity of 71 degrees @ 60 degrees Celsius.

Analysis of the logs shows a total of approximately 50m of net sand within the Waarre Formation (average ∅ 19% and average Sw 23.6%). Log evaluation and formation pressure data indicates a gross gas column of 39m with 34.5 of net pay. On intersection during drilling, good gas shows with maximum total gas between 350 units and 422 units were documented in the upper portion of the Waarre in four intervals between 1552.5m and 1594m. No oil fluorescence was detected in the samples.

Fenton Creek-1 has established the presence of hydrocarbons reservoired in the Waarre Formation at this location within PEP 108. It is very suitably positioned, just to the north of PPL1 and PPL2 to await possible development in the future, and tie in to existing production facilities.

Fenton Creek-1 has been cased and suspended as a future gas producer.

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APPENDIX I: LITHOLOGICAL DESCRIPTIONS

APPENDIX I(a): CUTTINGS

LITHOLOGICAL DESCRIPTIONS

Ditch cuttings were collected, washed, described, and checked for fluorescence at 10m intervals from the surface to 9 5/8" casing point at 415m, thereafter at 5m intervals from 415m casing shoe to 1300m, and then at 3m intervals to total depth at 1840m.

HEYTESBURY GROUP
Port Campbell Limestone (Middle to Late Miocene)
(58.3m thick)

Spud-63m CALCARENITE: light grey, fine grained, moderate to strong calcareous cement, trace to common fossil fragments, trace glauconite, friable to hard, very poor to poor intergranular porosity.
With trace to 20% increasing with depth:
MARL: light to medium grey, common to abundant very fine to fine calcarenitic fragments, trace glauconite, soft, sticky.

63-313m **Gellibrand Marl (Early to Middle Miocene)**
(250m thick)

63-137m MARL: medium olive grey, common to abundant fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules, trace very fine to occasionally coarse clear quartz grains, trace pyrite, trace glauconite, very soft, sticky, non fissile.

137-313m MARL: medium olive grey, abundant fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules, rare black carbonaceous detritus, rare pyrite occasionally as fossil replacement, trace glauconite, rare fine quartz sand grains, very soft, sticky, non fissile.

313-355m **Clifton Formation (Late Oligocene)**
(42m thick)

313-355m CALCARENITE: white to orange to dark brown, very iron oxide rich with abundant iron oxide pellets and common iron oxide replaced fossil fragments - in general decreasing with depth, common to abundant very coarse rounded brown iron oxide stained quartz grains, common fine clear quartz grains, abundant fossil fragments, trace glauconite increasing to abundant with depth, all set in a cryptocrystalline to calcarenitic matrix, friable, poor inferred porosity.

NIRRANDA GROUP

355-417.5m **Narrawaturk Marl (Late Eocene to Early Oligocene)**
(62.5m thick)

355-417m MARL: medium brown, medium olive grey, abundant fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules, trace pyrite, trace to common very fine to fine clear quartz sand grains, rare glauconite, very soft, sticky, non fissile

417-417.5m MARL: medium brown, abundant fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules, trace pyrite, trace very fine to fine quartz sand grains, trace to common glauconite, very soft, non fissile.

417.5-553m **Mepunga Formation (Middle Eocene to Early Oligocene)**
(135.5m thick)

417.5-478m SANDSTONE: (90%) medium brown, very fine to medium, occasional to common coarse to grit sized grains, dominantly fine to medium, angular to subrounded, dominantly subangular, moderately sorted, nil to occasionally strong calcareous cement - in general decreasing with depth, abundant medium brown argillaceous and silt matrix - often matrix supported, abundant brown stained quartz grains decreasing to common with depth, trace glauconite at top, trace fossil fragments, trace to common pyrite, trace coarse muscovite flakes, unconsolidated to occasionally hard, very poor to occasionally good inferred porosity, no oil fluorescence,
Grading to:
CLAYSTONE: (10%) medium brown, slightly to often very silty, often abundant dispersed very fine to grit sized brown stained quartz sand grains, slightly calcareous in part, trace glauconite at top, trace to common pyrite, very soft, very dispersive, non fissile.

478-678.5m SANDSTONE: (80%) very light brown grey, very fine to occasionally grit, dominantly medium, angular to subrounded, poorly sorted, very weak silica and calcareous cements, common to abundant medium brown argillaceous and silt matrix - matrix supported in part, clear to opaque to occasionally orange brown quartz grains, trace green grey cherty lithics, trace to common pyrite, trace black carbonaceous detritus, friable to unconsolidated, very poor to very good dominantly fair inferred porosity, no oil fluorescence,
Interbedded with and in part grading to:

CLAYSTONE: (20%) medium brown, moderately to very silty, often abundant dispersed very fine to grit sized brown stained quartz sand grains - in part grading to argillaceous sandstone, slightly calcareous in part, trace to common pyrite, very soft, very dispersive, non fissile.

WANGERRIP GROUP

553m-678.5m **Dilwyn Formation (Early Eocene)**
(125.5m thick)

478-680m SANDSTONE: (80%) very light brown grey, very fine to occasionally grit, dominantly medium, angular to subrounded, poorly sorted, very weak silica and calcareous cements, common to abundant medium brown argillaceous and silt matrix - matrix supported in part, clear to opaque to occasionally orange brown quartz grains, trace green grey cherty lithics, trace to common pyrite, trace black carbonaceous detritus, friable to unconsolidated, very poor to very good dominantly fair inferred porosity, no oil fluorescence,
Interbedded with and in part grading to:
CLAYSTONE: (20%) medium brown, moderately to very silty, often abundant dispersed very fine to grit sized brown stained quartz sand grains - in part grading to argillaceous sandstone, slightly calcareous in part, trace to common pyrite, very soft, very dispersive, non fissile.

752-893.5m **<u>Pebble Point Formation (Late Palaeocene)</u>**
(141.5m thick)

680-740m CLAYSTONE: (90%) light to medium brown to medium green grey, dominantly medium brown, moderately to very silty, abundant dispersed very fine to fine quartz sand grains in part, common glauconite especially at top, trace black carbonaceous flecks, trace micromica, trce pyrite, soft, sticky, non fissile,
Grading to , laminated and finely interbedded with:
SANDSTONE: (10%) off white to light brown, very fine to fine, dominantly fine, angular to subangular, moderately sorted, weak silica cement, abundant off white argillaceous and silt matrix - in part matrix supported, trace glauconite, trace pyrite, friable, very poor to poor inferred porosity, no oil fluorescence.

740-800m SANDSTONE: (70%) light to medium brown grey to mediium green grey, very fine to grit, dominantly coarse, angular to subangular, poorly sorted, weak silica cement, trace to abundant medium brown to medium green grey argillaceous and silt matrix - in general decreasing with depth, common orange brown quartz grains, nil to abundant glauconite decreasing with depth, trace black coaly detritus, trace to common pyrite, friable, very poor to good inferred porosity - in general improving with depth, no oil fluorescence,
Interbedded with and grading to:
CLAYSTONE: (30%) medium grey to medium brown grey, moderately to very silty, abundant dispersed very fine to grit quartz sand grains, abundant to nil glauconite decreasing with depth, slightly calcareous in part, trace to common pyrite, soft, sticky, non fissile.

800-833m

CLAYSTONE (90%) orange brown to orange green, moderately to very silty, iron oxide rich, abundant dispersed very fine to dominantly grit sized iron oxide stained quartz grains,trace black carbonaceous detritus, trace glauconite, trace iron oxide pellets, trace fossil fragments, trace pyrite, soft, sticky, non fissile.
Grading to:
SANDSTONE (10%) orange brown, very fine to grit, dominantly grit, angular to subrounded, very poorly sorted, weak iron oxide cement, abundant orange brown argillaceous and silt matrix - matrix supported, orange iron oxide stained quartz grains, trace dark brown iron oxide pellets, trace black carbonaceous matter, trace pyrite, no visible porosity, no oil fluorescence.

833-928m SANDSTONE: (100%) very light brown grey, very fine to pebble, dominantly very coarse, angular to subrounded, dominantly subangular, very poorly sorted, weak pyrite and silica cements, trace medium brown argillaceous and silt matrix, common yellow quartz grains, common grey green and red volcanogenic lithics, trace coarse brown and green mica flakes, trace black coaly detritus, friable, very good inferred porosity, no oil fluorescence.
(****See note** in main text in Stratigraphy, under Pebble Point Formation regarding depths)

893.5-1198.5m **SHERBROOK GROUP**

Paaratte Formation (Maastrichtian to Campanian)

833-928m **(305m thick)**

SANDSTONE: (100%) very light brown grey, very fine to pebble, dominantly very coarse, angular to subrounded, dominantly subangular, very poorly sorted, weak pyrite and silica cements, trace medium brown argillaceous and silt matrix, common yellow quartz grains, common grey green and red volcanogenic lithics, trace coarse brown and green mica flakes, trace black coaly detritus, friable, very good inferred porosity, no oil fluorescence.

928-1040m SANDSTONE: (90%) very light grey, very fine to occasionally pebbly, dominantly coarse to very coarse, angular to subrounded, dominantly subangular, very poorly sorted, weak silica cement, no visible matrix, trace yellow quartz grains, trace grey green and red volcanogenic lithics, trace coarse brown and green mica flakes, trace black coaly detritus often with associated pyrite, friable, very good inferred porosity, no oil fluorescence,
With minor interbedded:

CLAYSTONE: (8%) medium to dark grey to medium brown grey, very silty, common pyrite, common black coaly detritus often with associated pyrite, trace micromica, very dispersive, non to slightly subfissile, with minor thinly interbedded:

SILTSTONE: medium grey, moderately argillaceous, very finely arenaceous in part with quartz and partially altered feldspar grains, slightly dolomitic, common black carbonaceous flecks and fine detritus, trace to common pyrite, trace micromica, firm to moderately hard, slightly subfissile.

1040-1161m SANDSTONE: (70%) very light grey, very fine to grit, dominantly medium to coarse, angular to subangular, very poorly sorted, weak silica cement, trace green grey and red volcanogenic lithics, trace to common black coaly detritus, trace pyrite, friable, good to very good inferred porosity, no oil fluorescence,
Interbedded with:

CLAYSTONE: (30%) medium to dark grey, light to medium brown grey, moderately to very silty, abundant dispersed very fine to fine quartz sand grains in part, trace to occasionally abundant black carbonaceous matter, trace pyrite, trace micromica, soft, slightly subfissile.

1161-1198.5m CLAYSTONE: (80%) medium to dark grey to medium brown grey, moderately to very silty, occasionally very finely arenaceous with quartz and partially altered feldspar grains, trace to common black to dark brown carbonaceous flecks and fine detritus, slightly calcareous in part, trace pyrite, trace micromica, soft, slightly subfissile, Laminated and occasionally interbedded with:

SANDSTONE: (20%) off white to light brown, very fine to fine, angular to subrounded, moderately sorted, weak to moderate silica and calcareous cements, common to abundant white argillaceous and silt matrix, abundant altered feldspar grains in part, trace black coaly detritus, trace pyrite, friable to moderately hard, nil to very poor occasionally fair visual porosity, no oil fluorescence

1198.5-1324m **Skull Creek Mudstone (Santonian)**
(125.5m thick)

1198.5-1324m CLAYSTONE: (80%) medium grey to medium brown grey, moderately silty, occasionally common dispersed very fine quartz and partially altered feldspar sand grains, trace black coaly detritus, trace medium brown cryptocrystalline dolomite, common pyrite, trace micromica, soft, sticky, slightly subfissile,
Interbedded and laminated with:

SANDSTONE: (20%) very light brown grey, very fine to rarely coarse, dominantly very fine, occasionally dominantly medium, angular to subrounded, dominantly subangular, moderately sorted, weak silica cement, trace to common white argillaceous matrix, common yellow orange quartz grains, trace black coaly detritus, trace brown and green mica flakes, friable, very poor to occasionally fair visual porosity, no oil fluorescence.

1324-1417m **Nullawarre Greensand (Santonian)**
(93m thick)

1324-1330m SANDSTONE: (80%) medium green, very fine to coarse, dominantly medium, angular to subrounded, dominantly subangular, moderately sorted, weak silica cement, abundant medium green argillaceous matrix - matrix supported, orange to dominantly green stained quartz grains, common glauconite, trace mica flakes, friable, poor inferred porosity, no oil fluorescence,
Grading to:

CLAYSTONE: (20%) medium green to yellow green, abundant dispersed quartz grains, common glauconite, trace pyrite, soft, sticky, non fissile.

1330-1410m SANDSTONE: (90%) orange brown, becoming medium green in part with depth, very fine to coarse, dominantly medium, angular to subangular, moderately sorted, weak to moderate iron oxide cement, common to abundant orange brown iron oxide rich argillaceous matrix becoming medium green with depth, abundant orange brown stained quartz grains, trace to abundant green stained quartz grains increasing with depth, abundant dark brown iron oxide pellets decreasing with depth, friable to moderately hard, poor to fair inferred porosity, no oil fluorescence, In part grading to and with interbedded:
CLAYSTONE: (10%) orange brown, becoming medium greenish grey with depth, iron oxide rich, abundant dispersed very fine to coarse orange to green stained quartz grains, soft, sticky, non fissile.

1417-1524.5m **Belfast Mudstone (Santonian to Coniacian)**
(107.5m thick)

1410-1477m CLAYSTONE: (98%) medium to dark grey, medium olive grey to medium brown grey, moderately silty, common glauconite, rare medium brown cryptocrystalline dolomite, trace very fine partially altered feldspar grains in part, trace black carbonaceous detritus, trace to common black carbonaceous flecks, trace pyrite, trace micromica, firm, slightly subfissile.
With in part minor laminated and finely interbedded:
SANDSTONE: (2%) light grey, very fine to coarse, dominantly very fine to occasionally medium, angular to subangular, moderately sorted, weak calcareous and dolomite cements, moderate silica cement, common white argillaceous matrix, clear quartz grains, trace glauconite, trace black carbonaceous matter, moderately hard, very poor to poor visible porosity, no oil fluorescence.

1477-1524.5m CLAYSTONE: (100%) medium to dark grey to medium brown grey, moderately silty, trace very fine sandstone laminae in part, common glauconite, trace medium brown crytpocrystalline dolomite, trace fine black carbonaceous detritus anfd flecks, trace pyrite, trace to common micromica, firm, subfissile.

1524.5-1552.5m **Flaxman Formation (Turonian)**
(28m thick)

1524.5-1527m

CLAYSTONE: (70%) medium green to orange brown, moderately silty, abundant dispersed very fine to coarse quartz grains often stained green and orange, slightly calcareous in part, common glauconite, trace pyrite, soft, sticky, non fissile, Grading to

SANDSTONE: (30%) medium green to orange brown, very fine to coarse, dominantly medium, angular to subangular, moderately sorted, weak silica cement, occasional strong calcareous cement, abundant medium green to orange brown argillaceous matrix - matrix supported, abundant orange to green stained quartz grains, common glauconite, trace pyrite, friable, poor inferred porosity, no oil fluorescence.

1527-1552.5m CLAYSTONE: (100%) medium to dark grey to medium brown grey to medium green grey, moderately silty, slightly calcareous in part, trace medium brown cryptocrystalline dolomite, trace glauconite, trace black carbonaceous flecks, common micromica, firm, subfissile.

1552.5-1655m **Waarre Formation (Turonian)**
(102.5m)

1552.5-1557m CLAYSTONE: (80%) medium brown grey to medium grey, moderately to very silty, common dispersed very fine to pebble quartz grains often with orange staining, common very fine partially altered feldspar grains in part, trace pyrite, trace black coaly detritus, common micromica, firm, slightly subfissile, Grading in part to:

SANDSTONE: (20%) off-white to light brown grey, very fine to pebble, dominantly fine, angular to subrounded, very poorly sorted, weak to moderate silica cement, abundant off white to medium brown grey argillaceous and silt matrix - matrix supported in part, clear to occasionally orange quartz grains, trace black carbonaceous detritus, trace pyrite, trace mica flakes, friable, very poor inferred porosity at top increasing to poor with depth, no oil fluorescence.

1557-1565m SANDSTONE: (100%) light grey, very fine to grit, dominantly coarse, angular to subrounded, dominantly subangular, poorly sorted, moderate silica cement, trace pyrite cement, trace to common white argillaceous matrix, common black coaly detritus, friable to moderately hard, fair visible porosity, no oil fluorescence.

1565-1567m

CLAYSTONE: (100%) medium brown grey, very silty, trace very fine partially altered feldspar grains, common black carbonaceous flecks, trace pyrite, common micromica, firm, subfissile.

1567-1582m

SANDSTONE: (80%) very light grey, very fine to grit, dominantly fine to medium, angular to subrounded, dominantly subangular, very poorly sorted, moderate silica cement, trace pyrite cement, trace to common white argillaceous matrix, clear to opaque quartz grains, common black coaly detritus, trace amber, moderately hard, poor to good dominantly fair visible porosity, no oil fluorescence,
In part laminated and interbedded with:
CLAYSTONE: (20%) medium grey to medium brown grey, very silty, trace to abundant very fine quartz and partially altered feldspar grains, common black carbonaceous flecks and detritus, trace pyrite, common micromica, firm, subfissile.

1582-1602m

SANDSTONE: (80%) very light grey, very fine to grit, dominantly fine to medium, angular to subrounded, dominantly subangular, very poorly sorted, moderate silica cement, trace pyrite cement, trace to common white argillaceous matrix, clear to opaque quartz grains, common black coaly detritus, trace amber, moderately hard, poor to good, but dominantly fair visible porosity, no oil fluorescence,
In part laminated and interbedded with:
CLAYSTONE: (20%) medium grey to medium brown grey, very silty, trace to abundant very fine quartz and partially altered feldspar grains, common black carbonaceous flecks and detritus, trace pyrite, common micromica, firm, subfissile.

1602-1632m

SANDSTONE: (70%) light grey, very fine to grit, dominantly medium to coarse, angular to subrounded, dominantly subangular, very poorly sorted, moderate silica cement, occasional strong calcareous and dolomite cement, trace to common white argillaceous matrix, clear to opaque quartz grains, trace black coaly detritus, trace pyrite, moderately hard, fair visible porosity, no oil fluorescence, Interbedded with:
CLAYSTONE: (30%) medium grey to medium brown grey, very silty, common very fine partially altered feldspar sand grains in part, trace to common black coaly detritus and flecks, trace medium brown cryptocrystalline dolomite, trace to common pyrite, common micromica, firm to moderately hard, subfissile.

1632-1655m CLAYSTONE: (98%) medium brown grey to medium grey, occasionally very light brown, moderately to very silty, abundant black coal detritus, trace amber, abundant very fine off white partially altered feldspar grains in part, trace pyrite, trace to common micromica, firm, subfissile,
With detrital and laminated:

COAL: (2%) black, platy to subconchoidal fracture, earthy to dominantly subvitreous lustre, trace amber, trace disseminated pyrite, hard, brittle.

1655-1840m TD **<u>OTWAY GROUP</u>**

<u>Eumeralla Formation (Late Albian)</u>
(186+m)

1655-1666m SANDSTONE: (90%) off white, very fine to coarse, dominantly fine at top, dominantly medium at base, subangular, poor to moderately sorted, weak to moderate silica and calcareous cements, common to abundant white argillaceous matrix in general decreasing with depth, common grey green and trace red lithics, trace black coaly detritus, trace pyrite, very poor visible porosity at top increasing to poor at base, friable to moderately hard - common loose grains in sample at base, oil fluorescence (see hydrocarbon summary),
Interbedded and in part laminated with:

CLAYSTONE: (10%) off white to medium brown grey, occasionally very light brown, moderately to very silty, trace black coal detritus, trace amber, abundant dispersed very fine to medium quartz and lithic sand grains in part, trace pyrite, trace to common micromica, firm, subfissile.

1666-1686.5m SANDSTONE: (90%) (weathered to white clay in part) light to medium green grey, very fine to coarse, dominantly medium, angular to subangular, moderately sorted, moderate silica and calcareous cements, abundant white argillaceous matrix - often matrix supported, abundant green grey lithics, trace red brown lithics, common partially altered feldspar grains, trace black coaly detritus, trace pyrite, nil to very poor visible porosity, no oil fluorescence,
Interbedded with:

CLAYSTONE: (10%) off white to light blue grey, light to medium green grey, occasionally light brown, slightly silty, slightly calcareous, trace black coaly detritus, trace pyrite, trace micromica, soft to firm, slightly subfissile.

1686.5-1740m SANDSTONE: (70%) medium green grey, fine to coarse, dominantly medium, angular to subangular, moderately to well sorted, moderate calcareous cement, common to abundant white argillaceous matrix, abundant green grey lithics, common red brown lithics, trace green and brown mica flakes, friable, poor inferred porosity, fluorescence (see Hydrocarbon Summary).
Interbedded with:

CLAYSTONE: (30%) off white to light blue grey, light to medium green grey, occasionally light brown, slightly silty, slightly calcareous, trace black coaly detritus, trace pyrite, trace micromica, soft to firm, slightly subfissile

1740-1807m+ SANDSTONE: (50%) medium green grey, fine to coarse, dominantly medium, subangular, moderately to well sorted, moderate silica and weak calcareous cements, common to abundant white argillaceous matrix, abundant green grey lithics, common red brown lithics, common partially altered feldspar grains, trace green and brown mica flakes, rare pyrite, friable to moderately hard, very poor to poor inferred porosity, no oil fluorescence,
Interbedded with:
CLAYSTONE: (50%) medium green grey, off white to light brown grey, occasionally medium grey to medium to dark brown, slightly to moderately silty, trace very fine partially altered feldspar grains in part, trace to common black coaly detritus, trace pyrite, trace micromica, firm, slightly subfissile.

1807-1840 TD SANDSTONE: (70%) medium green grey, fine to coarse, dominantly medium, subangular, moderately to well sorted, moderate silica cement, common to abundant white argillaceous matrix, abundant green grey lithics, common red brown lithics, common partially altered feldspar grains, trace green and brown mica flakes, trace pyrite, friable to moderately hard, very poor to poor inferred porosity, no oil fluorescence,
Interbedded with:
CLAYSTONE: (30%) off white to medium green grey, light brown grey to medium grey, slightly to moderately silty, trace very fine partially altered feldspar grains in part, trace to common black coaly detritus, trace pyrite, trace micromica, firm, slightly subfissile.

APPENDIX I(b): SIDEWALL CORES

SANTOS LIMITED

SIDEWALL CORE DESCRIPTION

WELL: Fenton Creek-1 **DATE:** 5-4-97 **PAGE:** 1 of 3

GUN NO.: 1 **SHOTS FIRED:** 24 **SHOTS BOUGHT:** 45 of 48

GEOLOGIST: David Horner

CORE NO.	DEPTH	REC. Mm	PALYN. EVAL. REJECT	LITH.	COLOUR	GRAIN SIZE	HYDR. INDIC. (Y/N)	SUPPLEMENTARY INFORMATION
48	1118	19		Cly/sst	M brn/lt gy	Vf	N	Sdy Clyst: med-dk brn gy, vf sd grs supp in a cly mtx, sft, non fis
47	1200	20		Sst	Ly gy	Vf	N	Sst: lt gy, vf,sa-sr, w srt, abt gy brn mtx - mtx supp, com mmic, tr bk carb flks,fri, v pr por
46	1320	28		Cly	Dk brn		N	Clyst: dk brn, com wh sd grs, tr mmic, sft-frm
45	1422	29		Arg sst	Dk brn	C	N	Arg Sst: dk brn, tr glauc, vf-dom m, frm, non fis
44	1498.5	23		Cly	Dk grn brn		N	Clyst: dk grn brn, com glauc, frm, non fis
43	1520	20		Cly	Dk grn brn		N	Clyst: dk grn brn, v slty, tr mic flks, tr mmic, com glauc, frm, non fis
42	1524	21		Sst	Dk grn	M	N	Sst: dk grn, vf-c, dom m, sa-sr, m srt, wk sil cmt, tr wk calc cmt, abt gy arg mtx, com glauc, fri, v pr por
41	1526.5	35	Eval	Sst	M grn	M	N	Sst: m grn, vf-c, dom m, sa-sr, m srt, wk sil cmt, abt brn arg mtx, com glauc, fri, v pr por
40	1530	32		Cly	Dk grn gy		N	Clyst: dk grn gy, tr f-m qtz grs, tr mmic, tr glauc, v slty, sft, sl sbfis
39	1533.5	31		Cly	Dk brn gy		N	Clyst: dk brn gy, tr f-m qtz grs, tr mmic, tr glauc, mod slty, sft, sl sbfis
38	1535.5	26		Cly	Dk brn gy		N	Clyst: dk brn gy, v slty, tr glauc, tr mmic, sft, sl sbfis
37	1538	20		Cly	Dk brn gy		N	Clyst: dk brn gy, v slty, tr glauc, tr mmic, sft, sl sbfis
36	1543	25		Cly	Dk grn		N	Clyst: dk grn, v slty, tr glauc, tr mmic, sft, sl sbfis
35	1544.5	21		Cly	Dk brn gy		N	Clyst: dk brn gy, sl aren i/p, m slty, tr pyr, tr glauc, tr mmic, sft, sl sbfis
34	1548	20		Cly	V dk gy		N	Clyst: v dk gy, sl aren i/p, m slty, tr pyr, tr glauc, tr mmic, sft, sl sbfis
33	1549	20		Cly	V dk gy		N	Clyst: v dk gy, sl aren i/p, m slty, tr pyr, tr glauc, tr mmic, sft, sl sbfis
32	1553	13	Eval	Sst	V lt brn	Grit	N	Sst: v lt brn, vc-grit, sa, m srt, wk sil cmt, tr wh arg mtx, fri, gd inf por.
31	1566	17		Cly	Gy bk		N	Clyst: gy bk, sl slty, tr mmic, sft, sl sbfis
30	1567	12		Cly	Dk gy		N	Clyst: dk gy, v slty, com mmic, sft, sl sbfis

COMMENTS:
SWC No.25 (1660m) shot out of order.

SANTOS LIMITED

SIDEWALL CORE DESCRIPTION

WELL: Fenton Creek-1 **DATE:** 5-4-97 **PAGE:** 2 of 3

GUN NO.: 1 **SHOTS FIRED:** 24 **SHOTS BOUGHT:** 45 of 48

GEOLOGIST: David Horner

CORE NO.	DEPTH	REC. Mm	PALYN. EVAL. REJECT	LITH.	COLOUR	GRAIN SIZE	HYDR. INDIC. (Y/N)	SUPPLEMENTARY INFORMATION
29	1570.5	22	Eval	Coal	Brn bk		N	Coal: brn bk, sbvit, sbconch fract, hd, w/ tr Sst: off wh, f-m, sa-sr, m srt, wk sil cmt, fri, gd inf por.
28	1573	16		Sst	V lt brn	F	N	Sst: v lt brn, vf-m, dom f, sa-sr, m srt, wk sil & tr calc cmt, fri, gd vis por
27	1590	-	Eval					Empty
26	1594.5	-						Empty
24	1603.25	1.8		Sst	Off wh	m	N	Sst: off wh, vf-dom m, sa-sr, m srt, wk sil cmt, com wh arg mtx, fri, fr por
23	1614.5	23		Sst	Lt grn wh	Vf	N	Sst:lt grn wh, vf, sa-sr, m-w srt, wk sil & calc cmt, abt lt grn wh arg mtx, fri, pr por
22	1622	19		Sltst	M brn		N	Sltst: m brn, mod arg, f aren, tr mmic, sft, non fis
21	1635	18		Cly	Dk brn		N	Clyst: m brn, sl slty, tr mmic, sft, non fis
20	1640	20		Sst	Lt brn wh	F	N	Sst: lt brn wh, vf-c, dom f, sa-sr, m srt, wk-mod sil cmt, abt wh arg mtx, abt bk carb dtrl, fri, pr vis por
19	1646	24		Cly	M brn		N	Clyst: m brn, sl slty, com mmic, frm, sl sbfis
18	1650.5	22	Coal	Coaly	Brn bk		N	Coal/Clyst: brn bk, sl slty, com mmic, frm, sbfis, v arg & v carb.
17	1654	29		Cly	M brn		N	Clyst: m brn, sl slty, com bk carb dtrl, com mmic, frm, sbfis
25	1660	-	Eval	-				Empty
16	1662.5	20	Eval	Sst	Lt grn brn	F	Y	Sst: lt grn brn, vf-m, dom vf-f, a-sa, m srt, mod sil & calc cmt, abt wh arg & slt mtx, com gy grn liths & alt fspar, tr bk carb dtrl, mod hd, v pr por. 30% dull yel-wh pp-ptchy fluor, dull wh crush cut, tr residue
15	1667	23		Sst	Lt grn brn	M	Y	Sst: lt grn brn, vf-dom m, a-sa, pr srt, wk-mod sil & calc cmt, com wh arg mtx, abt gy grn & tr red liths, mod hd, fr vis por. 80% bri wh pp-ptchy wh fluor giving mod bri fst strmg wh cut, thick ring res.
14	1672	27		Sst	M grn gy	M	N	Sst: m grn gy, vf-c, dom m, sa-sr, m srt, wk sil cmt, abt wh arg mtx, abt grn gy red liths, mod hd, pr vis por
13	1684.5	26		Sst	M grn gy	M	N	Sst: m grn gy, vf-c, dom m, sa-sr, m srt, wk sil cmt, abt wh arg mtx, abt grn gy red liths, mod hd, pr vis por
12	1695.5	31		Sst	M grn gy	M-C	N	Sst: m grn gy, vf-c, dom m-c, sa-sr, m srt, wk sil cmt, abt wh arg mtx, abt grn gy red liths, mod hd, pr vis por
11	1696.5	20	Eval	Sst	M grn gy	M-C	N	Sst: m grn gy, vf-c, dom m-c, sa-sr, m srt, wk sil cmt, abt wh arg mtx, abt grn gy red liths, mod hd, pr vis por

SANTOS LIMITED

SIDEWALL CORE DESCRIPTION

WELL: Fenton Creek-1 **DATE:** 5-4-97 **PAGE:** 3 of 3

GUN NO.: 1 **SHOTS FIRED:** 24 **SHOTS BOUGHT:** 45 of 48

GEOLOGIST: David Horner

CORE NO.	DEPTH	REC. Mm	PALYN. EVAL. REJECT	LITH.	COLOUR	GRAIN SIZE	HYDR. INDIC. (Y/N)	SUPPLEMENTARY INFORMATION
10	1705	26		Sst	M grn gy	M	N	Sst: m grn gy, vf-c, dom m, sa-sr, m srt, wk sil cmt, abt wh arg mtx, abt grn gy red liths, mod hd, pr vis por
9	1730	29	Eval	Sst	M grn gy	M	N	Sst: m grn gy, vf-c, dom m, sa-sr, m srt, wk sil cmt, abt wh arg mtx, abt grn gy red liths, mod hd, pr vis por
8	1737	33		Sst	M grn gy	M	N	Sst: m grn gy, vf-c, dom m, sa-sr, m srt, wk sil cmt, abt wh arg mtx, abt grn gy red liths, mod hd, pr vis por
7	1739.5	33	Eval	Sst	M grn gy	M	N	Sst: m grn gy, vf-c, dom m, sa-sr, m srt, wk sil cmt, abt wh arg mtx, abt grn gy red liths, mod hd, pr vis por
6	1742	20		Sst	M grn gy	F	N	Sst: m grn gy, vf-f, dom f, sa, m srt, wk sil cmt, aby arg & slt mtx - mtx supp, tr bk carb mat, com mmic, fri, v pr por
5	1773.5	23		Sst	M grn gy	Vf	N	Sst: m grn gy, vf, v arg & slty, com mmic, sft, sl sbfis
4	1790.5	27		Sltst	M grn gy		N	Sltst: m grn gy, v arg, com mmic, frm, sbfis
3	1796	28	Eval	Sst	M grn	F-m	N	Sst: m grn, vf-c, dom f-m, sa, pr srt, wk sil cmt, abt gy grn red liths, mod hd, pr vis por.
2	1810	36		Sst	V lt gy	Slt-vf	N	Sst: v lt gy, slty-f, dom vf, sbang, w srt, wk sil cmt, com wh arg mtx, fri, pr por
1	1824.5	35		Sst	Lt grn	M	N	Sst: lt grn, m, sa-sr, m srt, wk sil cmt, abt wh arg mtx, fri, pr vis por

COMMENTS:
SWC-15 (1667m) has strong hydrocarbon odour, poor-fair visible porosity - though difficult to tell after mashing from swc impact.

APPENDIX II: HYDROCARBON SHOW REPORTS

SANTOS LIMITED

OIL SHOW EVALUATION REPORT

WELL: Fenton Creek-1

DEPTH: Top: 1658m

DEPTH: Bottom: 1662m

GEOLOGIST: David Horner

DATE: 3-04-97

C1 ppm	5k	10k	20k	30k	40k	50k	100k	150k	200k	>250k
C2+ ppm	500	750	1k	2k	3k	4k	5k	7.5k	10k	>15k
Porosity Ø	tight			poor		fair		good		
% with fluorescence	trace	10	20	30	40	50	60	70	80	>90
Fluorescence appearance	trace		spotted			streaked		patchy		solid
Brightness of fluorescence	v. dull		dull		dim			bright	v. bright	glowing
Type of cut	trace	v. slow crush cut	crush cut	instant crush cut	v. slow streaming cut	slow stream	moderate streaming	streaming	fast streaming	instant
Residue on spot plate	trace	heavy trace	v. thin ring	thin ring	thick ring	v. thick ring	thin film	thin film	thick film	solid
Show rating	trace		poor		Fair		good			
Comments:										

APPENDIX III: WIRELINE LOGGING REPORTS

APPENDIX III(a): LOGGING ORDER FORM

Santos

A.C.N. 007 550 923

REVISION 1.0
(DATE: 22/11/96)

LOGGING ORDER

COMPANY:	BPB		
WELL:	Fenton Creek-1	**FIELD:**	WCNF
RIG:	ODE-30	**STATE:**	Victoria
LOCATION:	Otway Basin, Victoria	**BLOCK:**	PEP 108
LATITUDE:	38 deg 30' 48.81"	**LONGITUDE:**	142 deg 56' 00.34"
ELEVATIONS:	**GL**: 82.2m	**RT**: 86.9m	**DF**:
12.25" HOLE:	417m	**9.625" CSG:**	Surf-399m **WT**: 36 lb/ft
8.5" HOLE:	1840m	**9.625"CSG:**	399-415 **WT**: 47 lb/ft
TD (Drlr.):	1840m	**TD (Logr.):**	1835m
MUD SYSTEM:	KCl/PHPA/Polymer	**CIRCULATION STOPPED:** 1400 **HRS ON** 4-04-97	

WT: 9.3 **VISC**: 38 **PV/YP**: 7/13 **PH**: 8.4 **FLUID LOSS**: 6.8 **CHL**: 18000

GEOLOGIST: David Horner

INFORMATION GIVEN ABOVE IS TO BE USED ON LOG HEADING SHEETS.

HOLE CONDITIONS: (TIGHT SPOTS, DEVIATION, COALS, BARITE IN MUD, ETC)
Hole condition good, possible washouts in Belfast Mudstone 1410-1550m. Most of hole deviation <1 deg, bottom 3.5 deg. Expect possible differential cable sticking with RFS tool.

DRILL STEM TESTS/CORED INTERVALS:

To this stage, no cores cut or DST's run

COMMENTS: (TO BE INCLUDED IN REMARKS SECTION ON HEADER SHEET)

LOGS:

PROGRAM CONFIRMED WITH OPERATIONS GEOLOGIST AT 0740 HOURS ON 4-04-97.
PROGRAM VARIES FROM PRE-SPUD **YES:** ☐ **NO:** ☐
NOTES:

LOG	INTERVAL	REPEAT SECTION
GR	1840-surface	1605-1545
DLL-SP-CAL-SONIC	1840-415	1605-1545
MSFL-ML	1840-1290	1605-1545
LDL-CNL-GR-CAL	1840-1350	1605-1545
RFS-D	21 Points	
SCG	48	

REMARKS:

(ALL OPERATIONS ARE TO CONFORM TO CURRENT SCHLUMBERGER AND SANTOS OPERATING PROCEDURES)

1. TENSION CURVE - TO BE DISPLAYED ON LOG FROM T.D. TO CASING SHOE.
2. ALL CALIBRATIONS IN CASING MUST BE VERSUS DEPTH. (IF HOLE CONDITIONS PERMIT).
3. SONIC WAVEFORMS TO BE RECORDED OVER ENTIRE PERMIAN SECTION.
4. ALL ZONES OF SONIC CYCLE SKIPPING OR POOR QUALITY DATA TO BE REPEATED AND NOTED IN REMARKS SECTION. (EXCEPT ABOVE CADNA-OWIE FM. IF HOLE CONDITION IS POOR).
5. REPEAT SECTION NOT TO BE RUN IN 6" HOLES, COMPARE DOWN LOG FOR REPEAT ANALYSIS.
6. REPEAT SECTION TO BE LOGGED PRIOR TO MAIN LOG OVER INTERVAL OF INTEREST. (IF HOLE CONDITIONS ALLOW). CONFIRM REPEAT SECTION INTERVAL WITH OPERATIONS GEOLOGIST.
7. ALL THERMOMETER READINGS TO BE RECORDED ON LOG.
8. ALL SCALES AND PRESENTATIONS TO CONFIRM TO STANDARDS UNLESS OTHERWISE ADVISED.

9. THE FIELD/EDIT TAPE MUST BE A MERGED COPY OF ALL LOGS RUN. SEPARATE TAPES ARE ONLY ACCEPTABLE AS AN INTERIM MEASURE.

10. ANY CHANGE FROM STANDARD PROCEDURES/SCALES TO BE NOTED IN REMARKS SECTION.

11. RM, RMF, RMC AND BHT MUST BE ANNOTATED ON FAXED LOGS. FAXED LOGS SHOULD ALSO INDICATE IF ON DEPTH OR NOT.

12. LOG DATA IS TO BE TRANSMITTED AS SOON AS POSSIBLE AFTER ACQUISITION. IF ANY DELAYS ARE LIKELY OR IF DATA TRANSMISSION WILL ADVERSELY EFFECT THE OPERATION THEN THE OPERATIONS GEOLOGIST MUST BE IMMEDIATELY INFORMED.

13. THE OPERATIONS GEOLOGIST MUST BE INFORMED IMMEDIATELY OF ANY TOOL OR HOLE PROBLEMS, LOST TIME OR ANY OTHER EVENT WHICH MAY AFFECT THE LOGGING OPERATIONS.

APPENDIX III(b): FIELD ELECTRIC LOG REPORT

SANTOS LIMITED

FIELD ELECTRIC LOG REPORT

WELL:	Fenton Creek-1	**GEOLOGIST:**	David Horner
LOGGING ENGINEER:	T. Power / R. Tench		
RUN NO.:	1	**DATE LOGGED:**	4-5/4/97
DRILLERS DEPTH:	1840.0 m	**LOGGERS DEPTH:**	1835.0 m
ARRIVED ON SITE:	-		
ACTUAL LOG TIME:	18.5hrs	**LOST TIME LOGGER:**	3.5hrs
TOTAL TIME:	28hrs	**LOST TIME OTHER:**	0.5hrs

TYPE OF LOG	DFE/BCA	PDS	RFS-D	SCG			
TIME CIRC. STOPPED	1400hrs	1400hrs	1400hrs	1400hrs			
TIME TOOL RIG UP	1840hrs	0400hrs	0900hrs	1800hrs			
TIME TOOL RIH	1910hrs	0430hrs	1020hrs	1815hrs			
TIME TOOL RIG DOWN	0330hrs	0830hrs	1715hrs	2145hrs			
TOTAL TIME	8.8 hrs	5.5 hrs	9.0 hrs	3.75 hrs			

TYPE OF LOG	FROM	TO	REPEAT SECTION	TIME SINCE LAST CIRCULATION	BHT
GR	1835	0	1605 - 1545	10 hours	65 C
DLL-GR-SP-CAL-SONIC	1835	415	1605 - 1545	10 hours	65 C
MSFL-ML	1835	1290	1605 - 1545	10 hours	65 C
LDL-CNL-GR-CAL	1835	1350	1605-1545	16.5 hours	66 C
RFT-D	25 points	-	-	24 hours	-
SCG	Shot 48	Rec 45	-	33 hours	-

MUD SYSTEM: KCl / PHPA / Polymer WEIGHT: 9.3

HOLE CONDITIONS: Good. PDS hit ledge on RIH at 1550m, passed on first retry. RFS cable sticking (differential), up to 2400 lbs overpull to free tool, degree of overpull dependant upon time tool was seated. No problems with CST.

REMARKS / RECOMMENDATIONS

Due to sticking of cable, maximum considered safe time for RFS to be seated was assessed to be 30 minutes, flow times hence were reduced to tool being set for no more than 30 minutes.

WELLSITE LOG QUALITY CONTROL CHECKS

LOG ORDER FORM	Y	MUD SAMPLE RESISTIVITY	Y	TOOL NO. / CODE CHECK	N
OFFSET WELL DATA	Y	CABLE DATA CARD	N	LOG SEQUENCE CONFIRM.	Y

LOG TYPE	SLS	GR	CAL	DLL	MSFL	LDL	CNL	ML	CST	RFT	REMARKS
CASING CHECK	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	
SCALE CHECK	Y	Y	Y	Y	Y	Y	Y	Y	-	-	
DEPTH Casing Total	Y	Y	Y	Y	Y	Y	Y	Y	-	-	
CALIBRATIONS OK	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	
REPEATABILITY	Y	Y	Y	Y	Y	Y	Y	Y	-	-	
LOGGING SPEED m/min	9	9	9	9	9	5.5	5.5	9	-	-	
OFFSET WELL Repeatability	Y	Y	Y	Y	Y	Y	Y	Y	-	-	
NOISY / MISSING DATA	N	N	N	N	N	N	N	N	-	-	
CURVES/LOGS Depth Matched	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Rm MEASUREMENT	Y	Y	Y	Y	Y	Y	Y	Y	-	-	
LLS / LLD / CHECK											
PERF / RHOB CHECK											
LOG HEADER / TAIL	Y	Y	Y	Y	Y	Y	Y	Y	-	Y	
PRINT/FILM QUALITY	G	G	G	G	G	G	G	G	-	G	

COMMENTS: BFE/BCA initially checked OK at surface, RIH to 382m on log down before comms failure, changed comms package in unit, still inoperative, POOH, cut 100m off cable, checked all junction interfaces, checked DFE bridal, picked up tool, surface checks were good, continued DFE/BCA run without problem. Remainder of logging run problem free.

ENGINEERS COMMENTS (If this report has not been discussed with the Engineer state reason).

APPENDIX IV: LOG EVALUATION

FENTON CREEK 1

LOG ANALYSIS

Prepared By: A. Buffin
Approved By: L. Finlayson
Date: July, 1997

FENTON CREEK 1

LOG ANALYSIS

Fenton Creek 1 is located in the PEP 108 licence (Onshore Otway Basin), 5km SW of the township of Timboon and 2km NNE of the successful Mylor 1 well gas discovery.

Fenton Creek 1 was drilled as a gas exploration well, the Cretaceous Waarre Sandstone represented the primary target and the underlying Eumeralla Formation the secondary target.

DST #1 over a high gas show in the Eumeralla flowed gas at RTSTM whilst DST #2 in the mid Waarre Unit 'C' sand flowed gas at 6.0 MMCFD with 43 BCPD.

Log analysis over the interval 1530m -1750m identified 34.5m of pay in the Waarre 'C'unit. The well was cased and suspended as a successful Waarre gas well.

Logs Run

Logs were recorded by BPB, log quality was very good, the logging job ran smoothly with no lost time.

LOGS	RUN	INTERVAL (m)	REMARKS
GR-	1/1	1835-surface	BHT 63 C
DLS		1835-414.7	Dual laterolog
MRS		1835-414.7	Microlog
CSS		1835-414.7	Sonic
PDS-	2/1	1835-1350	BHT 66 C
CNS		1835-1350	Density-Neutron
RFS	3/1	1703-1526	25 points 2 samples

Drill Stem Tests

DST	INTERVAL (m)	FORMATION	RESULTS
1	1649-1714	Eumeralla	GTS @ RTSTM
2	1574-1584	Waarre	GTS @ 6.0 MMCFD with 43 BCPD

Drilling Overview

A 12 1/4" surface hole was drilled to 417m and casing was set at 415m. An 8 1/2" production hole was drilled to 1840m (drillers depth) without any significant problems. Hole conditions were very good.

Bore Hole Fluids

Mud Type:	KCl-PhPa
MW:	9.3 lb/gal
Rm:	0.232 Ωm @ 20C
Rmf:	0.236 Ωm @ 20C
Rmc:	0.439 Ωm @ 20C

ENVIRONMENTAL CORRECTIONS

Environmental corrections were applied as necessary to the logging measurements using Mincom's Geolog programme.

INTERPTETATION PROCEDURES AND PARAMETERS

An interpretation was made using a density-neutron derived Vshale and a hydrocarbon corrected density porosity model. Water saturations were calculated using the Simandoux equation. The parameters used for the interpretation are detailed below:

PARAMETERS	WAARRE	EUMERALLA
Rw @ 75°F	0.5 Ωm	0.5 Ωm
a	1	1
m	1.77	1.77
n	1.64	1.64
Rt_Sh	8 Ωm	8 Ωm
GRmin	35 API	50 API
GRmax	150 API	90 API
Vshale	DN	DN
Porosity	Density (HC corr)	Density
Saturation	Simandoux	Simandoux
Cut-offs		
Vshale	.35	.35
Porosity	.1	.1
Saturation	.55	.55

Formation water resistivities (Rw) derived from a Pickett plot and are inline with those provided by Cultus.

Shale resisitivities *(Rt_Sh)*, gamma ray maximum *(GRmax)* and minimum *(GR Min)* were defined from the logs and the m, n, and a values were assumed to be similar to those derived from core analysis at Mylor 1.

CONCLUSIONS

1. High gas readings were observed on the mudlog throughout the Waarre Sandstone and Eumeralla Formations.

2. Log analysis throughout the Eumeralla Formation was affected by the high volcano-lithic content of the sediments, there was difficulty identifying the sandstone units noted on the mudlog and a lack of gas cross-over on the neutron - density logs opposite mudlog gas readings. Due to the complex nature of the Eumeralla Formation a deterministic log analysis resulted in questionable results and a DST was performed over a zone exhibiting the highest mudlog gas reading. Gas flowed at RTSTM.

3. Oil recovered from the RFS sample chamber within the uppermost Eumeralla Formation was interpreted to be from a thin non-economic oil rim.

4. Log analysis over the Waarre Unit 'C' identified 34.5m of net pay down to a GWC at 1592m KB (-1529m sub-sea). DST #2 confirmed that the reservoir exhibited good deliverability.

5. The well was cased and suspended.

PE600631

This is an enclosure indicator page.
The enclosure PE600631 is enclosed within the container PE900817 at this location in this document.

The enclosure PE600631 has the following characteristics:

ITEM_BARCODE	= PE600631
CONTAINER_BARCODE	= PE900817
NAME	= Well Evaluation Summary
BASIN	= OTWAY
PERMIT	= PEP 108
TYPE	= WELL
SUBTYPE	= WELL_LOG
DESCRIPTION	= Well Evaluation Summary (enclosure from WCR) for Fenton Creek-1
REMARKS	=
DATE_CREATED	= 30/06/97
DATE_RECEIVED	= 12/10/97
W_NO	= W1192
WELL_NAME	= Fenton Creek-1
CONTRACTOR	= Santos Limited
CLIENT_OP_CO	= Santos

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX V: PRESSURE SURVEY

SANTOS LIMITED

PRESSURE SURVEY

WELL: Fenton Creek-1 R.T.: 86.9 m TOOL AND GAUGE TYPE: RFS-D / HP PAGE: 1 of 2

WITNESS: D. Horner TIME SINCE LAST CIRC.: 21 hours PROBE / PACKER TYPE: D/D DATE: 5-4-97

TEST	FORMATION UNIT SANDS	DEPTH K.B.	DEPTH S.S.	EXPECT. FORM PRESS.	EXPECT. TEMP.	FILE NO.	TEST RESULTS						INTERPRETATION		COMMENTS (FLUID TYPE)
							HYDR. BEFORE	FORM. PRESS	HYDR. AFTER	TEMP.	DRAW D. MOBILITY	TYPE D/D	TYPE BUILDUP	DEPLET -S/C	
		M	M	PSIG	°F/P°C		PSI__	PSI__	PSI__	°F/°C	MD/CP				
1	Belfast	1526.5	1439.6			1	2463.2	2176.9	2463.3	59.05	-	norm	Instant		High perm
2	Waarre	1553.5	1466.6			2	2506.3	2171.6	2506.9	59.05	-	norm	Instant		High perm
3	Waarre	1554.5	1467.6			3	2508.9	2171.6	2508.5	59.54	-	norm	Instant		High perm
4	Waarre	1560.0	1473.1			4	2517.0	2201.3	2517.2	59.56	-	norm	Slow		Super charged
5	Waarre	1563.5	1476.6			5	2522.5	2172.9	2522.8	60.03	-	norm	Good		
6	Waarre	1570.0	1483.1			6	2533.3	2174.0	2533.5	60.03	-	norm	Rapid		
7	Waarre	1576.5	1489.6			7	2543.7	2183.8	2544.2	60.52	-	norm	Slow		
8	Waarre	1580.0	1493.1			8	2549.2	2193.3	2549.6	60.52	-	norm	Good		Supercharged
9	Waarre	1587.5	1500.6			9	2561.5	2177.2	2561.7	61.01	-	norm	Instant		High perm
10	Waarre	1590.0	1503.1			10	2565.6	2177.7	2565.8	61.01	-	norm	Rapid		
11	Waarre	1593.0	1506.1			11	2570.2	2197.4	2570.2	61.50	-	norm	Rapid		
11RR	Waarre	1593.0	1506.1			11	2570.2	2179.5	2570.7	61.50	-	norm	Rapid		
12	Waarre	1598.5	1511.6			12	2579.1	2187.2	2579.4	61.5	-	norm	Instant		
13	Waarre	1611.0	1524.1			13	2599.1	2400	2599.0	62.0	-	-	-		Lost seal

SANTOS LIMITED

PRESSURE SURVEY

WELL:	Fenton Creek-1	R.T.:	86.9 m	TOOL AND GAUGE TYPE:	RFS-D / HP	PAGE:	1 of 2
WITNESS:	D. Horner	TIME SINCE LAST CIRC.:	21 hours	PROBE / PACKER TYPE:	D/D	DATE:	5-4-97

TEST	FORMATION UNIT SANDS	DEPTH K.B.	DEPTH S.S.	EXPECT. FORM PRESS.	EXPECT. TEMP.	FILE NO.	TEST RESULTS						INTERPRETATION		COMMENTS (FLUID TYPE)
							HYDR. BEFORE	FORM. PRESS	HYDR. AFTER	TEMP.	DRAW D. MOBILITY	TYPE D/D	TYPE BUILDUP	DEPLET -S/C	
		M	M	PSIG	°F/P°C		PSI_	PSI_	PSI_	°F/°C	MD/CP				
13RR	Waarre	1611.0	1524.1			13RR	2599.1	2205.2	2599.6	62.0	-	norm	Instant		
14	Waarre	1625.5	1538.6			14	2622.2	2225.8	2622.6	62.5	-	norm	Instant		
15	Waarre	1643.0	1556.1			15	2649.9	2250.5	2650.4	62.9	-	norm	Instant		
16	Waarre	1662.0	1575.1			16	2680.2	2295.9	2680.8	63.5	-	norm	Very slow		Sample (large)
17	Waarre	1665.0	1578.1			17	2683.7	2284.8	-	63.9	-	norm	Good		Sample (small)
18	Eumeralla	1694.0	1607.1			18	2731.5	233.4	-	64.4	-	norm	-		Delay in hydrostatic
18RR	Eumeralla	1694.0	1607.1			18	2731.5	-	2732.4	64.4	-	-	-		
19	Eumeralla	1739.0	1652.1			19	2802.5	2635.0	2803.4	65.4	-	norm	Slow		
20	Eumeralla	1788.0	1701.1			20	2881.3	2544.8	2282.0	66.4	-	norm	Slow		
21	Eumeralla	1699.0	1612.1			21	2739.8	-	2739.8	66.5	-	norm	Slow		Tight
22	Eumeralla	1703.0	1616.1			22	2746.0	-	2746.1	65.9	-	-	-		No seal
23	Eumeralla	1702.5	1615.6			23	2744.6	-	2745.2	65.8	-	-	-		No seal
24	Eumeralla	1702.0	1615.1			24	2744.8	-	2744.9	65.7	-	-	-		No seal
25	Eumeralla	1693.5	1606.6			25	2731.3	-	2731.2	65.4	-	-	-		No seal

ANTICIPATED GEOTHERMAL GRADIENT: 30 degrees C/ 1000m

ANTICIPATED WATER GRADIENT: 8.4 lb/gal eq.

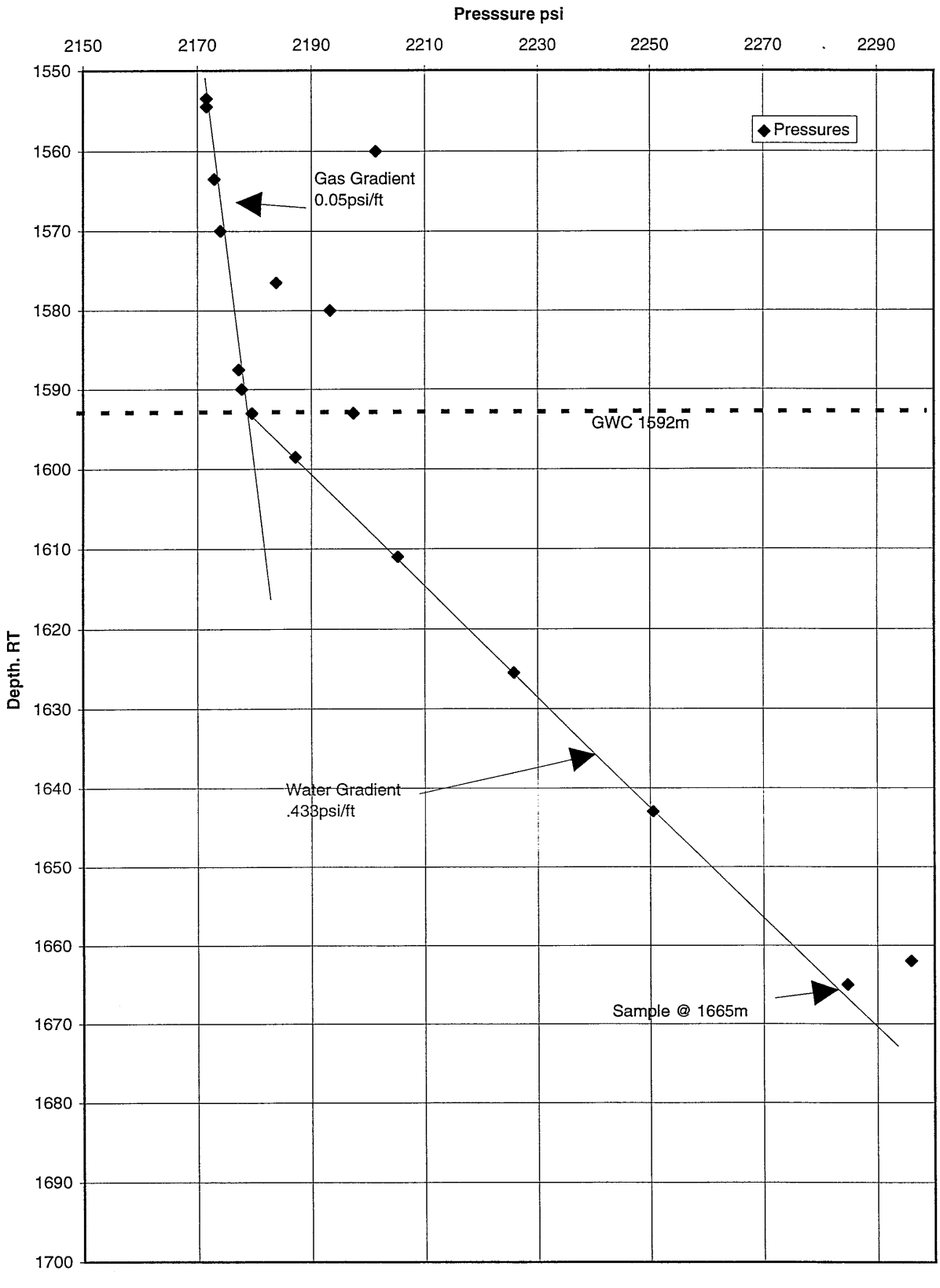
MUD WEIGHT / GRADIENT: 9.3 lb/gal

DRAWDOWN NORMAL : PRESSURE DOES NOT DROP TO ZERO

LIMITED : PRESSURE DROPS TO ZERO

BUILD UP TYPES : IMMEDIATE - RAPID - GOOD - SLOW

Fenton Creek 1 RFT Pressure Plot



APPENDIX VI: DRILL STEM TEST DATA

Santos

A.C.N. 007 550 923

DRILL STEM TEST REPORT No.1

WELL:	Fenton Creek-1	**DST NO: 1**		**DATE:**	6-04-97
INTERVAL:	1699 - 1714m	**FORMATION:**		Eumeralla	
TEST TYPE:	IS	**Separator:**	Yes	**Type:**	3 phase
CUSHION:	No	**Rmf:**	0.22 at 64 C		
		Rw:	5.7 at 63 C		
GEOLOGIST:	David Horner	**Tracer:**	No		

REMARKS

ELAPSED TIME (MIN)	REMARKS/ PRESSURES	ELAPSED TIME (MIN)	REMARKS/ PRESSURES	ELAPSED TIME (MIN)	REMARKS/ PRESSURES
0	Tool opened	63	3		
1	5	68	2		
2	10	73	1		
3	15	78	0 lazy flare		
4	17	90	0 lazy flare		
5	18	120	0 lazy flare		
6	19 Tool closed	150	0 lazy flare		
20	GTS	180	0 lazy flare		
45	9 Tool opened	210	0 lazy flare		
51	8	227	Lazy flare close tool		
53	7	447	Pull packers		
58	5	470	Reverse out.		

SURFACE FLOW SUMMARY

CHOKE SIZE (IN) MANIFOLD	GAS TO SURFACE (MIN)	FLOWING TIME (MIN)	MAXIMUM SURFACE PRESSURE	FINAL GAS RATE (MMCFD)	FINAL LIQUIDS RATE	FIELD GAS ANALYSIS	FIELD LIQUIDS ANALYSIS
0.25"	20	6 182	19 psi	RSTM	-	73/17/8/ 2/trace	-

FIELD DOWNHOLE PRESSURE DATA

		BOTTOM	BOTTOM EMP	TOP EMP	INSIDE	TIMES
DEPTH	M	1699.8	1690.58	1688.75	1687.22	-
INITIAL HYDROSTATIC	Psig	2707.9	2718	2725	2738	-
1ST - INITIAL FLOW	Psig	103.4	81.1	81.5	123	-
1ST - FINAL FLOW	Psig	122.2	93.8	91.5	131.6	6 mins
1ST - CLOSED IN	Psig	903.8	937.5	939.8	931.5	39 mins
2ND - INITIAL FLOW	Psig	75.2	48.1	47.9	90.5	-
2ND - FINAL FLOW	Psig	84.6	81.7	81.6	98.7	182 mins
2ND - CLOSED IN	Psig	611.3	627.6	628.5	652.9	180 mins
FINAL HYDROSTATIC	Psig	2678.9	2702.1	2710.4	2714.1	-
TEMPERATURE	m	-	149.13F	149.13F	-	-

WELL: Fenton Creek-1 **DST NO:** 1 **DATE:** 6-4-97

RECOVERY

REVERSE CIRCULATED	Y
PULLED	

RECOVERY: 1 bbl rathole mud with trace condensate.

SAMPLE DATA

GAS/CONDENSATE

SAMPLE NO	BOMB NO	TYPE	SOURCE	PRESS/TEMP
1	Amdel #145	Gas	Bubble hose	5 PSI / 10 C
2	Amdel # 218	Gas	Bubble hose	~100 PSI / 10C
3	Amdel # 306	Gas	Bubble hose	~100PSI / 10C

Sample-1 from main flow. Samples-2&3 from reverse circulation.

OIL/CONDENSATE FILTRATE

SAMPLE NO	TYPE	SAMPLE	RMF	TRACER	CL (PPM)
NIL					

WATER

SAMPLE NO	TYPE	RW	REMARKS
4	Rathole mud		Top recovery
5	Rathole mud		0.5 bbl into recovery
6	20ml mud filtrate		
7	20ml make-up water		

REMARKS:

EXPERTEST PTY. LTD.

FIELD READINGS

Customer:	Santos Ltd.	Well Name:	Fenton Creek #1	Formation:	Eumeralla
Perforations:	1699 m - 1714 m	Type Of Test:	DST #1	Operator:	D. Poitras
Date Of Test:	06/04/97	Client Ref. No.:	0	Control No.:	V200304a.97

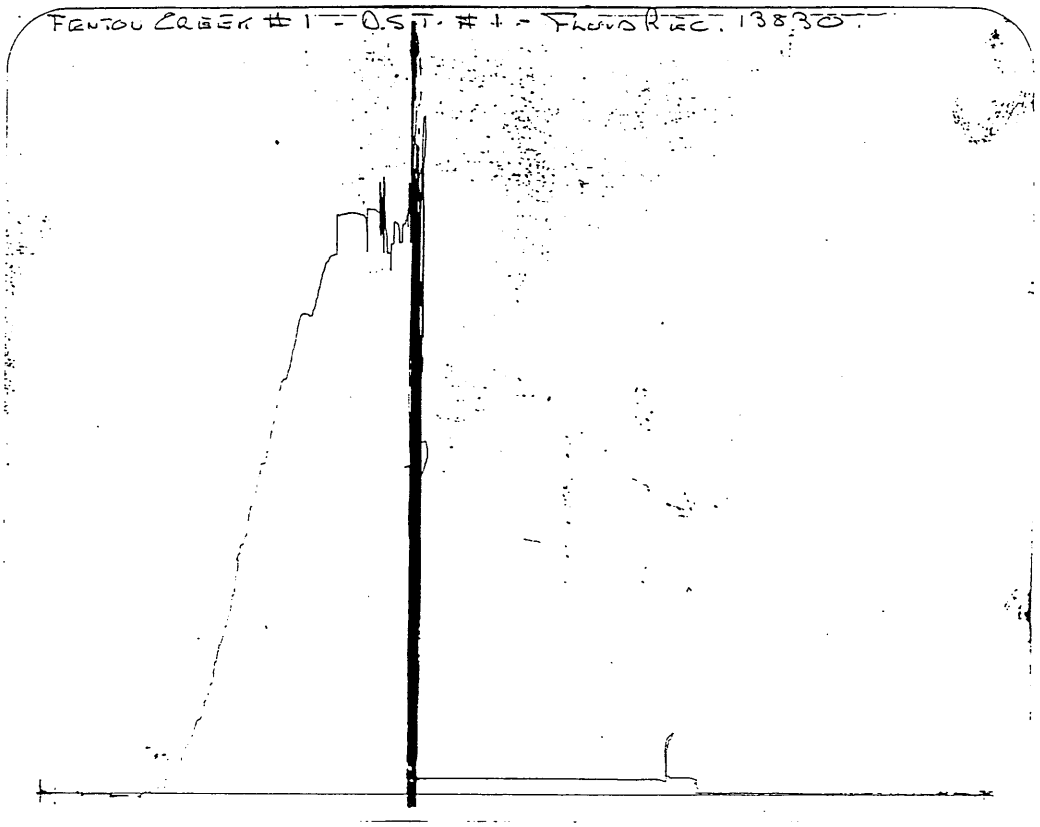
TIME			WELLHEAD DATA							SEPARATOR DATA					LIQUID PRODUCTION				
Date	Time	Elapsed Time (Hours)	Pressures Tubing	Pressures Casing	Units	Well-Head Temp.	Choke Size		BS &W (%)	Orifice Plate (Inch)	Spec. Grav.	Static Pressure	Differential Pressure	Gas Temp	Tnk No	Total Liquid	Oil Dip	Water Dip	Dip Units
6/04/97	2000	0.8000	0		PSI		16	64th			0.76								
6/04/97	2000	0.8000	Small flare.																
6/04/97	2015	1.0500	0		PSI		16	64th			0.76								
6/04/97	2015	1.0500	Hose half way down water bucket.																
6/04/97	2030	1.3000	0		PSI		16	64th			0.76								
6/04/97	2030	1.3000	Hose 1/4 of the way into water bucket. Very small flare.																
6/04/97	2100	1.8000	0		PSI		16	64th			0.76								
6/04/97	2100	1.8000	Very small flare.																
6/04/97	2130	2.3000	0		PSI		16	64th			0.76								
6/04/97	2130	2.3000	No flare, slight blow in water bucket.																
6/04/97	2200	2.8000	0		PSI		16	64th			0.76								
6/04/97	2200	2.8000	No flare, slight blow in water bucket.																
6/04/97	2214	3.0333	0		PSI		16	64th			0.76								
6/04/97	2214	3.0333	No flare, slight blow in bucket. Close test tool for shut in period. End of DST #1.																
6/04/97	2230	3.3000	Secure equipment, leave location.																

EXPERTEST PTY. LTD.

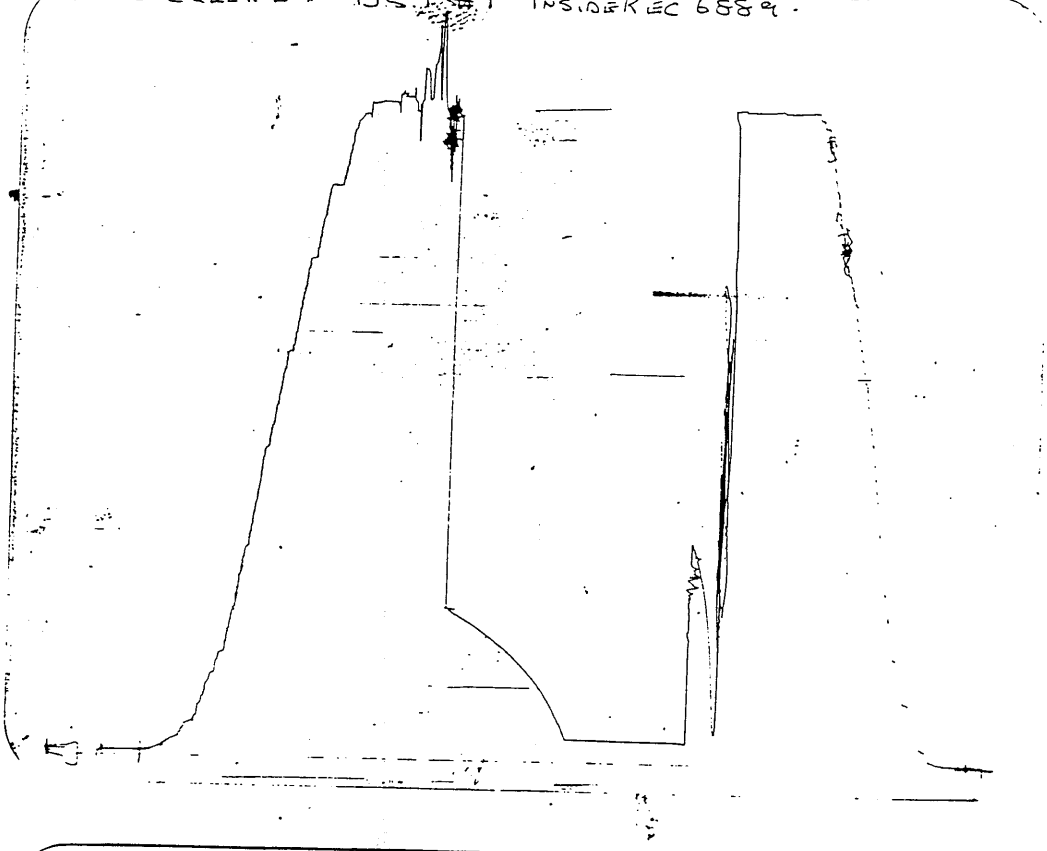
FIELD READINGS

Customer:	Santos Ltd.	Well Name:	Fenton Creek #1	Formation:	Eumeralla
Perforations:	1699 m - 1714 m	Type Of Test:	DST #1	Operator:	D. Poitras
Date Of Test:	06/04/97	Client Ref. No.:	0	Control No.:	V200304a.97

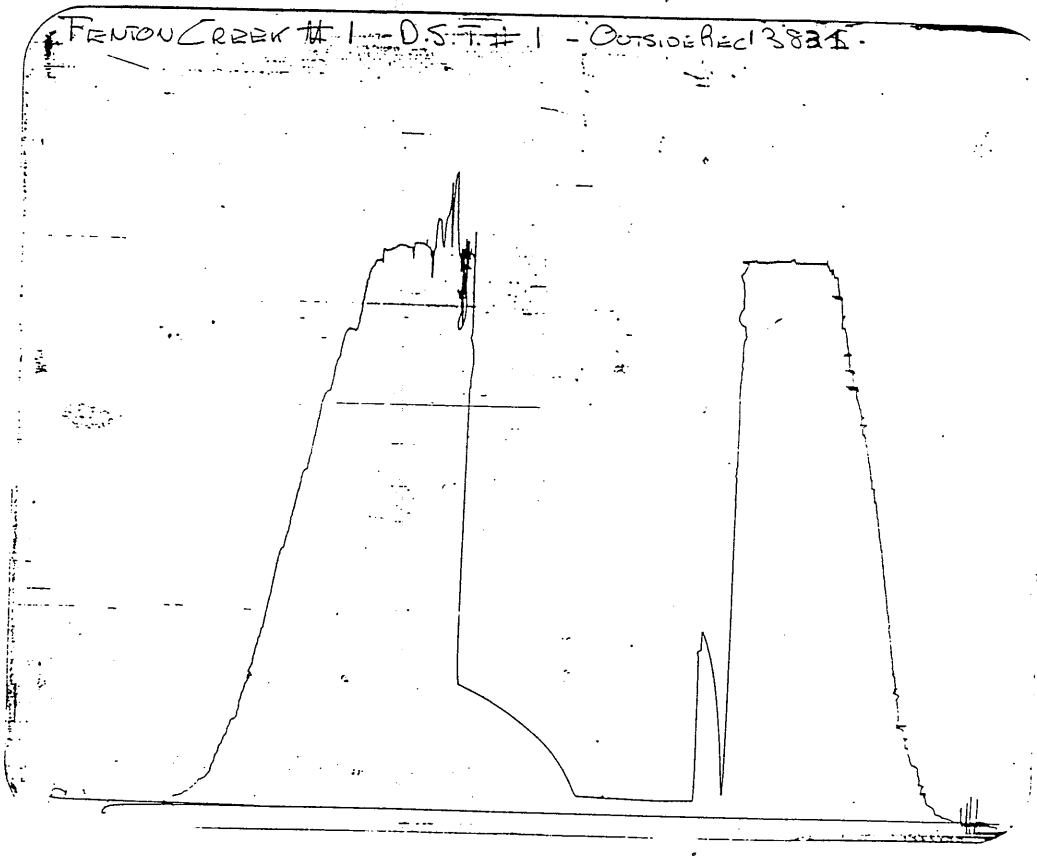
TIME			WELLHEAD DATA						SEPARATOR DATA					LIQUID PRODUCTION				
Date	Time	Elapsed Time (Hours)	Pressures Tubing	Pressures Casing	Pressures Units	Well-Head Temp.	Choke Size	BS &W (%)	Orifice Plate (Inch)	Spec. Grav.	Static Pressure	Differential Pressure	Gas Temp	Tnk No.	Total Liquid	Oil Dip	Water Dip	Dip Units
6/04/97	0700	-12.2000	On stand-by for DST.															
6/04/97	1300	-6.2000	Finish rigging up lines and stand-by for test tool to be opened.															
6/04/97	1744	-1.4667	Inflate packers.															
6/04/97	1820	-0.8667	Set packers to open test tool.															
6/04/97	1827	-0.7500	Test tool opened for five minute pre-flow. Choke closed.															
6/04/97	1828	-0.7333	5		PSI					0.76								
6/04/97	1828	-0.7333	Pressure building, hose to water bucket plugged															
6/04/97	1829	-0.7167	12		PSI					0.76								
6/04/97	1830	-0.7000	14		PSI					0.76								
6/04/97	1831	-0.6833	17		PSI					0.76								
6/04/97	1832	-0.6667	18		PSI					0.76								
6/04/97	1832	-0.6667	Hose to water bucket plugged.															
6/04/97	1833	-0.6500	19		PSI					0.76								
6/04/97	1833	-0.6500	Close test tool for build up period. End of pre-flow.															
6/04/97	1847	-0.4167	19		PSI					0.76								
6/04/97	1847	-0.4167	Open choke to flare, gas to surface. Leave pressure bleed down.															
6/04/97	1903	-0.1500	Set packers to open test tool.															
6/04/97	1912	0.0000	9		PSI		16	64th		0.76								
6/04/97	1912	0.0000	Test tool opened for main flow period on .250 choke. Gas to surface.															
6/04/97	1914	0.0333	10		PSI		16	64th		0.76								
6/04/97	1915	0.0500	10		PSI		16	64th		0.76								
6/04/97	1918	0.1000	8		PSI		16	64th		0.76								
6/04/97	1920	0.1333	7		PSI		16	64th		0.76								
6/04/97	1925	0.2167	5		PSI		16	64th		0.76								
6/04/97	1930	0.3000	3		PSI		16	64th		0.76								
6/04/97	1935	0.3833	2		PSI		16	64th		0.76								
6/04/97	1945	0.5500	1		PSI		16	64th		0.76								
6/04/97	1950	0.6333	0		PSI		16	64th		0.76								
6/04/97	1950	0.6333	Hose on bottom of bucket, small flare.															


FENTON CREEK #1 - D.S.T. #1 - FLOW REC. 13830'

FENTON CREEK #1 D.S.T. #1 INSIDE REC 6889.



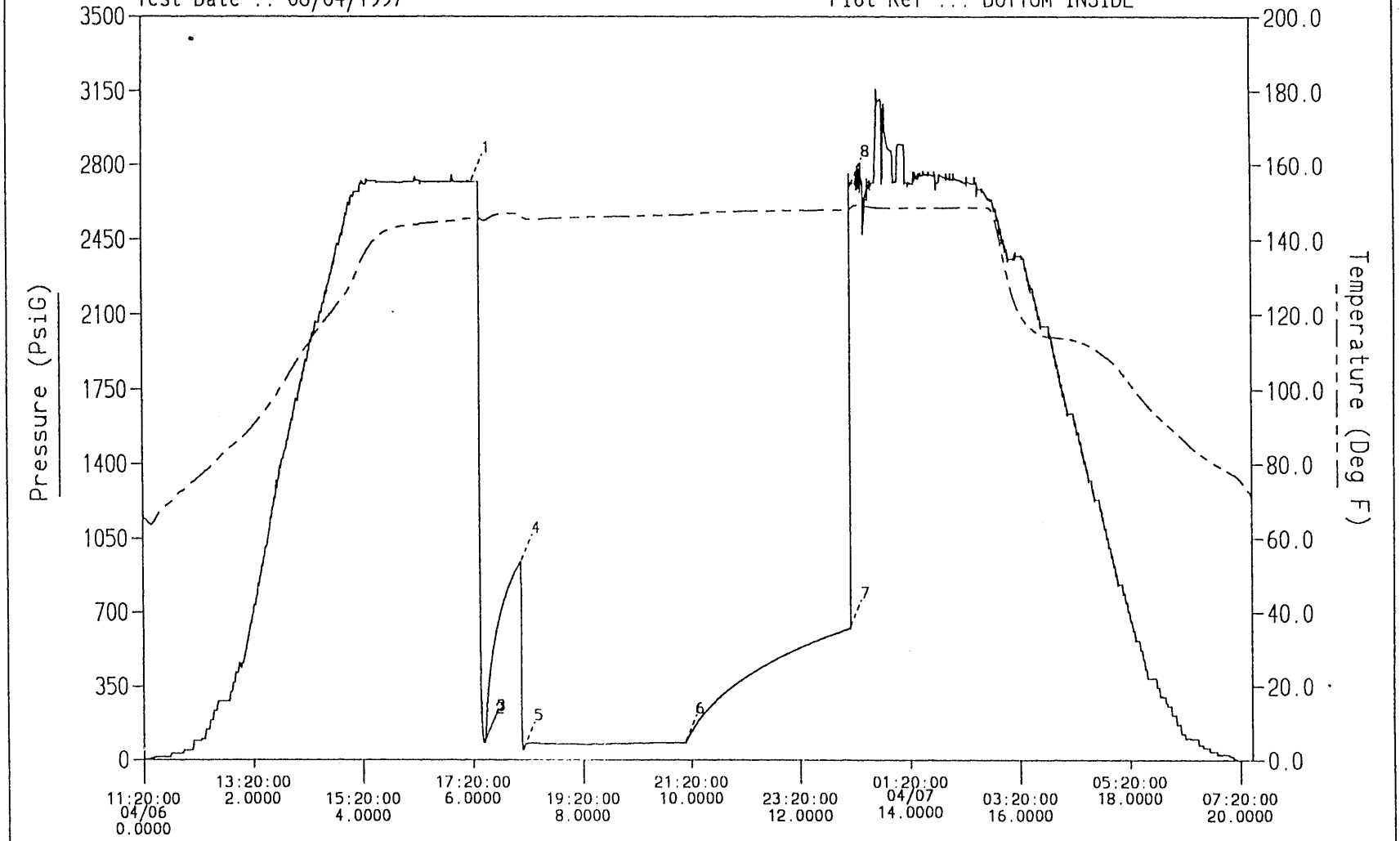
FENTON CREEK #1 - D.S.T. #1 - OUTSIDE REC 13824.



97/04/07
11:14:05

Company .... SANTOS PETROLEUM
Well ..... FENTON CREEK # 1 OTWAY BASIN PERMIT PEP108
Test Date .. 06/04/1997

EMP S/N 080-526
File Ref ... FC1-DST1
Plot Ref ... BOTTOM INSIDE

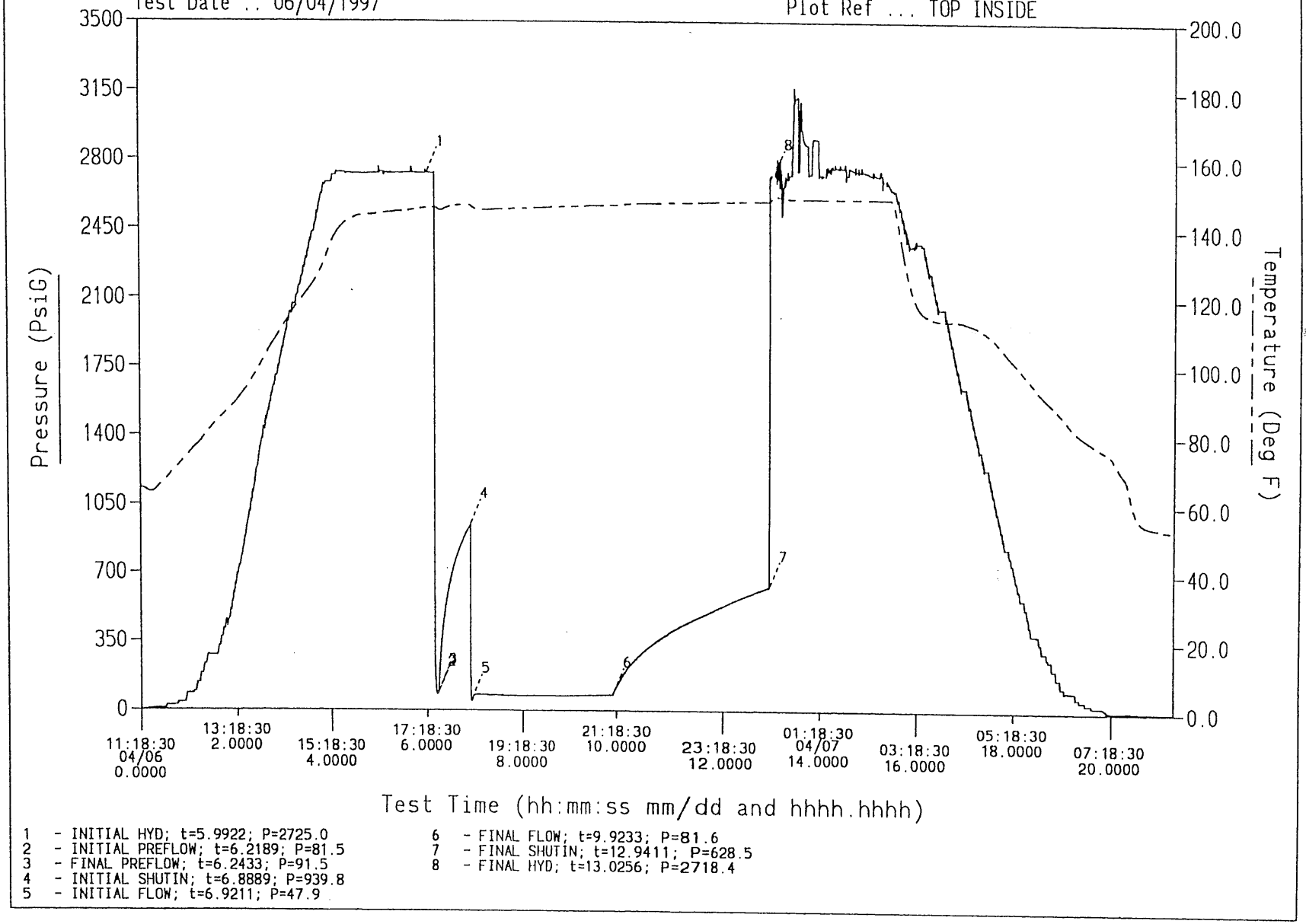


1 - INITIAL HYD; t=6.0011; P=2718.0
2 - INITIAL PREFLOW; t=6.1944; P=81.1
3 - FINAL PREFLOW; t=6.2200; P=93.8
4 - INITIAL SHUTIN; t=6.8656; P=937.5
5 - INITIAL FLOW; t=6.9000; P=48.1
6 - FINAL FLOW; t=9.8756; P=81.7
7 - FINAL SHUTIN; t=12.9044; P=627.6
8 - FINAL HYD; t=12.9489; P=2702.1

97/04/07
10:15:58

Company .... SANTOS PETROLEUM
Well ..... FENTON CREEK # 1 OTWAY BASIN PERMIT PEP 108
Test Date .. 06/04/1997

EMP S/N 080-522
File Ref ... FNC1DST1
Plot Ref ... TOP INSIDE

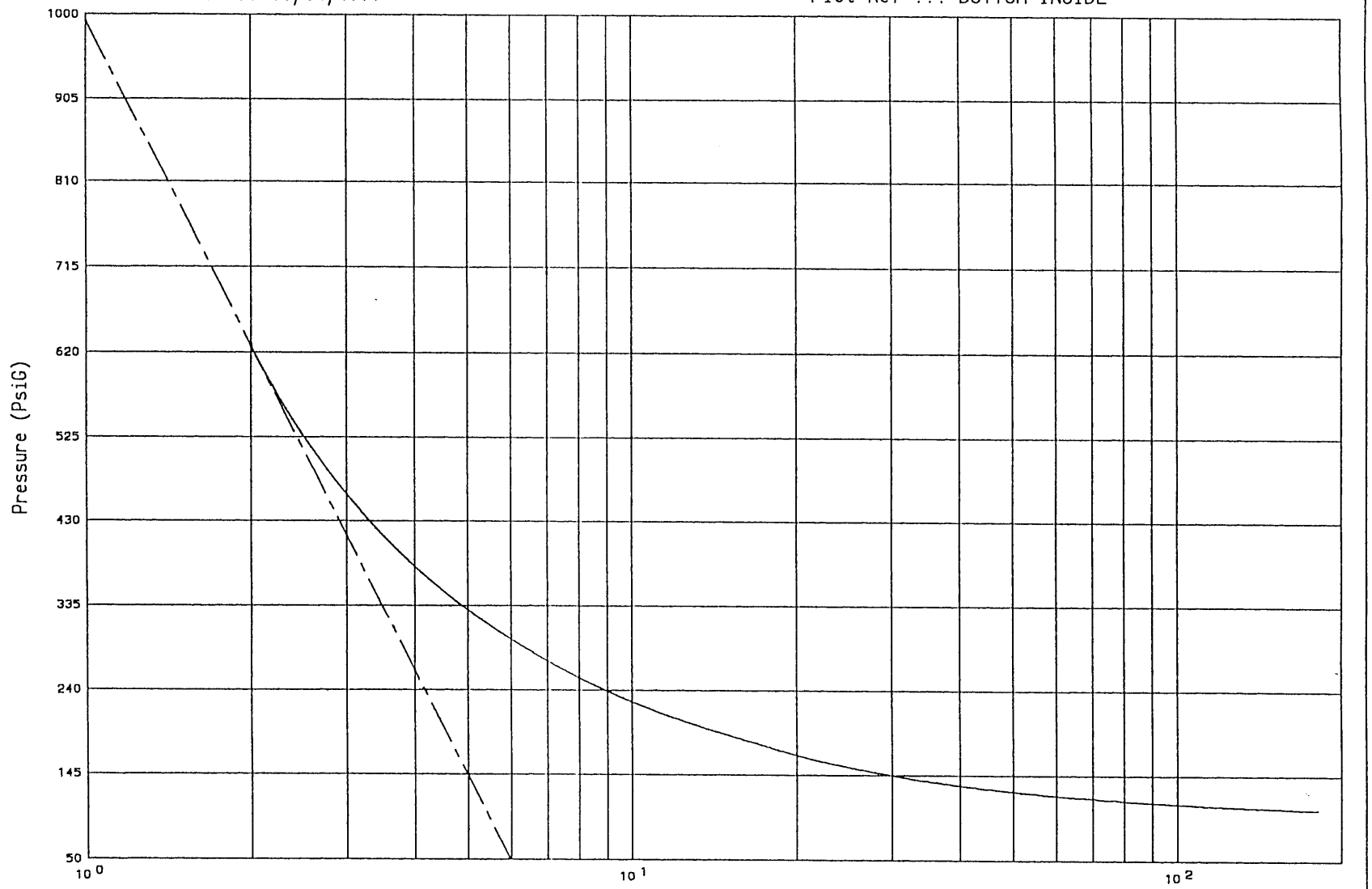


1 - INITIAL HYD; t=5.9922; P=2725.0
2 - INITIAL PREFLOW; t=6.2189; P=81.5
3 - FINAL PREFLOW; t=6.2433; P=91.5
4 - INITIAL SHUTIN; t=6.8889; P=939.8
5 - INITIAL FLOW; t=6.9211; P=47.9
6 - FINAL FLOW; t=9.9233; P=81.6
7 - FINAL SHUTIN; t=12.9411; P=628.5
8 - FINAL HYD; t=13.0256; P=2718.4

97/04/07
10:52:11

Company .... SANTOS PETROLEUM
Well ..... FENTON CREEK # 1 OTWAY BASIN PERMIT PEP108
Test Date .. 06/04/1997

EMP S/N 080-526
File Ref ... FC1-DST1
Plot Ref ... BOTTOM INSIDE



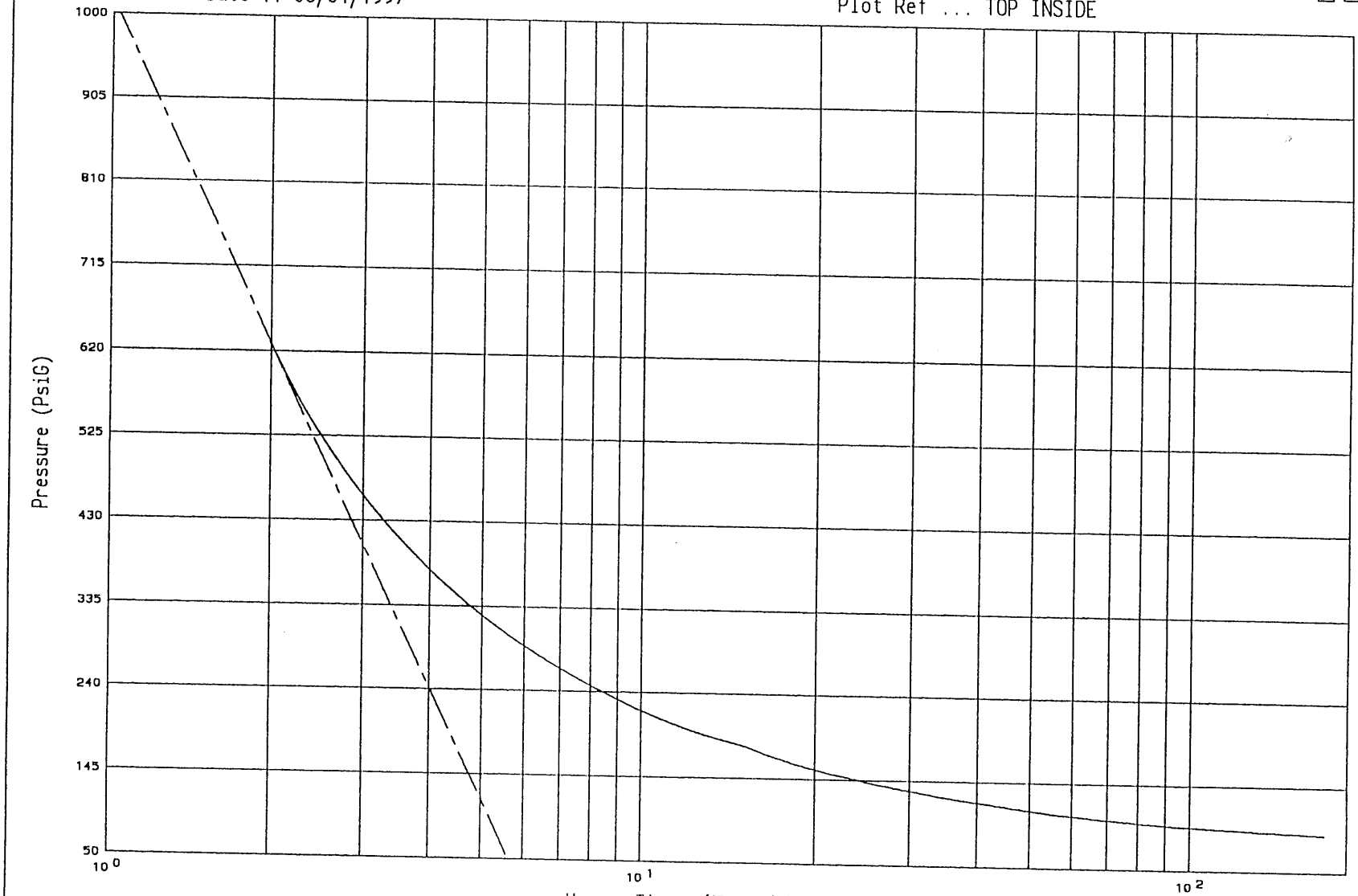
Shut-in Started 97/04/06 21:15:24
Shut-in Ended 97/04/07 00:15:04
Total Flow Time .... 180.1 minute(s)

First Delta-t ..... 1.0 minute(s)
Intercept ..... 992.6 PsiG
Slope ..... 1214.1 PsiG/Cycle

97/04/07
10:19:34

Company .... SANTOS PETROLEUM
Well ..... FENTON CREEK # 1 OTWAY BASIN PERMIT PEP 108
Test Date .. 06/04/1997

EMP S/N 080-522
File Ref ... FNC1DST1
Plot Ref ... TOP INSIDE



Shut-in Started 97/04/06 21:13:54
Shut-in Ended 97/04/07 00:14:34
Total Flow Time .... 180.1 minute(s)

First Delta-t ..... 1.0 minute(s)
Intercept ..... 1015.7 PsiG
Slope ..... 1285.8 PsiG/Cycle

Reversed Out YES

Tool Chased NO

Tester J. SILVESTER / C. McGUINN

Co. Rep. R PICHLMANN

Contractor ODE

Rig No. RIG 30

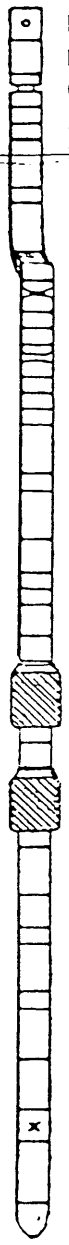
BLOW DESCRIPTION 1st FLOW: WEAK AIR BLOW. 5PSI AFTER 2mins AND 19PSI AT END OF FLOW. BUBBLE HOSE BLOCKED WITH MUD (CLEANED WHEN TOOL SHUT-IN)

BLOW DESCRIPTION 2nd FLOW: STRONG AIR BLOW G.T.S. IMMEDIATELY. WITH 9 PSI. AND DECREASING TO 0PSI IN. 33mins. WITH A LAZY

~~REMARKS~~: FLAME AT END OF FLARE LINE. FLAME WENT OUT 15MINS BEFORE TOOL SHUT-IN.

	LENGTH
TOTAL TOOL TO BOTTOM TOP PACKERS	18-30
INTERVAL TOOL AND DRILL COLLAR	15-27
BOTTOM PACKER + ANCHOR	4.09
TOTAL TOOL	37.66
DRILL COLLAR ANCHOR IN INTERVAL	
TOTAL TOOL TO BOTTOM OF TOP PACKER	18-30
DRILL COLLARS ABOVE TOOLS Stands ~~5 STDS+2 JTS~~	Total 173.47
DRILL PIPE ABOVE TOOLS Stands 50 +PUP	Total 1428.19
H. W. PIPE ABOVE TOOLS Stands 3	Total 83-39
OTHER ABOVE TOOL	Total
TOTAL DRILL COLLARS DRILL PIPE AND TOOLS	1703.35
TOTAL DEPTH	1699
TOTAL DRILL PIPE ABOVE K.B.	4.35m

REMARKS:



	LENGTH
BO SUB	
P.O. SUB	
C.O. SUB	
~~SHUT-IN TOOL~~	
HMV	
JARS	
SAFETY JOINT	
PACKER	
PACKER	
DEPTH	
STUBB	
ANCHOR	
BULLNOSE	
T.D.	

COMPANY SANTOS PETROLEUM STATE VICT. DATE 6/4/97.

Well Name FENTON CREEK #1 KB Elv. 86.3 ft. Ticket No. 182 DST No. 1

Well Location OTWAY BASIN: PEP 108 GR Elv. 82. ft. Formation FLOREALLA

Interval 1699-1714.27 m T.D. 1540 m. ft. Net Pay _____ ft. Type of Test INFLATE. STRADDLE

API Gravity _____ W.S. _____ Average Porosity _____

RECORDER DATA

Mins.		INSIDE	INSIDE	INSIDE	OUTSIDE
PF Rec.#	13830	#6889	#528	#528	#13831
SI Range	3850 lbs.	3200	5600	5000	3825
SF Clock	24 hrs.	24	31	45	24
FS Depth	1681.71 ft.	1687.22	1688.75	1690.58	1699.8
		PSI	PSI	PSI	PSI
A. Init. Hyd.		2738	2725	2718	2707.9
B. First Flow		123	81.5	81.1	103.4
B1 Final Flow		131.6	91.5	93.8	122.2
C. In. Shut-In		931.5	939.8	937.5	903.8
D. Init. Flow		90.5	47.9	48.1	75.2
E. Final Flow		98.7	81.6	81.7	84.6
F. Fl. Shut-in	84.9	652.9	625.5	627.6	611.3
G. Final Hyd.		2714.1	2718.4	2702.1	2678.9
Inside/Outside	FLUID	(IN)	(IN)	(IN)	(OUT)

TIME DATA

PF Fr. 18:27 to 18:33 hr.

IS Fr. 18:33 to 19:12 hr.

SF Fr. 19:12 to 22:14 hr.

FS Fr. 22:14 to 01.14 hr.

T. STARTED 10:30 hr.

T. ON BOTM. 17.53 hr.

T. OPEN 18:27 hr.

T. PULLED 01:14 hr.

T. OUT 09:30

RECOVERY

Total Fluid 173 ft. of 173 ft. in D.C. and _____ ft. in D.P.

173 ft. of RAT HOLE MUD.

_____ ft. of _____

_____ ft. of _____

_____ ft. of _____

TOOL DATA

Tool Wt. _____ lbs.

Wt. Set on Packer 40,000 lbs.

Wt. Pulled Loose 145,000 lbs.

Initial Str. Wt. 108,000 lbs.

Unseated Str. Wt. 110,000 lbs.

Bot. Choke 3/4 in.

Hole Size 8 1/2 in.

D. Col. I.D. 2 15/16 in.

D. Pipe I.D. 3.826 in.

D.C. Leng. 285.68 m ft.

D.P. Leng. 1428.19 m ft.

GAS RECOVERY MEASURED WITH

	Time Mins.	Orifice inches	Pressure PSI	H_2O inches	Rate mcf/d
1.	19:12	1/4"	9		
2.	19:18		8		
3.	19:20		7		
4.	19:25		5		
5.	19:30		3		
6.	19:35		2		
7.	19:40		1		
8.	19:45		0		
9.					
10.					

SURFACE CHOKE SIZE: 1/4

MUD DATA

Mud type KCL PHPA

Weight 9.3

Vis. 36

W.L. 6.5

F.C. 1 in.

Mud Drop 10 BBLS

GENERAL DATA

Amt. of fill _____ ft.

Btm. H. Temp. 149.13 °F

Hole Cond. GOOD

Packer Size 6 3/4 x 66 in.

No. of Packers 2

Cushion Amt. - ft.

Cushion Type -

Reversed Out YES

Tool Chased NO

Tester J. SILVESTER / C. McGUINN

Co. Rep. R. PICHLMANN

Contractor ODE

Rig No. RIG 30

Santos

A.C.N. 007 550 923

DRILL STEM TEST REPORT No2

WELL:	Fenton Creek-1	**DST NO: 2**		**DATE:**	8-04-97
INTERVAL:	1574 - 1584m	**FORMATION:**		Waarre "C"	
TEST TYPE:	IS	**Separator:**	Yes	**Type:**	3 phase
CUSHION:	No	**Rmf:**	0.31 at 74 C		
		Rw:	5.7 at 63 C		
GEOLOGIST:	David Horner	**Tracer:**	No		

REMARKS

ELAPSED TIME (MIN)	REMARKS/ PRESSURES	ELAPSED TIME (MIN)	REMARKS/ PRESSURES	ELAPSED TIME (MIN)	REMARKS/ PRESSURES
0	99 Tool opened	50	815	62	1250
1	290 0.5" choke	51	908	63	1257
2	426 GTS	52	960	67	1264
3	550	53	1005	72	1200
4	680	54	1050	77	1237
5	764	55	1130	92	1243
6	810 Tool closed	56	1150	107	1251
45	Tool open GTS	57	1170	122	1275
46	223	58	1195	137	1263
47	435	59	1220	152	1280
48	590	60	1232	165	1298 Close tool
49	720	61	1240	285	Pull packers

SURFACE FLOW SUMMARY

CHOKE SIZE (IN) MANIFOLD	GAS TO SURFACE (MIN)	FLOWING TIME (MIN)	MAXIMUM SURFACE PRESSURE	FINAL GAS RATE (MMCFD)	FINAL LIQUIDS RATE	FIELD GAS ANALYSIS	FIELD LIQUIDS ANALYSIS
0.5"	2	6	810 psi			91/6/2/	API 71 at
0.5"	Immediate	120	1298 psi	6.0	43 bocd	0.4/trace	60 degC

FIELD DOWNHOLE PRESSURE DATA

		BOTTOM	BOTTOM TEMP	TOP TEMP	INSIDE	TIMES
DEPTH	m	1575.5	1567.4	1565.5	1562.5	-
INITIAL HYDROSTATIC	psig	2524.2	2529.3	2532.9	2578.3	-
1ST - INITIAL FLOW	psig	2150.4	1343.8	1351.1	-	-
1ST - FINAL FLOW	psig	2150.4	1768.8	1755.1	-	6 mins
1ST - CLOSED IN	psig	2150.4	2163.6	2169.0	2179.4	39 mins
2ND - INITIAL FLOW	psig	2150.4	1757.8	1714.0	1540	-
2ND - FINAL FLOW	psig	2150.4	1992.7	1986.7	1948	120 mins
2ND - CLOSED IN	psig	2150.4	2163.3	2167.8	2235.7	134 mins
FINAL HYDROSTATIC	psig	2524.2	2532.0	2538.4	2175	-
TEMPERATURE	F	-	141.78F	141.78F	-	-

WELL: Fenton Creek-1 **DST NO:** 2 **DATE:** 8-4-97

RECOVERY

REVERSE CIRCULATED	Y
PULLED	

RECOVERY: 0.5 bbls condensate

SAMPLE DATA

GAS/CONDENSATE

SAMPLE NO	BOMB NO	TYPE	SOURCE	PRESS/TEMP PSI
1	Amdel # 230	Gas	Separator	355 @ 43C
2	Amdel # 117	Gas	Separator	385 @ 43C
3	Amdel # 316	Condensate	Separator	355 @ 43C
4	Amdel # 206	Condensate	Separator	385 @ 43C
5	Amdel # 246	Gas	Bubble hose	1275 @ 25C

OIL/CONDENSATE FILTRATE

SAMPLE NO	TYPE	SAMPLE	API/RMF	TRACER	CL (PPM)
6	Tin	condensate	71 @ 60C	-	-
7	Tin	condensate	71 @ 60C	-	-

WATER

SAMPLE NO	TYPE	RW	REMARKS
8	Mud filtrate	0.31 at 74C	
9	Make-up water	5.7 at 63C	
10	Condensate cut mud	-	From reverse circulation

REMARKS:
Separator gas samples from meter run, separator condensate samples from liquid line.

EXPERTEST PTY. LTD.

FIELD READINGS

Customer:	Santos Ltd	Well Name:	Fenton Creek #1	Formation:	Waarre "C"
Perforations:	1574 m - 1584 m	Type Of Test:	DST #2	Operator:	D. Poitras
Date Of Test:	08/04/97	Client Ref. No.:	0	Control No.:	V200304b.97

TIME			WELLHEAD DATA						SEPARATOR DATA					LIQUID PRODUCTION				
Date	Time	Elapsed Time (Hours)	Pressures Tubing	Pressures Casing	Pressures Units	Well-Head Temp.	Choke Size	BS &W (%)	Orifice Plate (Inch)	Spec. Grav.	Static Pressure	Differential Pressure	Gas Temp	Tnk No.	Total Liquid	Oil Dip	Water Dip	Dip Units
8/04/97	0700	-5.5833	Stand-by for test tool to be opened.															
8/04/97	0900	-3.583	Rig up flow lines and prepare for DST.															
8/04/97	1033	-2.0333	Inflating packers.															
8/04/97	1105	-1.5000	Set packers to open test tool.															
8/04/97	1113	-1.3667	Test tool open, pressure increasing rapidly															
8/04/97	1114	-1.3500	99		PSI													
8/04/97	1114	-1.3500	Open well to flare on 1/2 inch choke, separator on by-pass.															
8/04/97	1115	-1.3333	290		PSI		32	64th										
8/04/97	1115	-1.3333	Gas to surface.															
8/04/97	1116	-1.3167	426		PSI		32	64th										
8/04/97	1117	-1.3000	550		PSI		32	64th										
8/04/97	1118	-1.2833	680		PSI		32	64th										
8/04/97	1119	-1.2667	764		PSI		32	64th										
8/04/97	1119	-1.2667	Close test tool end of pre-flow.															
8/04/97	1120	-1.2500	810		PSI		32	64th										
8/04/97	1121	-1.2333	775		PSI		32	64th										
8/04/97	1121	-1.2333	Open by-pass on choke to bleed down pressure.															
8/04/97	1150	-0.7500	0		PSI		32	64th										
8/04/97	1150	-0.7500	Set weight down to open test tool.															
8/04/97	1158	-0.6167	0		PSI		32	64th										
8/04/97	1158	-0.6167	Test tool open on 1/2 inch choke to flare. Gas to surface, pressure increasing rapidly.															
8/04/97	1159	-0.6000	223		PSI		32	64th										
8/04/97	1200	-0.5833	435		PSI	64 °F	32	64th										
8/04/97	1201	-0.5667	590		PSI	66 °F	32	64th										
8/04/97	1202	-0.5500	720		PSI	68 °F	32	64th										
8/04/97	1203	-0.5333	815		PSI	70 °F	32	64th										
8/04/97	1204	-0.5167	900		PSI	72 °F	32	64th										
8/04/97	1205	-0.5000	960		PSI	72 °F	32	64th										
8/04/97	1206	-0.4833	1005		PSI	72 °F	32	64th										

EXPERTEST PTY. LTD.

FIELD READINGS

Customer:	Santos Ltd.	Well Name:	Fenton Creek #1	Formation:	Waarre "C"
Perforations:	1574 m - 1584 m	Type Of Test:	DST #2	Operator:	D. Poitras
Date Of Test:	08/04/97	Client Ref. No.:	0	Control No.:	V200304b.97

TIME			WELLHEAD DATA							SEPARATOR DATA					LIQUID PRODUCTION				
Date	Time	Elapsed Time (Hours)	Pressures Tubing	Pressures Casing	Units	Well-Head Temp.	Choke Size		BS &W (%)	Orifice Plate (Inch)	Spec. Grav.	Static Pressure	Differential Pressure	Gas Temp	Tnk No.	Total Liquid	Oil Dip	Water Dip	Dip Units
8/04/97	1207	-0.4667	1050		PSI	73 °F	32	64th											
8/04/97	1208	-0.4500	1130		PSI	73 °F	32	64th											
8/04/97	1209	-0.4333	1150		PSI	73 °F	32	64th											
8/04/97	1210	-0.4167	1170		PSI	75 °F	32	64th											
8/04/97	1211	-0.4000	1195		PSI	75 °F	32	64th											
8/04/97	1212	-0.3833	1220		PSI	75 °F	32	64th											
8/04/97	1213	-0.3667	1232		PSI	75 °F	32	64th											
8/04/97	1214	-0.3500	1240		PSI	75 °F	32	64th											
8/04/97	1215	-0.3333	1250		PSI	75 °F	32	64th											
8/04/97	1216	-0.3167	1257		PSI	75 °F	32	64th											
8/04/97	1217	-0.3000	1259		PSI	77 °F	32	64th											
8/04/97	1218	-0.2833	1261		PSI	77 °F	32	64th											
8/04/97	1219	-0.2667	1263		PSI	77 °F	32	64th											
8/04/97	1220	-0.2500	1264		PSI	77 °F	32	64th											
8/04/97	1225	-0.1667	1200		PSI	77 °F	32	64th											
8/04/97	1225	-0.1667	Fluid to surface.																
8/04/97	1230	-0.0833	1237		PSI	77 °F	32	64th											
8/04/97	1235	0.0000	1240		PSI	77 °F	32	64th		2.500	0.61				2	0.00	0.00	0.00	mm
8/04/97	1235	0.0000	Divert flow through separator.																
8/04/97	1245	0.1667	1243		PSI	79 °F	32	64th		2.500	0.61	330 PSI	58 In WC	45 °F					
8/04/97	1300	0.4167	1251		PSI	79 °F	32	64th		2.500	0.61	345 PSI	58 In WC	43 °F					
8/04/97	1315	0.6667	1275		PSI	80 °F	32	64th		2.500	0.61	380 PSI	32 In WC	44 °F					
8/04/97	1320	0.7500	Change orifice plate to 2.250".																
8/04/97	1330	0.9167	1267		PSI	79 °F	32	64th		2.250	0.61	385 PSI	88 In WC	43 °F					
8/04/97	1330	0.9167	Samples taken: H.P. Gas- #230 ; H.P. Condensate- #316																
8/04/97	1345	1.1667	1281		PSI	76 °F	32	64th		2.250	0.61	385 PSI	76 In WC	43 °F					
8/04/97	1345	1.1667	Samples taken: H.P. Gas- #117 ; H.P. Condensate-#206																
8/04/97	1358	1.3833	1298		PSI	77 °F	32	64th		2.250	0.61	380 PSI	77 In WC	43 °F	2	100.00	100.00	0.00	mm
8/04/97	1358	1.3833	Close test tool end of DST. By-pass separator to bleed down pressure.																

EXPERTEST PTY. LTD.

TEST RESULTS

Customer:	Santos Ltd.	Well Name:	Fenton Creek #1	Formation:	Waarre "C"
Perforations:	1574 m - 1584 m	Type Of Test:	DST #2	Operator:	D. Poitras
Date Of Test:	08/04/97	Client Ref. No.:	0	Control No.:	V200304b.97

TIME			WELLHEAD DATA				SEPARATOR		FLOW RATES			CUMULATIVE PRODUCTION			
Date	Time	Elapsed Time (Hours)	Tubing Pressure (PSI)	Annulus Pressure (PSI)	Wellhead Temp (°F)	Choke Size (64th)	Pressure (PSI)	Temp (°F)	Gas Flow Rate (MMSCFD)	Oil Flow Rate (BPD)	Water Flow Rate (BPD)	Gas (MMSCF)	Oil (BBLS)	Water (BBLS)	W.G.R. (BBLS/ MMSCF)
8/04/97	1114	-1.3500	99												
8/04/97	1115	-1.3333	290			32									
8/04/97	1116	-1.3167	426			32									
8/04/97	1117	-1.3000	550			32									
8/04/97	1118	-1.2833	680			32									
8/04/97	1119	-1.2667	764			32									
8/04/97	1120	-1.2500	810			32									
8/04/97	1121	-1.2333	775			32									
8/04/97	1150	-0.7500	0			32									
8/04/97	1158	-0.6167	0			32									
8/04/97	1159	-0.6000	223			32									
8/04/97	1200	-0.5833	435		64	32									
8/04/97	1201	-0.5667	590		66	32									
8/04/97	1202	-0.5500	720		68	32									
8/04/97	1203	-0.5333	815		70	32									
8/04/97	1204	-0.5167	900		72	32									
8/04/97	1205	-0.5000	960		72	32									
8/04/97	1206	-0.4833	1005		72	32									
8/04/97	1207	-0.4667	1050		73	32									
8/04/97	1208	-0.4500	1130		73	32									
8/04/97	1209	-0.4333	1150		73	32									
8/04/97	1210	-0.4167	1170		75	32									
8/04/97	1211	-0.4000	1195		75	32									
8/04/97	1212	-0.3833	1220		75	32									
8/04/97	1213	-0.3667	1232		75	32									
8/04/97	1214	-0.3500	1240		75	32									
8/04/97	1215	-0.3333	1250		75	32									
8/04/97	1216	-0.3167	1257		75	32									

EXPERTEST PTY. LTD.

TEST RESULTS

Customer:	Santos Ltd.	Well Name:	Fenton Creek #1	Formation:	Waarre "C"
Perforations:	1574 m - 1584 m	Type Of Test:	DST #2	Operator:	D. Poitras
Date Of Test:	08/04/97	Client Ref. No.:	0	Control No.:	V200304b.97

TIME			WELLHEAD DATA				SEPARATOR		FLOW RATES			CUMULATIVE PRODUCTION			
Date	Time	Elapsed Time (Hours)	Tubing Pressure (PSI)	Annulus Pressure (PSI)	Wellhead Temp (°F)	Choke Size (64th)	Pressure (PSI)	Temp (°F)	Gas Flow Rate (MMSCFD)	Oil Flow Rate (BPD)	Water Flow Rate (BPD)	Gas (MMSCF)	Oil (BBLS)	Water (BBLS)	W.G.R. (BBLS/ MMSCF)
8/04/97	1217	-0.3000	1259		77	32									
8/04/97	1218	-0.2833	1261		77	32									
8/04/97	1219	-0.2667	1263		77	32									
8/04/97	1220	-0.2500	1264		77	32									
8/04/97	1225	-0.1667	1200		77	32									
8/04/97	1230	-0.0833	1237		77	32									
8/04/97	1235	0.0000	1240		77	32									
8/04/97	1245	0.1667	1243		79	32	330	45	6.453			0.04			
8/04/97	1300	0.4167	1251		79	32	345	43	6.618			0.11			
8/04/97	1315	0.6667	1275		80	32	380	44	5.159			0.17			
8/04/97	1330	0.9167	1267		79	32	385	43	6.739			0.24			
8/04/97	1345	1.1667	1281		76	32	385	43	6.261			0.30			
8/04/97	1358	1.3833	1298		77	32	380	43	6.260	43.37	0.00	0.36	2.50	0.00	

Cushion Type _____

Reversed Out _____

Tool Chased NO

Tester T. SILVESTER - C. M°GUINN

Co. Rep. A. BRADLEY

Contractor OD + E

Rig No. 32

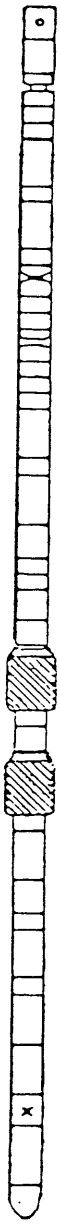
BLOW DESCRIPTION 1st FLOW: WEAK AIR BLOW INCREASING TO STRONG IN 30 SECS. G.T.S 2 MINS 810 PSI THRU ½" CHOKE AT END OF FLOW.

BLOW DESCRIPTION 2nd FLOW: STRONG AIR BLOW GTS IMMEDIATELY.

REMARKS: FLOW RATE OF 6 MMCFD AND 43 BBLS CONDENSATE/DAY.

	LENGTH
TOTAL TOOL TO BOTTOM TOP PACKERS	18.30
INTERVAL TOOL ~~AND~~ & BOTTOM PACKER + ANCHOR	10.15 4.09
TOTAL TOOL	32.54
TOTAL TOOL TO BOTTOM OF TOP PACKER	18.30
DRILL COLLAR ANCHOR IN INTERVAL	
DRILL COLLARS ABOVE TOOLS Stands 5+2+JARS Total	169.06
DRILL PIPE ABOVE TOOLS Stands 45+2 Total	1301.74
H. W. PIPE ABOVE TOOLS Stands 3 Total	83.39
OTHER ABOVE TOOL Total	4.41
TOTAL DRILL COLLARS DRILL PIPE AND TOOLS	1576.9
TOTAL DEPTH	1574
TOTAL DRILL PIPE ABOVE K.B.	2.9 m

REMARKS: NO PRESSURE WAS OBTAINED FROM THE SAMPLE CHAMBER AS THE MANDREL IN THE HYD TOOL GOT WASHED OUT AND BROKE FROM THE GAS FLOW AND THE SAMPLER MANDREL DROPPED DOWN AND COULDNT SEAT ON THE O'RINGS.



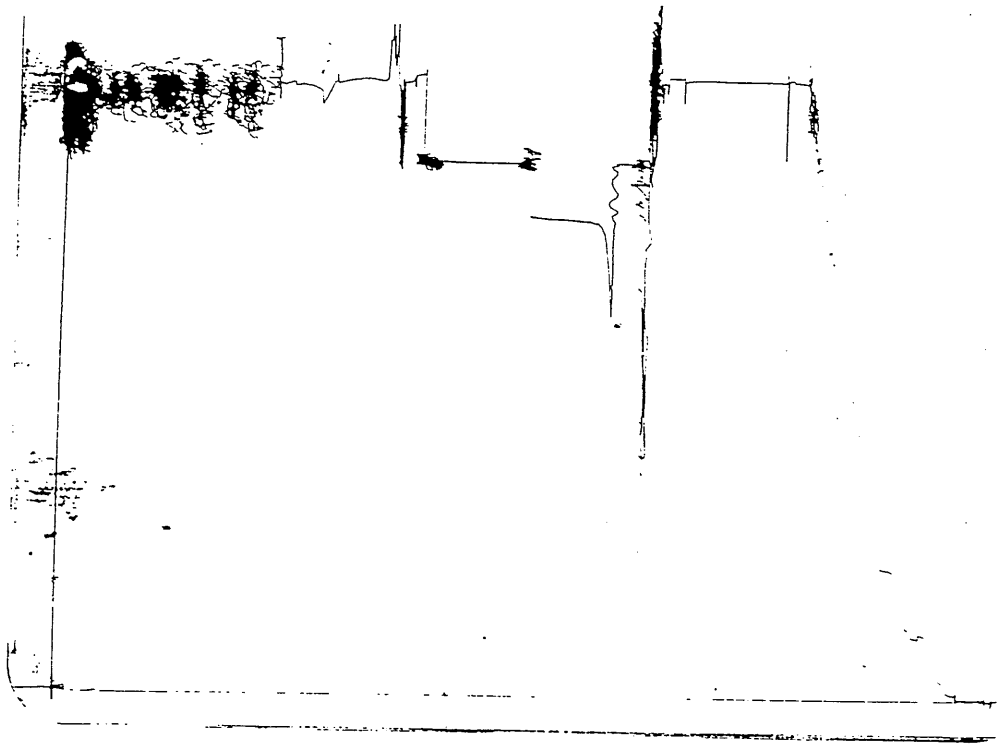
	LENGTH
BO SUB	
P.O. SUB	
C.O. SUB	
SHUT-IN TOOL	
HMV	
JARS	
SAFETY JOINT	
PACKER	
PACKER	
DEPTH	
STUBB	
ANCHOR	
BULLNOSE	
T.D.	

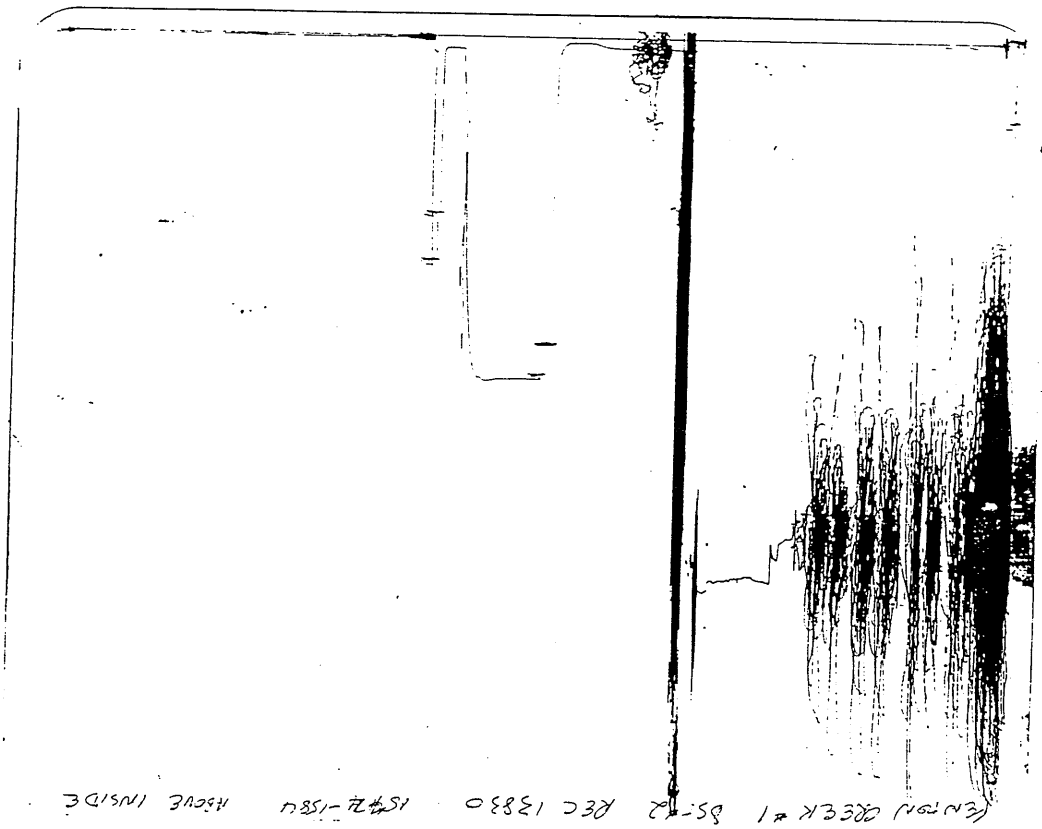
WELL NAME: FENTON CREEK #1 **D.S.T.# 2** **DATE:08/04/1997**

FORMATION :WAARRE C **TESTER** J. SILVESTER
C.McGUINN

TOTAL TOOL TO BTM OF TOP PACKER	18.3		
TOOL & DRILL COLLARS IN INTERVAL	10.15		
BOTTOM PACKER & ANCHOR	4.09		
TOTAL TOOL	**32.54**		
TOTAL TOOL TO BTM OF TOP PACKEF	**18.3**		
STICK UP	**-2.9**		
DRILL PIPE	1301.74	-2.9	45 STDS + DBL
HEAVY WEIGHT DRILL PIPE	83.39	1298.84	3 STDS
DRILL COLLARS	112.78	1382.23	3 STDS+DBL+JARS
PONY COLLAR	4.41	1495.01	
DRILL COLLARS	37.52	1499.42	4 DRILL COLLARS
PUMP OUT SUB	0.41	1536.94	
DRILL COLLAR	9.38	1537.35	1 DRILL COLLAR
DROP BAR SUB	0.3	1546.73	
DRILL COLLAR	9.38	1547.03	1 DRILL COLLAR
CROSS OVER	0.3	1556.41	
RECORDER CARRIER	1.53	1556.71	
HYDRAULIC TOOL	1.61	1558.24	
SAMPLER	1.2	1559.85	
SQUEEZE RELIEF VALVE	1.17	1561.05	
RECORDER CARRIER	1.53	1562.22	
RECORDER CARRIER EMP	1.83	1563.75	
RECORDER CARRIER EMP	1.83	1565.58	
SAFETY JOINT	1.64	1567.41	
INFLATE PUMP	0.86	1569.05	
SCREEN	1.33	1569.91	
DEFLATE	1.02	1571.24	
PACKER	1.74	1572.26	
DEPTH	**1574**		
FLOW PORTS	0.8	1574	
RECORDER CARRIER	2.04	1574.8	
SPACING	6.71	1576.84	
STICK UP	0.6	1583.55	
DEPTH	**1584.15**	1584.15	
PACKER	1.71		
DRAGSPRING	2.38		

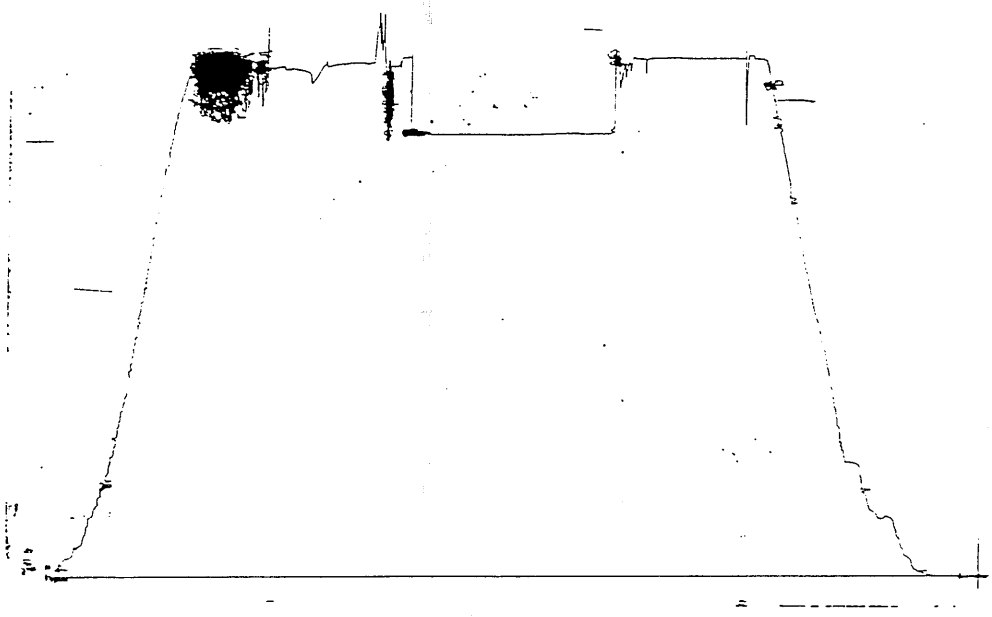
FENTON CREEK #1 DST #2 1574-5[illegible] REC 6889 INSIDE





FENTON CREEK #1 DST #2 REC 13830 1574-1584 ABOVE INSIDE

FENTON CREEK #1 DST #2 1574-1584 REC 13831 OUTSIDE



COMPANY Santos Petroleum STATE Victoria DATE 8-4-97

Well Name Fenton Creek #1 KB Elv. 86.3 m ~~ft~~ Ticket No. 103 DST No. 2

Well Location Otway Basin Onshore Victoria GR Elv. 82 m ft. Formation Waarre "C"

Interval 1574 - 1584 m T.D. 1840 ~~m~~ ~~ft~~ Net Pay _____ ft. Type of Test Inflate Straddle

API Gravity _____ W.S. _____ Average Porosity _____

RECORDER DATA

Mins.

		# 6889	# 522	# 526	# 13831
PF	Rec.# 13830				
SI	Range 3825 lbs.	3200	5000	5000	3850
SF	Clock 24 hrs.	24	Battery	Battery	24
FS	Depth 1557 ~~m~~	1562.5	1565.5	1567.4	1575.5
		PSI	PSI	PSI	PSI
A.	Init. Hyd.	2578.3	2532.9	2529.3	2524.2
B.	First Flow		1351.1	1343.8	2150.4
	Final Flow		1755.1	1768.8	2150.4
C.	In. Shut-In	2179.4	2169.0	2163.6	2150.4
D.	Init. Flow	1540	1714.0	1757.8	2150.4
E.	Final Flow 46 1689.9	1948	1986.7	1992.7	2150.4
F.	Fl. Shut-in 9 4.7 30 47.2	2235.2	2167.8	2163.3	2150.4
G.	Final Hyd.	2179	2538.4	2532.0	2524.2
	Inside/Outside Above	(IN)	(IN)	(IN)	(Out)

TIME DATA

PF Fr.	1113	to	1119	hr.
IS Fr.	1119	to	1158	hr.
SF Fr.	1158	to	1358	hr.
FS Fr.	1358	to	1612	hr.

T. STARTED	0230.	hr.
T. ON BOTM.	0725	hr.
T. OPEN	1113	hr.
T. PULLED	1612	hr.
T. OUT		hr.

RECOVERY

Total Fluid _____ ft. of _____ ft. in D.C. and _____ ft. in D.P.

_____ ft. of _____

_____ ft. of _____

_____ ft. of _____

_____ ft. of _____

GAS RECOVERY MEASURED WITH

	Time ~~Mins.~~	Orifice inches	Pressure PSI	H_2O inches	Rate mcf/d
1.	1158 HRS		4		
2.	1200		435		
3.	1205		960		
4.	1210		1170		
5.	1215		1250		
6.	1220		1264		
7.	1230		1237		
8.	1300		1267		
9.	1330		1267		
10.	1358		1298		

SURFACE CHOKE SIZE: 1/2

TOOL DATA

Tool Wt.		lbs.
Wt. Set on Packer	40.000	lbs.
Wt. Pulled Loose		lbs.
Initial Str. Wt.	103 000	lbs.
Unseated Str. Wt.	103.000	lbs.
Bot. Choke	3/4	in.
Hole Size	8 1/2	in.
D. Col. I.D.	2 13/16	in.
D. Pipe I.D.	3.826	in.
D.C. Leng.	173.47	~~m~~ ~~ft.~~
D.P. Leng.	1301.74	~~m~~ ~~ft.~~
HWDP	83.39	m

MUD DATA

Mud type	KCL PHPA	
Weight	9.3	
Vis.	37	
W.L.	6	
F.C.	1	in.
Mud Drop	6 bbls	

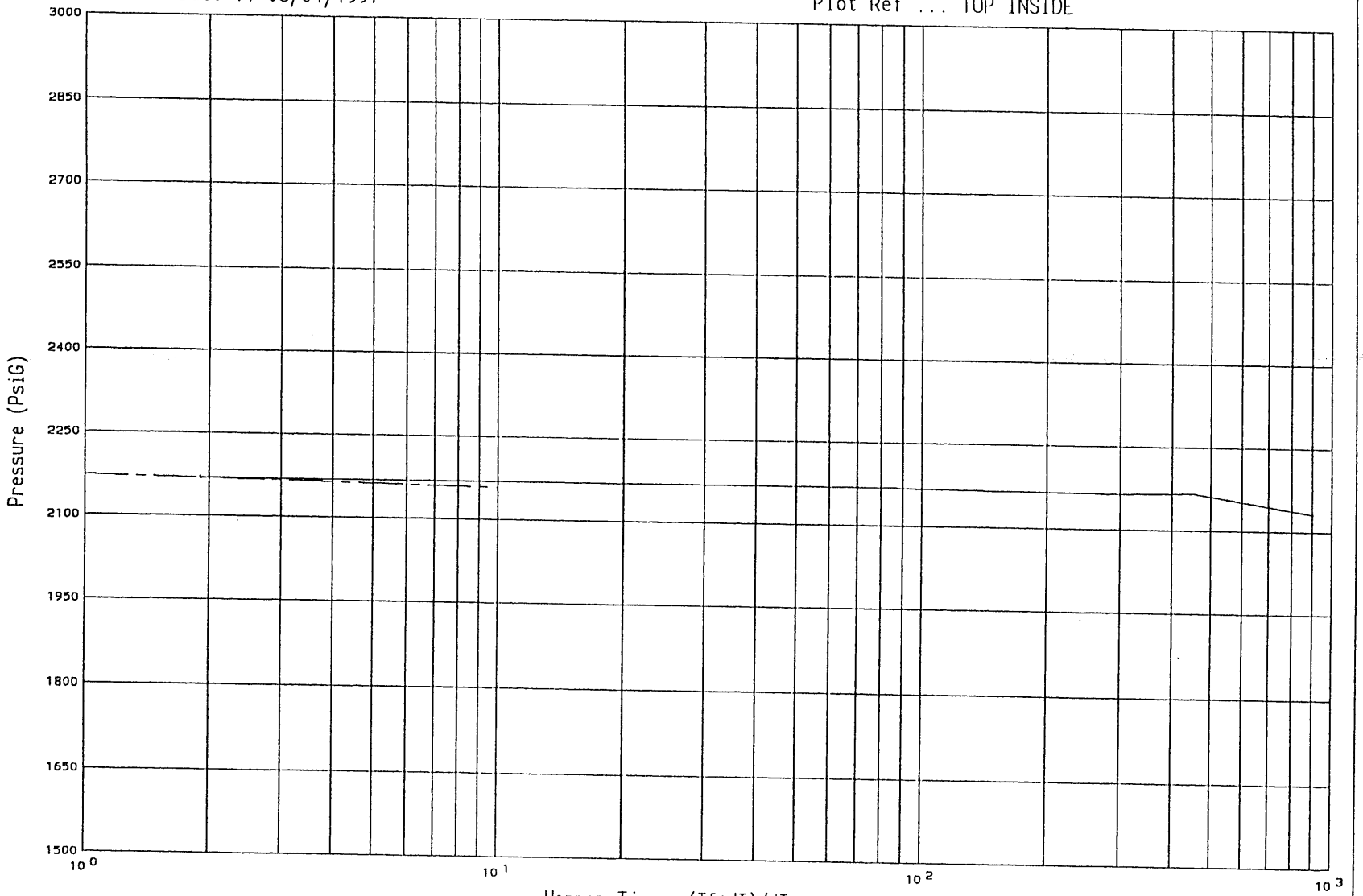
GENERAL DATA

Amt. of fill	—	ft.
Btm. H. Temp.	191.78	°F
Hole Cond.		
Packer Size	6 3/4 x 66	in.
No. of Packers	2	
Cushion Amt.	—	ft.
Cushion Type	—	
Reversed Out		
Tool Chased	NO	
Tester	T. Silvester - C. M°Guinn	
Co. Rep.	A. Bradley	
Contractor	OD&E	
Rig No.	32	

97/04/09
06:37:42

Company .... SANTOS PETROLEUM
Well ..... FENTON CREEK # 1 ONSHORE OTWAY BASIN VICYORIA
Test Date .. 08/04/1997

EMP S/N 080-522
File Ref ... FC1-DST2
Plot Ref ... TOP INSIDE



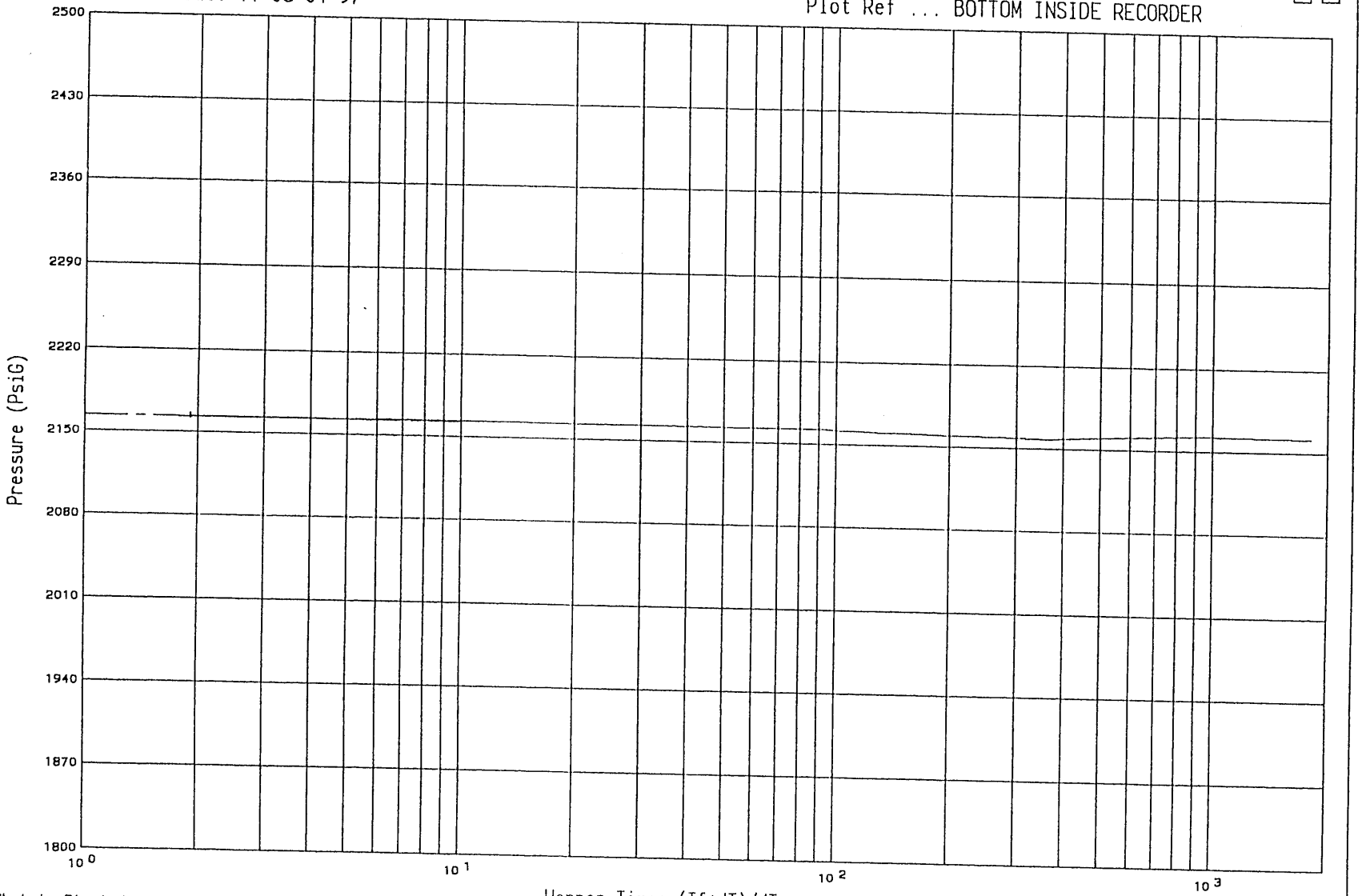
Shut-in Started 97/04/08 13:57:52
Shut-in Ended 97/04/08 16:11:36
Total Flow Time .... 120.5 minute(s)

First Delta-t ..... 0.1 minute(s)
Intercept ..... 2172.8 PsiG
Slope ..... 15.7 PsiG/Cycle

97/04/09
07:15:50

Company .... SANTOS PETROLEUM
Well ..... FENTON CREEK #1 ONSHORE OTWAY BASIN VICTORIA
Test Date .. 08-04-97

EMP S/N 080-526
File Ref ... FNC1DST2
Plot Ref ... BOTTOM INSIDE RECORDER



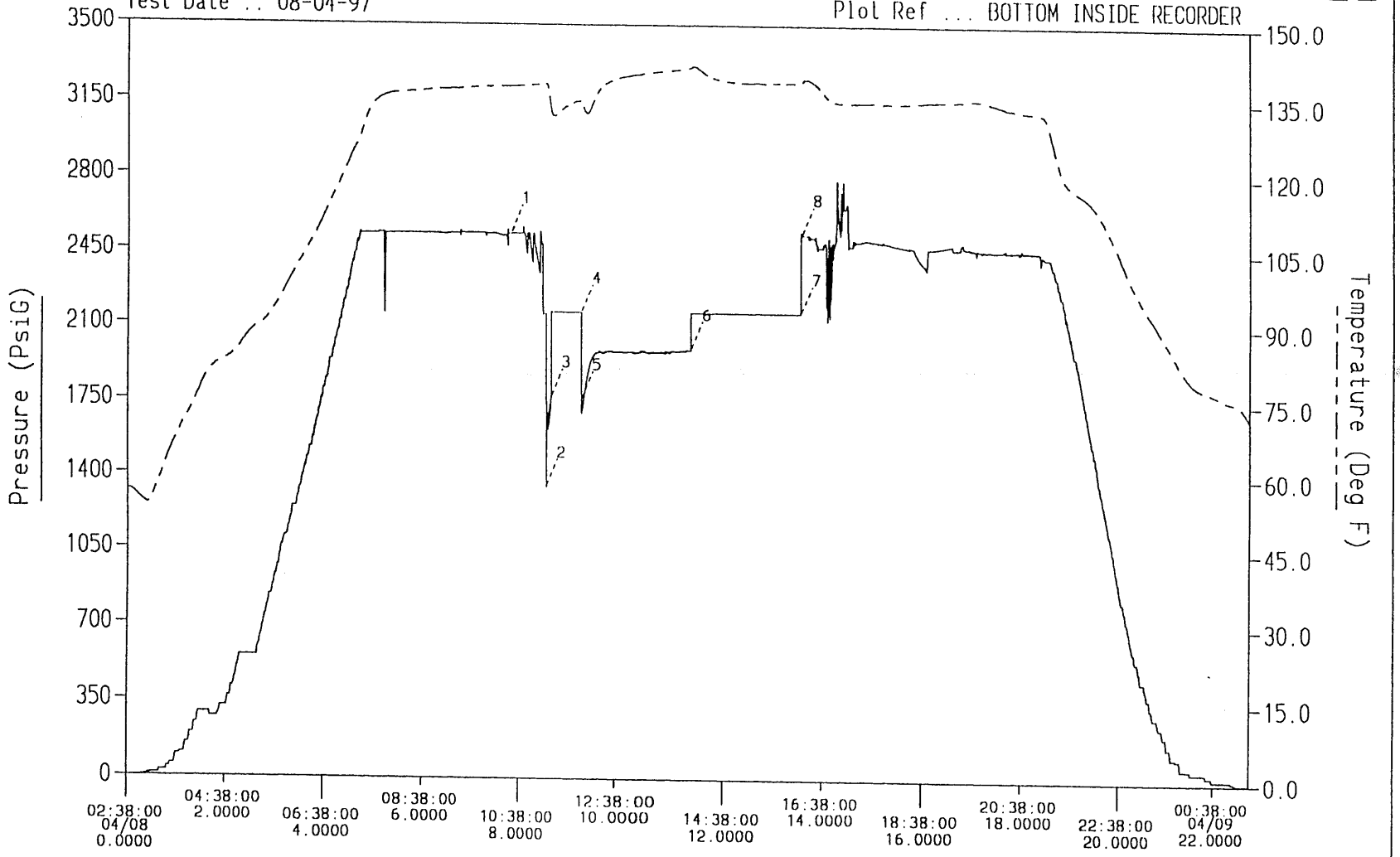
Shut-in Started 97/04/08 13:57:44
Shut-in Ended 97/04/08 16:11:24
Total Flow Time .... 120.7 minute(s)

First Delta-t ..... 0.1 minute(s)
Intercept ..... 2163.4 PsiG
Slope ..... 1.1 PsiG/Cycle

97/04/09
07:03:34

Company .... SANTOS PETROLEUM
Well ..... FENTON CREEK #1 ONSHORE OTWAY BASIN VICTORIA
Test Date .. 08-04-97

EMP S/N 080-526
File Ref ... FNC1DST2
Plot Ref ... BOTTOM INSIDE RECORDER

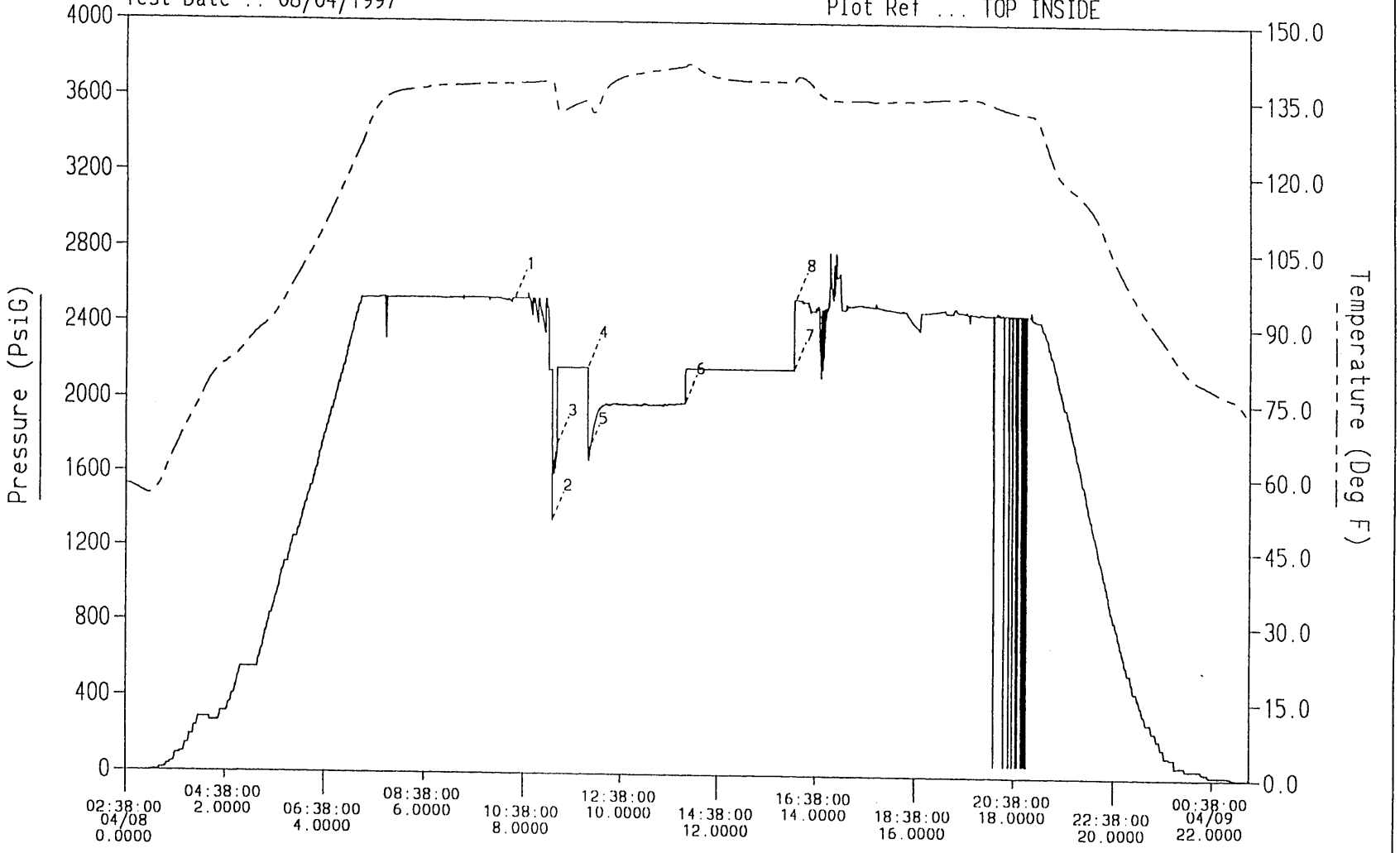


1 - INITIAL HYDROSTATIC; t=7.8356; P=2529.3
2 - INITIAL PREFLOW; t=8.5833; P=1343.8
3 - FINAL PREFLOW; t=8.6833; P=1768.8
4 - INITIAL SHUTIN; t=9.3167; P=2163.6
5 - INITIAL FLOW; t=9.3178; P=1757.8
6 - FINAL FLOW; t=11.3289; P=1992.7
7 - FINAL SHUTIN; t=13.5567; P=2163.3
8 - FINAL HYDROSTATIC; t=13.5756; P=2532.0

97/04/09
06:28:12

Company .... SANTOS PETROLEUM
Well ..... FENTON CREEK # 1 ONSHORE OTWAY BASIN VICYORIA
Test Date .. 08/04/1997

EMP S/N 080-522
File Ref ... FC1-DST2
Plot Ref ... TOP INSIDE



1 - INITIAL HYDROSTATIC; t=7.8222; P=2532.9
2 - INITIAL PREFLOW; t=8.5867; P=1351.1
3 - FINAL PREFLOW; t=8.6867; P=1755.1
4 - INITIAL SHUTIN; t=9.3200; P=2169.0
5 - INITIAL FLOW; t=9.3222; P=1714.0
6 - FINAL FLOW; t=11.3311; P=1986.7
7 - FINAL SHUTIN; t=13.5600; P=2167.8
8 - FINAL HYDROSTATIC; t=13.5933; P=2538.4

APPENDIX VII: HYDROCARBON ANALYSIS

amdel

Amdel Limited
A.C.N. 008 127 802

Petroleum Services
PO Box 338
Torrensville Plaza SA 5031

Telephone: (08) 8416 5240
Facsimile: (08) 8234 2933

29 April, 1997

Santos Limited
GPO Box 2319
ADELAIDE SA 5001

Attention: A. Pietsch

REPORT LQ5795 - Part 1

CLIENT REFERENCE: C18969

WELL NAME/RE: Fenton Creek-1, DST-1 and DST-2

MATERIAL: HP Gas and HP Liquid

WORK REQUIRED: Compositional Analysis

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

Brian L. Watson
Manager
Petroleum Services

PETROLEUM SERVICES GAS ANALYSIS

Method GL-01-01 — ASTM D 1945-91 (modified)

Client: SANTOS Ltd — Report # LQ5795 Pt 1

Sample: FENTON CREEK-1
DST-1
690 kPag @ 10°C
07/04/97, 0130h, Cyl# 218

GAS	MOL %
Nitrogen	1.28
Carbon Dioxide	0.14
Methane	85.09
Ethane	6.55
Propane	3.40
I-Butane	0.78
N-Butane	1.00
I-Pentane	0.36
N-Pentane	0.30
Hexanes	0.54
Heptanes	0.26
Octanes and higher h'cs	0.30
Total	100.00

(0.00 = less than 0.01%)

The above results are calculated on an air and water free basis assuming only the measured constituents are present
The following parameters are calculated from the above composition at 15°C and 101.325 kPa (abs)

Average Molecular Weight	20.13
Lower Flammability limit	4.28
Upper Flammability limit	14.32
Ratio of upper to lower	3.35
Wobbe Index	53.93
Compressibility Factor	0.9967
Ideal Gas Density (Rel to air = 1)	0.695
Real gas Density (Rel to air = 1)	0.697
Ideal Nett Calorific Value MJ/m^3	40.73
Ideal Gross Calorific Value MJ/m^3	44.96
Real Nett Calorific Value MJ/m^3	40.87
Real Gross Calorific Value MJ/m^3	45.11
Gross calorific value of water-saturated gas MJ/m^3	44.17

This report relates specifically to the sample submitted for analysis.

Approved Signatory Diane Cass

Registration No: 2013
Date : 28-04-97

amdel

OPENING PRESSURE

WELL	FENTON CREEK-1 DST-1
SEPARATOR	690kPag @ 10°C
DATE	07/04/97 @ 0130 h
CYLINDER NUMBER	Cyl# 218
OPENING PRESSURE	300 kPag @ 20°C
LIQUID CHECK	NIL

amdel

PETROLEUM SERVICES GAS ANALYSIS

Method GL-01-01 ASTM D 1945-91 (modified)

Client: SANTOS Ltd Report # LQ5795 Pt 1

Sample: FENTON CREEK-1
DST-1
35 kPag @ 10°C
07/04/97, 1925h, Cyl# 145

GAS	MOL %
Nitrogen	1.28
Carbon Dioxide	0.14
Methane	85.44
Ethane	6.43
Propane	3.19
I-Butane	0.71
N-Butane	0.90
I-Pentane	0.32
N-Pentane	0.27
Hexanes	0.54
Heptanes	0.34
Octanes and higher h'cs	0.44
Total	100.00

(0.00 = less than 0.01%)

The above results are calculated on an air and water free basis assuming only the measured constituents are present
The following parameters are calculated from the above composition at 15°C and 101.325 kPa (abs)

Average Molecular Weight	20.13
Lower Flammability limit	4.27
Upper Flammability limit	14.32
Ratio of upper to lower	3.35
Wobbe Index	53.94
Compressibility Factor	0.9967
Ideal Gas Density (Rel to air = 1)	0.695
Real gas Density (Rel to air = 1)	0.697
Ideal Nett Calorific Value MJ/m^3	40.74
Ideal Gross Calorific Value MJ/m^3	44.97
Real Nett Calorific Value MJ/m^3	40.88
Real Gross Calorific Value MJ/m^3	45.12
Gross calorific value of water-saturated gas MJ/m^3	44.18

This report relates specifically to the sample submitted for analysis.

Approved Signatory Diane Cass

Registration No: 2013

Date : 28-04-97

PETROLEUM SERVICES GAS ANALYSIS

Method GL-01-01 — ASTM D 1945-91 (modified)

Client: SANTOS Ltd — Report # LQ5795 Pt 1

Sample: FENTON CREEK-1
DST-2
2650 kPag @ 6°C
08/04/97, 1345h, Cyl# 117

GAS	MOL %
Nitrogen	1.62
Carbon Dioxide	0.16
Methane	84.85
Ethane	7.07
Propane	3.57
I-Butane	0.80
N-Butane	0.95
I-Pentane	0.29
N-Pentane	0.22
Hexanes	0.24
Heptanes	0.08
Octanes and higher h'cs	0.15
Total	100.00

(0.00 = less than 0.01%)

The above results are calculated on an air and water free basis assuming only the measured constituents are present
The following parameters are calculated from the above composition at 15°C and 101.325 kPa (abs)

Average Molecular Weight	19.68
Lower Flammability limit	4.37
Upper Flammability limit	14.46
Ratio of upper to lower	3.31
Wobbe Index	53.19
Compressibility Factor	0.9970
Ideal Gas Density (Rel to air = 1)	0.680
Real gas Density (Rel to air = 1)	0.681
Ideal Nett Calorific Value MJ/m^3	39.70
Ideal Gross Calorific Value MJ/m^3	43.84
Real Nett Calorific Value MJ/m^3	39.82
Real Gross Calorific Value MJ/m^3	43.98
Gross calorific value of water-saturated gas MJ/m^3	43.08

This report relates specifically to the sample submitted for analysis.

Approved Signatory Diane Cass

Registration No: 2013
Date : 28-04-97

amdel

OPENING PRESSURE

WELL	FENTON CREEK-1 DST-2
SEPARATOR	2650kPag @ 6°C
DATE	08/04/97 @ 1345 h
CYLINDER NUMBER	Cyl# 117
OPENING PRESSURE	3100 kPag @ 20°C
LIQUID CHECK	NIL

AMDEL PETROLEUM SERVICES

Method GL-02-03

Client: SANTOS Ltd Report # LQ5795 Pt 1

Sample: FENTON CREEK-1
DST-2, 2650 kPag @ 6°C
08/04/97, 1245 h, Cyl# 206

HP Gas Rate	169.90	x 1000 m^3/D
Stock Tank Oil Rate	6.84	m^3/D

COMPOSITIONAL ANALYSIS OF RECOMBINED RESERVOIR FLUID

Component	Mol %	US Gallon/1000ft^3
Nitrogen	1.60	-------
Carbon Dioxide	0.16	-------
Methane	84.01	-------
Ethane	7.06	1.88
Propane	3.65	1.00
I-Butane	0.85	0.27
N-Butane	1.04	0.33
I-Pentane	0.34	0.12
N-Pentane	0.27	0.10
Hexanes	0.35	0.14
Heptanes	0.23	0.11
Octanes plus	0.44	0.22
TOTAL	100.00	4.17

DERIVED DATA FROM FULL WELL STREAM COMPOSITION

Molecular Weight		20.32			
Gas Density (rel air = 1)		0.702			
Molecular Weight C_{8+}		119.3			
Density C_{8+}		0.7490			
Wobbe Index		53.83		1445	
Heating Value	Gross:	45.09	MJ/m^3	1211	BTU/ft^3
	Nett:	40.86	MJ/m^3	1097	BTU/ft^3
Critical Temperature Tc		214.0	°K	385.3	°R
Critical Pressure Pc		4552	kPa abs	660.2	psia
Gas Liquid Ratio C_4/C_{5+}		10452	m^3/m^3		

Sales Gas And Liquid Recovery

Assuming Liquid Recovery of 75% C_2, 95% C_3, 100% C_4+ and Sales Gas Content of 2.5% CO_2

Gas Shrinkage		0.8980
Liquid Content of Raw Gas (US Bbl/MMSCF)	Ethane	33.5
	LPG	36.9
	Pentane +	16.5

Approved Signatory Diane Cass

Registration No: 2013

Date 28-Apr-97

Sample: FENTON CREEK-1
DST-2, 2650 kPag @ 6°C
08/04/97, 1245 h, Cyl# 206

COMPOSITIONAL ANALYSIS OF RECOMBINED SEPARATOR FLUID

Component	Flashed Stock Tank Liquid Mol %	Flashed Stock Tank Gas Mol %	Recomb. Sep. Liquid Mol %
Nitrogen	-------	0.10	0.04
Carbon Dioxide	-------	0.16	0.07
Methane	-------	27.14	11.32
Ethane	0.33	15.41	6.62
Propane	2.28	23.32	11.06
I-Butane	2.44	8.88	5.13
N-Butane	5.56	12.33	8.38
I-Pentane	5.37	4.41	4.97
N-Pentane	6.19	3.32	4.99
Hexanes	14.18	3.40	9.68
Heptanes	21.62	1.09	13.05
Octanes plus	42.02	0.44	24.67
TOTAL	100.00	100.00	100.00

RATIOS

Molar ratio	0.5829	0.4171	1.0000
Mass Ratio	0.7683	0.2317	1.0000
Gas Liquid Ratio	1.00 bbl @ SC	680.9 SCF	-------

STREAM PROPERTIES

Molecular Weight	99.3	41.8	75.3
Density obs(g/cc)	0.7099 @ 15°C	-------	-------
API-Gas Density	67.74 API @60°F	1.443 (air=1)	-------
GHV (BTU/scf)	-------	2389	-------

OCTANE PLUS PROPERTIES

Mol %	42.02	0.44	24.67
Molecular Weight	122.1	114.2	122.0
Density (g/cc)	0.7739 @ 15°C	-------	-------
API @ 60°F	51.28	-------	-------

LABORATORY FLASH SEPARATION DETAILS

Separation Temperature	21	°C
Flash Gas Volume	42.01	litres
Stabilised Liquid Volume	347	ml
Liquid Density	0.7044	g/ml

Sample: FENTON CREEK-1
DST-2, 2650 kPag @ 6°C
08/04/97, 1245 h, Cyl# 206

COMPOSITIONAL ANALYSIS OF RECOMBINED RESERVOIR FLUID

Component	Separator Liquid Mol %	Separator Gas Mol %	Recomb. Reservoir Fluid Mol %
Nitrogen	0.04	1.62	1.60
Carbon Dioxide	0.07	0.16	0.16
Methane	11.32	84.86	84.01
Ethane	6.62	7.07	7.06
Propane	11.06	3.57	3.65
I-Butane	5.13	0.80	0.85
N-Butane	8.38	0.95	1.04
I-Pentane	4.97	0.29	0.34
N-Pentane	4.99	0.22	0.27
Hexanes	9.68	0.24	0.35
Heptanes	13.05	0.08	0.23
Octanes plus	24.67	0.15	0.44
TOTAL	100.00	100.00	100.00

RATIOS

Molar ratio	0.0116	0.9884	1.0000
Mass Ratio	0.0428	0.9572	1.0000

STREAM PROPERTIES

Molecular Weight	75.3	19.7	20.3
Gas Density	-------	0.680 (air=1)	0.702
GHV (BTU/scf)	-------	1177	1211

OCTANE PLUS PROPERTIES

Mol %	24.67	0.15	0.44
Molecular Weight	122.0	114.2	119.3
Density (g/cc) @15°C	-------	-------	0.7490
API @ 60°F	-------	-------	57.33

Method GL-02-03
Client: SANTOS Ltd Report # LQ5795 Pt 1

Sample: FENTON CREEK-1
DST-2, 2650 kPag @ 6°C
08/04/97, 1245 h, Cyl# 206

Boiling Point Range (Deg.C)	Component	Weight%	Mol%
-88.6	Ethane	0.10	0.33
-42.1	Propane	1.01	2.28
-11.7	I-Butane	1.43	2.44
-0.5	N-Butane	3.25	5.56
27.9	I-Pentane	3.91	5.37
36.1	N-Pentane	4.50	6.19
36.1-68.9	C-6	12.31	14.18
80.0	Benzene	0.13	0.16
68.9-98.3	C-7	21.66	21.46
100.9	Methylcyclohexane	10.85	10.97
110.6	Toluene	0.66	0.71
98.3-125.6	C-8	12.90	11.21
136.1-144.4	Ethylbenz+Xylenes	1.54	1.44
125.6-150.6	C-9	9.33	7.22
150.6-173.9	C-10	7.77	5.42
173.9-196.1	C-11	4.00	2.54
196.1-215.0	C-12	2.15	1.25
215.0-235.0	C-13	1.43	0.77
235.0-252.2	C-14	0.49	0.24
252.2-270.6	C-15	0.28	0.13
270.6-287.8	C-16	0.12	0.05
287.8-302.8	C-17	0.08	0.03
302.8-317.2	C-18	0.06	0.02
317.2-330.0	C-19	0.02	0.01
330.0-344.4	C-20	0.01	0.01
344.4-357.2	C-21	0.01	0.00
357.2-369.4	C-22	0.01	0.00
369.4-380.0	C-23	0.01	0.00
380.0-391.1	C-24	0.00	0.00
391.1-401.7	C-25	0.00	0.00
401.7-412.2	C-26	0.00	0.00
412.2-422.2	C-27	0.00	0.00
>422.2	C-28+	0.00	0.00
	Total	100.00	100.00

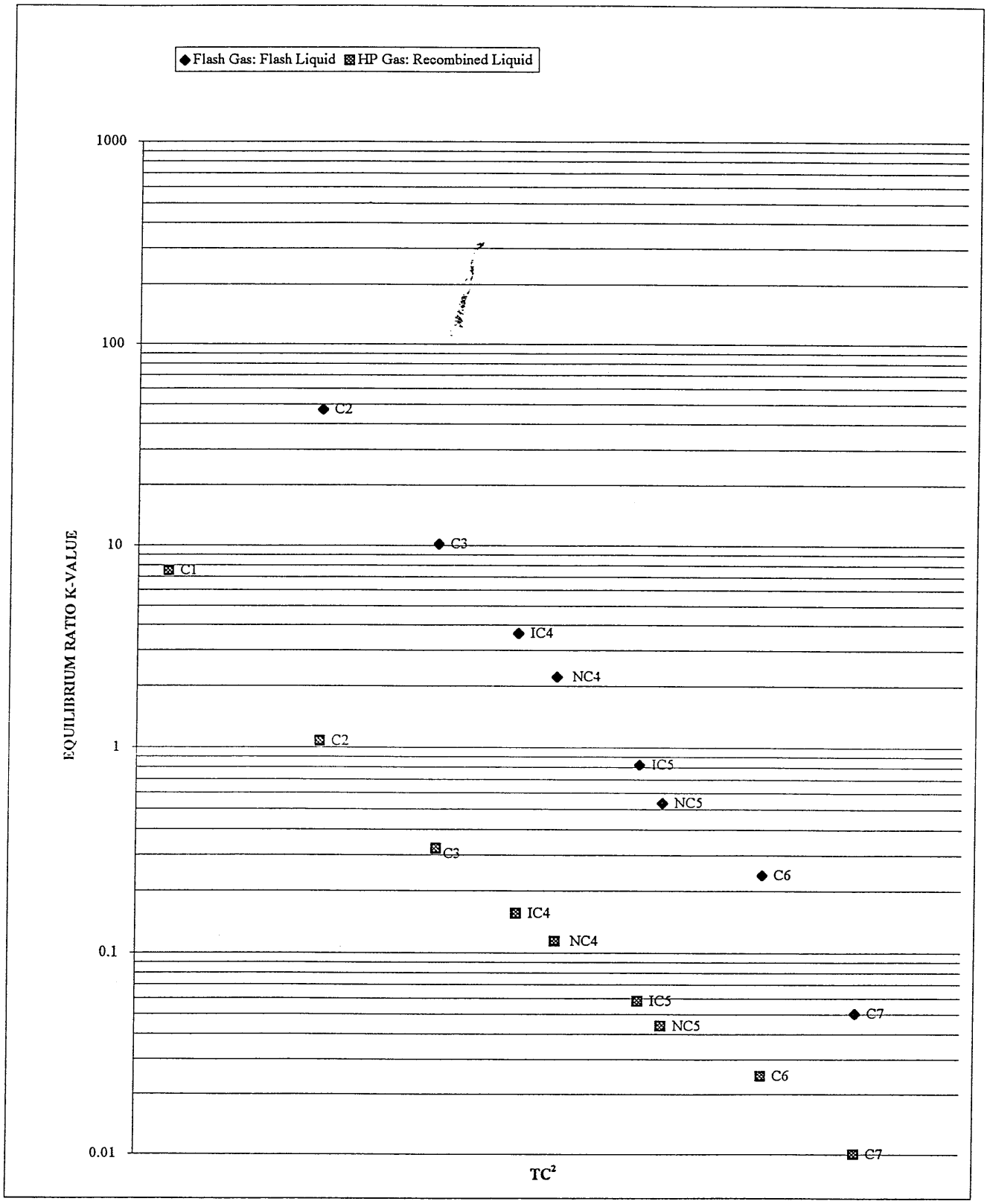
(0.00 = LESS THAN 0.01%)

The above boiling point ranges refer to the normal paraffin hydrocarbon boiling in that range. Aromatics, branched hydrocarbons, naphthenes and olefins may have higher or lower carbon numbers but are grouped and reported according to their boiling points.

Oil Parameters:

Density of Oil @ 21.0 °C	0.7044	
Specific Gravity @ 15.6 °C	0.7102	
API Gravity	67.74	
Specific Gravity of C_{8+} fraction	0.7742	(calc)
Average molecular weight of C_{8+} fraction	122	

Sample: FENTON CREEK-1
DST-2, 2650 kPag @ 6°C
08/04/97, 1245 h, Cyl# 206



AMDEL PETROLEUM SERVICES
Method GL-02-03

Client: SANTOS Ltd

Report # LQ5795 Pt 1

Sample: FENTON CREEK-1
DST-2, 2650 kPag @ 6°C
08/04/97, 1245 h, Cyl# 206

Full Well Stream

Separator Gas	6.000 MMSCF		
Stock Tank Oil Rate	43.000 BBLS		
			Av Mol Wt
Flash Gas Moles		1.762	41.80
Flash Liquid Moles		2.462	99.26
Recombination Moles		4.224	
Molar Shrinkage Factor		0.583	
Full Well Stream	83906	Moles Liquid	1.16%
Molar ratio	7170647	Moles Gas	98.84%

	Flash Gas Mol%	Flash Liquid Mol%	Recomb. Liquid Mol%	HP Gas Mol%	Full Well Stream Mol%
Nitrogen	0.10	------	0.04	1.62	1.60
Carbon Dioxide	0.16	------	0.07	0.16	0.16
Methane	27.14	------	11.32	84.86	84.01
Ethane	15.41	0.33	6.62	7.07	7.06
Propane	23.32	2.28	11.06	3.57	3.65
I-Butane	8.88	2.44	5.13	0.80	0.85
N-Butane	12.33	5.56	8.38	0.95	1.04
I-Pentane	4.41	5.37	4.97	0.29	0.34
N-Pentane	3.32	6.19	4.99	0.22	0.27
Hexanes	3.40	14.18	9.68	0.24	0.35
Heptanes	1.09	21.62	13.06	0.08	0.23
Octanes plus	0.44	42.02	24.66	0.15	0.44
	100.00	100.00	100.00	100.00	100.00
Av.Mol.Weight	41.80	99.26	75.28	19.68	20.32

K Factors	Flash Gas/ Flash Liquid Ratio	HP Gas/ Recombined Liquid Ratio
C1	------	7.49
C2	46.95	1.07
C3	10.21	0.32
IC4	3.64	0.16
NC4	2.22	0.11
IC5	0.82	0.06
NC5	0.54	0.04
C6	0.24	0.02
C7	0.05	0.01

APPENDIX VIII: WATER ANALYSIS

Amdel Limited
A.C.N. 008 127 802

Petroleum Services
PO Box 338
Torrensville Plaza SA 5031

Telephone: (08) 8416 5240
Facsimile: (08) 8234 2933

28 April, 1997

Santos Limited
GPO Box 2319
ADELAIDE SA 5001

Attention: A. Pietsch

REPORT LQ5795 - Part 2

CLIENT REFERENCE:	C18969
WELL NAME/RE:	Fenton Creek-1
MATERIAL:	Water
WORK REQUIRED:	Water Analysis

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

Brian L. Watson
Manager
Petroleum Services

1. INTRODUCTION AND RESULTS

Six (6) samples were received for standard water analysis (WA-10-01). All analyses were performed according to APHA methods (19th Edition). Results are presented on the following pages.

amdel
Petroleum Services

TABLE 1 - WATER ANALYSIS

JOB NUMBER: **LQ5795 - Part 2**

WELL / ID: Fenton Creek-1, DST-2, Sample 9
SAMPLE TYPE: Mud Filtrate
SAMPLE POINT: -
DATE COLLECTED: 08/04/97,2400h
DATE RECEIVED: 21/04/97

FORMATION: -
INTERVAL: -
COLLECTED BY: Client

PROPERTIES:

pH (measured) = 7.93
Resistivity (Ohm.M @ 25°C) = 0.22
Electrical Conductivity (µS/cm @ 25°C) = 45400
Specific Gravity (S.G. @ 20°C) = na
Measured Total Dissolved Solids(Evap@180°C) mg/L = na
Measured Total Suspended Solids mg/L = na

CHEMICAL COMPOSITION

CATIONS		mg/L	meq/L	ANIONS		mg/L	meq/L
Ammonium	as NH_4	na	na	Bromide	as Br	na	na
Potassium	as K	12772	326.65	Chloride	as Cl	15145	426.62
Sodium	as Na	2447	106.44	Fluoride	as F	na	na
Barium	as Ba	na	na	Hydroxide	as OH	nd	nd
Calcium	as Ca	152	7.58	Nitrite	as NO_2	na	na
Iron	as Fe	na	na	Nitrate	as NO_3	nd	nd
Magnesium	as Mg	nd	nd	Sulphide	as S	na	na
Strontium	as Sr	na	na	Bicarbonate	as HCO_3	1192	19.54
Boron	as B	na	na	Carbonate	as CO_3	nd	nd
				Sulphite	as SO_3	na	na
				Sulphate	as SO_4	246	5.12
Total Cations		15371	440.67	**Total Anions**		16583	451.28

DERIVED PARAMETERS

a) Ion Balance (Diff*100/Sum) (%) = 1.19
b) Total Alkalinity (calc as $CaCO_3$) (mg/L) = 977
c) Total of Cations + Anions = 31954
(measured dissolved salts)
d) Theoretical Result of Evaporation Test = 29056
(From Electrical Conductivity)
e) 0.6 x Concentration of Bicarbonate ion* = 715.2
f) Theoretical Total Dissolved Salts d) + e) = 29771.2

QUALITY CONTROL COMMENTS

Item	Actual Value	Acceptance Criteria	Satisfactory? (Yes/No)
Ion Balance (%) =	1.19	5%	Yes
Undetected ions % =	7.33	10%	Yes
(from comparison of measured vs theoretical salts derived from measured conductivity)			
Expected pH range		< 8.3	Yes
% difference between measured total dissolved solids and calc total dissolved salts (from ionic comp) =	na	5%	na

na = not applicable
nd = not detected
is = insufficent sample

If No - what action is recommended by Amdel

Petroleum Services

TABLE 1 - WATER ANALYSIS

JOB NUMBER: **LQ5795 - Part 2**

WELL / ID: Fenton Creek-1, DST-1, Sample 6
SAMPLE TYPE: Mud Filtrate
SAMPLE POINT: -
DATE COLLECTED: 06/04/97,2400h
DATE RECEIVED: 21/04/97

FORMATION: -
INTERVAL: -
COLLECTED BY: Client

PROPERTIES:

pH (measured) = 8.44
Resistivity (Ohm.M @ 25°C) = 0.23
Electrical Conductivity (µS/cm @ 25°C) = 43600
Specific Gravity (S.G. @ 20°C) = na
Measured Total Dissolved Solids(Evap@180°C) mg/L = na
Measured Total Suspended Solids mg/L = na

CHEMICAL COMPOSITION

CATIONS		mg/L	meq/L	ANIONS		mg/L	meq/L
Ammonium	as NH_4	na	na	Bromide	as Br	na	na
Potassium	as K	12316	314.99	Chloride	as Cl	13319	375.18
Sodium	as Na	2121	92.26	Fluoride	as F	na	na
Barium	as Ba	na	na	Hydroxide	as OH	nd	nd
Calcium	as Ca	28.3	1.41	Nitrite	as NO_2	na	na
Iron	as Fe	na	na	Nitrate	as NO_3	nd	nd
Magnesium	as Mg	nd	nd	Sulphide	as S	na	na
Strontium	as Sr	na	na	Bicarbonate	as HCO_3	782	12.82
Boron	as B	na	na	Carbonate	as CO_3	117	3.90
				Sulphite	as SO_3	na	na
				Sulphate	as SO_4	nd	nd
Total Cations		14465.3	408.66	**Total Anions**		14218	391.90

DERIVED PARAMETERS

a) Ion Balance (Diff*100/Sum) (%) = 2.09
b) Total Alkalinity (calc as $CaCO_3$) (mg/L) = 977
c) Total of Cations + Anions = 28683.3
(measured dissolved salts)

d) Theoretical Result of Evaporation Test = 27904
(From Electrical Conductivity)
e) 0.6 x Concentration of Bicarbonate ion* = 469.2
f) Theoretical Total Dissolved Salts d) + e) = 28373.2

QUALITY CONTROL COMMENTS

Item	Actual Value	Acceptance Criteria	Satisfactory? (Yes/No)
Ion Balance (%) =	2.09	5%	Yes
Undetected ions % =	1.09	10%	Yes
(from comparison of measured vs theoretical salts derived from measured conductivity)			
Expected pH range		< 8.3	Yes
% difference between measured total dissolved solids and calc total dissolved salts (from ionic comp) =	na	5%	na

na = not applicable
nd = not detected
is = insufficent sample

If No - what action is recommended by Amdel

Petroleum Services

TABLE 1 - WATER ANALYSIS

JOB NUMBER: **LQ5795 - Part 2**

WELL / ID: Fenton Creek-1, DST-1, Sample 5
SAMPLE TYPE: Mud Filtrate
SAMPLE POINT: Reverse Circulation
DATE COLLECTED: 4/07/97
DATE RECEIVED: 21/04/97

FORMATION: -
INTERVAL: 1699-1704m
COLLECTED BY: Client

PROPERTIES:

pH (measured) = 8.35
Resistivity (Ohm.M @ 25°C) = 0.29
Electrical Conductivity (µS/cm @ 25°C) = 34200
Specific Gravity (S.G. @ 20°C) = na
Measured Total Dissolved Solids(Evap@180°C) mg/L = na
Measured Total Suspended Solids mg/L = na

CHEMICAL COMPOSITION

CATIONS		mg/L	meq/L	ANIONS		mg/L	meq/L
Ammonium	as NH_4	na	na	Bromide	as Br	na	na
Potassium	as K	8844	226.19	Chloride	as Cl	9775	275.35
Sodium	as Na	1362	59.24	Fluoride	as F	na	na
Barium	as Ba	na	na	Hydroxide	as OH	nd	nd
Calcium	as Ca	62.8	3.13	Nitrite	as NO_2	na	na
Iron	as Fe	na	na	Nitrate	as NO_3	nd	nd
Magnesium	as Mg	nd	nd	Sulphide	as S	na	na
Strontium	as Sr	na	na	Bicarbonate	as HCO_3	695	11.39
Boron	as B	na	na	Carbonate	as CO_3	195	6.50
				Sulphite	as SO_3	na	na
				Sulphate	as SO_4	nd	nd
Total Cations		10268.8	288.57	**Total Anions**		10665	293.25

DERIVED PARAMETERS

a) Ion Balance (Diff*100/Sum) (%) = 0.80
b) Total Alkalinity (calc as $CaCO_3$) (mg/L) = 896
c) Total of Cations + Anions = 20933.8
(measured dissolved salts)

d) Theoretical Result of Evaporation Test = 21888
(From Electrical Conductivity)
e) 0.6 x Concentration of Bicarbonate ion* = 417
f) Theoretical Total Dissolved Salts d) + e) = 22305

QUALITY CONTROL COMMENTS

Item	Actual Value	Acceptance Criteria	Satisfactory? (Yes/No)
Ion Balance (%) =	0.80	5%	Yes
Undetected ions % =	6.15	10%	Yes
(from comparison of measured vs theoretical salts derived from measured conductivity)			
Expected pH range		< 8.3	Yes
% difference between measured total dissolved solids and calc total dissolved salts (from ionic comp) =	na	5%	na

na = not applicable
nd = not detected
is = insufficent sample

If No - what action is recommended by Amdel

Petroleum Services

TABLE 1 - WATER ANALYSIS

JOB NUMBER: LQ5795 - Part 2

WELL / ID: Fenton Creek-1, DST-1, Sample 7
SAMPLE TYPE: Make Up Water
SAMPLE POINT: Rig Water
DATE COLLECTED: 4/07/97
DATE RECEIVED: 21/04/97

FORMATION: -
INTERVAL: -
COLLECTED BY: Client

PROPERTIES:

pH (measured) = 7.72
Resistivity (Ohm.M @ 25°C) = 10.96
Electrical Conductivity (µS/cm @ 25°C) = 912
Specific Gravity (S.G. @ 20°C) = na
Measured Total Dissolved Solids(Evap@180°C) mg/L = na
Measured Total Suspended Solids mg/L = na

CHEMICAL COMPOSITION

CATIONS		mg/L	meq/L	ANIONS		mg/L	meq/L
Ammonium	as NH_4	na	na	Bromide	as Br	na	na
Potassium	as K	187	4.78	Chloride	as Cl	387	10.90
Sodium	as Na	37.3	1.62	Fluoride	as F	na	na
Barium	as Ba	na	na	Hydroxide	as OH	nd	nd
Calcium	as Ca	18.8	0.94	Nitrite	as NO_2	na	na
Iron	as Fe	na	na	Nitrate	as NO_3	nd	nd
Magnesium	as Mg	3.4	0.28	Sulphide	as S	na	na
Strontium	as Sr	na	na	Bicarbonate	as HCO_3	199	3.26
Boron	as B	na	na	Carbonate	as CO_3	nd	nd
				Sulphite	as SO_3	na	na
				Sulphate	as SO_4	127	2.64
Total Cations		246.5	7.62	**Total Anions**		713	16.81

DERIVED PARAMETERS

a) Ion Balance (Diff*100/Sum) (%) = 37.60
b) Total Alkalinity (calc as $CaCO_3$) (mg/L) = 163
c) Total of Cations + Anions = 959.5
(measured dissolved salts)

d) Theoretical Result of Evaporation Test = 583.68
(From Electrical Conductivity)
e) 0.6 x Concentration of Bicarbonate ion* = 119.4
f) Theoretical Total Dissolved Salts d) + e) = 703.08

QUALITY CONTROL COMMENTS

Item	Actual Value	Acceptance Criteria	Satisfactory? (Yes/No)
Ion Balance (%) =	37.60	5%	No - Recommend further testing
Undetected ions % =	36.47	10%	Yes
(from comparison of measured vs theoretical salts derived from measured conductivity)			
Expected pH range		< 8.3	Yes
% difference between measured total dissolved solids and calc total dissolved salts (from ionic comp) =	na	5%	na

na = not applicable
nd = not detected
is = insufficent sample

If No - what action is recommended by Amdel

Amdel
Petroleum Services

TABLE 1 - WATER ANALYSIS

JOB NUMBER: **LQ5795 - Part 2**

WELL / ID: Fenton Creek-1, RFT Sample 1
SAMPLE TYPE: Water
SAMPLE POINT: Large Sample Chamber
DATE COLLECTED: -
DATE RECEIVED: 21/04/97

FORMATION: -
INTERVAL: 1662m
COLLECTED BY: Client

PROPERTIES:

pH (measured) = 7.28
Resistivity (Ohm.M @ 25°C) = 0.20
Electrical Conductivity (µS/cm @ 25°C) = 50600
Specific Gravity (S.G. @ 20°C) = na
Measured Total Dissolved Solids(Evap@180°C) mg/L = na
Measured Total Suspended Solids mg/L = na

CHEMICAL COMPOSITION

CATIONS		mg/L	meq/L	ANIONS		mg/L	meq/L
Ammonium	as NH_4	na	na	Bromide	as Br	na	na
Potassium	as K	14738	376.93	Chloride	as Cl	17401	490.17
Sodium	as Na	2564	111.53	Fluoride	as F	na	na
Barium	as Ba	na	na	Hydroxide	as OH	nd	nd
Calcium	as Ca	362	18.06	Nitrite	as NO_2	na	na
Iron	as Fe	na	na	Nitrate	as NO_3	nd	nd
Magnesium	as Mg	39.9	3.28	Sulphide	as S	na	na
Strontium	as Sr	na	na	Bicarbonate	as HCO_3	854	14.00
Boron	as B	na	na	Carbonate	as CO_3	nd	nd
				Sulphite	as SO_3	na	na
				Sulphate	as SO_4	55	1.15
Total Cations		17703.9	509.81	**Total Anions**		18310	505.31

DERIVED PARAMETERS

a) Ion Balance (Diff*100/Sum) (%) = 0.44
b) Total Alkalinity (calc as $CaCO_3$) (mg/L) = 700
c) Total of Cations + Anions = 36013.9
(measured dissolved salts)

d) Theoretical Result of Evaporation Test = 32384
(From Electrical Conductivity)
e) 0.6 x Concentration of Bicarbonate ion* = 512.4
f) Theoretical Total Dissolved Salts d) + e) = 32896.4

QUALITY CONTROL COMMENTS

Item	Actual Value	Acceptance Criteria	Satisfactory? (Yes/No)
Ion Balance (%) =	0.44	5%	Yes
Undetected ions % =	9.48	10%	Yes
(from comparison of measured vs theoretical salts derived from measured conductivity)			
Expected pH range		< 8.3	Yes
% difference between measured total dissolved solids and calc total dissolved salts (from ionic comp) =	na	5%	na

na = not applicable
nd = not detected
is = insufficent sample

If No - what action is recommended by Amdel

Amdel
Petroleum Services

TABLE 1 - WATER ANALYSIS

JOB NUMBER: **LQ5795 - Part 2**

WELL / ID: Fenton Creek-1, RFT Sample 2
SAMPLE TYPE: Water
SAMPLE POINT: Small Sample Chamber
DATE COLLECTED: -
DATE RECEIVED: 21/04/97

FORMATION: -
INTERVAL: 1665m
COLLECTED BY: Client

PROPERTIES:

pH (measured) = 7.22
Resistivity (Ohm.M @ 25°C) = 0.20
Electrical Conductivity (µS/cm @ 25°C) = 49900
Specific Gravity (S.G. @ 20°C) = na
Measured Total Dissolved Solids(Evap@180°C) mg/L = na
Measured Total Suspended Solids mg/L = na

CHEMICAL COMPOSITION

CATIONS		mg/L	meq/L
Ammonium	as NH_4	na	na
Potassium	as K	11025	281.97
Sodium	as Na	4653	202.39
Barium	as Ba	na	na
Calcium	as Ca	1523	76.00
Iron	as Fe	na	na
Magnesium	as Mg	52.6	4.33
Strontium	as Sr	na	na
Boron	as B	na	na
Total Cations		17253.6	564.69

ANIONS		mg/L	meq/L
Bromide	as Br	na	na
Chloride	as Cl	17723	499.24
Fluoride	as F	na	na
Hydroxide	as OH	nd	nd
Nitrite	as NO_2	na	na
Nitrate	as NO_3	nd	nd
Sulphide	as S	na	na
Bicarbonate	as HCO_3	596	9.77
Carbonate	as CO_3	nd	nd
Sulphite	as SO_3	na	na
Sulphate	as SO_4	48	1.00
Total Anions		18367	510.01

DERIVED PARAMETERS

a) Ion Balance (Diff*100/Sum) (%) = 5.09
b) Total Alkalinity (calc as $CaCO_3$) (mg/L) = 489
c) Total of Cations + Anions = 35620.6
(measured dissolved salts)

d) Theoretical Result of Evaporation Test = 31936
(From Electrical Conductivity)
e) 0.6 x Concentration of Bicarbonate ion* = 357.6
f) Theoretical Total Dissolved Salts d) + e) = 32293.6

QUALITY CONTROL COMMENTS

Item	Actual Value	Acceptance Criteria	Satisfactory? (Yes/No)
Ion Balance (%) =	5.09	5%	No - Recommend further testing
Undetected ions % =	10.30	10%	Yes
(from comparison of measured vs theoretical salts derived from measured conductivity)			
Expected pH range		< 8.3	Yes
% difference between measured total dissolved solids and calc total dissolved salts (from ionic comp) =	na	5%	na

na = not applicable
nd = not detected
is = insufficent sample

If No - what action is recommended by Amdel

APPENDIX IX: PALYNOLOGICAL ANALYSIS

PE900749

This is an enclosure indicator page.
The enclosure PE900749 is enclosed within the container PE900817 at this location in this document.

The enclosure PE900749 has the following characteristics:

ITEM_BARCODE	= PE900749
CONTAINER_BARCODE	= PE900817
NAME	= Palynomorph Range Chart
BASIN	= OTWAY
PERMIT	= PEP 108
TYPE	= WELL
SUBTYPE	= DIAGRAM
DESCRIPTION	= Palynomorph Range Chart, Relative Abundance by Lowest Appearance (enclosure of WCR) for Fenton Creek-1
REMARKS	=
DATE_CREATED	= 27/05/97
DATE_RECEIVED	=
W_NO	= W1192
WELL_NAME	= Fenton Creek-1
CONTRACTOR	=
CLIENT_OP_CO	= Santos

(Inserted by DNRE - Vic Govt Mines Dept)

Palynological analysis of sidewall cores from Fenton Creek-1, Port Campbell Embayment Otway Basin.

by

Alan D. Partridge

Biostrata Pty Ltd
A.C.N. 053 800 945

Biostrata Report 1997/11

27 May 1997

Palynological analysis of sidewall cores from Fenton Creek–1, Otway Basin.

by Alan D. Partridge

Table of Contents

INTERPRETATIVE DATA

BASIC DATA

ATTACHMENT

INTERPRETATIVE DATA

Summary

Twenty-five sidewall core samples were analysed in Fenton Creek–1 with the focus of the palynological investigation concentrated on the Upper Cretaceous Sherbrook Group. Only two samples of Albian age were analysed from the underlying Eumeralla Formation. The palynological zones, their ages and suggested correlations to established stratigraphic units are summarised in the following Table 1.

Additional interpretative data on all samples including zone identification and Confidence Ratings are recorded in Table 2, whilst basic data on sidewall core lithologies, visual residue yields, preservation and species diversity are recorded on Table 3. Counts of the assemblages are presented on Table 4 and distribution of all identified palynomorphs are presented on the accompanying range chart.

Materials and Methods

The palynological slides were prepared in the Santos Ltd palynological laboratory and received by the author in two batches on the 7th and 13th May 1997. Provisional reports were submitted on the 8th and 15th May. For most samples the oxidised slides separated using 1.65 specific gravity zinc bromide were the only slides both scanned and counted. The counts were mostly made under a x40 objectives to be confident of picking up all specimens of the smaller palynomorphs. On some samples, where the residue were sparsely or unevenly distributed on the slides, it was necessary to partially count the slides using a x25 objective. The counts were all terminated when just over 100 specimens of spores and pollen had been counted. Only on the slides with the best preservation and concentration of specimens are significantly larger counts provided. The counts give a good approximation of the changes in the abundance of the major species groups in the assemblages but are only considered accurate to ±5%.

Although the calculated yield from processing was mostly low the visual yield of residue on the palynological slides was overall moderate to high, certainly sufficient to record high diversity spore-pollen assemblages and moderate diversity microplankton assemblages from most of the samples. Palynomorph preservation was somewhat variable but mostly fair. Recorded spore-pollen diversity ranged from 17 to 44 species and averaged 29+ species per sample over the whole section, while recorded microplankton diversity ranged 4 to 21 species and averaged 10+ species per sample through the Sherbrook Group (Table 3).

Table–1: Palynological summary for Fenton Creek–1

AGE	LITHOLOGICAL UNIT	SPORE–POLLEN ZONES (Subzones)	MICROPLANKTON ZONES (Subzones)
EARLY EOCENE TO LATE PALEOCENE	PEMBER MUDSTONE 799–832.5m	NOT SAMPLED	NOT SAMPLED
LATE PALEOCENE	PEBBLE POINT FORMATION 832.5–851.5m	NOT SAMPLED	NOT SAMPLED
DANIAN TO MAASTRICHTIAN	K/T BOUNDARY SHALE 851.5–862m	NOT SAMPLED	NOT SAMPLED
MAASTRICHTIAN	WIRIDJIL FORMATION 862–893.5m	NOT SAMPLED	NOT SAMPLED
MAASTRICHTIAN to CAMPANIAN	Undifferentiated TIMBOON SAND and PAARATTE FORMATION 893.5–1198.5m	*N. senectus* and *F. sabulosus* Subzone 1118m	*N. aceras* 1118m
SANTONIAN	SKULL CREEK MUDSTONE 1198.5–1324m	Upper *T. apoxyexinus* 1320m	*I. cretaceum* and *I. rotundatum* Subzone 1320m
SANTONIAN	NULLAWARRE GREENSAND 1324–1417m	NOT SAMPLED	NOT SAMPLED
SANTONIAN to CONIACIAN	BELFAST MUDSTONE 1417–1524.5m	Upper *T. apoxyexinus* 1422m *P. mawsonii* 1498.5-1520m	*I. cretaceum* 1422m *I. balmei* Subzone 1498.5-1520m
TURONIAN	FLAXMAN FORMATION 1524.5–1552.5m including Banoon Member 1524.5–1527m	*P. mawsonii* 1524–1549m *G. ancorus* Subzone 1524–1543m	*P. infusorioides* 1524–1549m *K. polypes* Subzone 1524–1549m
TURONIAN	WAARRE FORMATION 1552.5–1655m Subdivided into Unit C 1552.5m–1612.5m Unit B 1612.5–1624m Unit A 1624–1655m	*P. mawsonii* 1566–1654m *L. musa* Subzone 1566–1567m *H. trinalis* Subzone 1622–1654m	*P. infusorioides* 1566–1654m *I. evexus* Subzone 1566–1567m *C. edwardsii* Acme 1622–1654m
LATE ALBIAN	EUMERALLA FORMATION 1655–1840m	*P. pannosus* 1790.5–1810m	Indeterminate Non-marine

T.D. 1840m

Geological Comments

1. The sequence sampled in Fenton Creek–1, with minor modifications, can be readily assigned to the Mesozoic spore-pollen and microplankton zones defined by Helby *et al.* (1987) with further resolution provided by subzones recognised by McMinn (1988) and Partridge (1997). The time interval sampled is from the Late Albian to Early Campanian.

2. The spore-pollen zones identified conform to the succession in the Otway Basin first established by Dettmann & Playford (1969), and modified by Helby *et al.* (1987), except that the *P. mawsonii* Zone can now be demonstrated to extend to the base of the Waarre Formation. The *A. distocarinatus* Zone originally established by Dettmann & Playford (1969) and subsequently redefined by Helby *et al.* (1987) is considered to be absent at the unconformity between the Waarre and Eumeralla Formations. This latter result confirms recent review work in the Port Campbell Embayment where the index species *Clavifera triplex* and *Phyllocladidites mawsonii* have been found in all examined wells to range to the base of the Waarre Formation (Partridge, 1996a;1997).

   The implications of this discovery is that all sections assigned to the *A. distocarinatus* Zone in the Otway Basin actually belongs to the *P. mawsonii* Zone and consequently there are no sediments of proven Cenomanian age currently recognised in the Otway Basin. In manuscripts currently in preparation it is proposed to abandon the use of the *A. distocarinatus* Zone and replace it with the *Hoegisporis uniforma* Zone for the revised "Cenomanian" concept of the zone as redefined by Helby *et al.*, (1987).

   In many wells in the Otway Basin the top of *A. distocarinatus* Zone, which has usually been picked at the youngest occurrence of *Appendicisporites distocarinatus*, approximates the top of the new *H. trinalis* Subzone. This stratigraphic level corresponds to about the last or youngest **consistent**, frequent to common occurrences of *A. distocarinatus*. Unfortunately, sporadic, inconsistent and rare occurrences of *A. distocarinatus* are recorded as high as the top of the new *G. ancorus* Subzone as has been recorded in this well. These latter records are the reason why the previously recorded tops for the *A. distocarinatus* Zone is often irregular or time diachronous with respect to log correlations and stratigraphic units. Many of these younger records are believed to represent reworked specimens.

3. Marine microplankton first appear in Fenton Creek–1 in the basal sample analysed from the Waarre Formation and thereafter are found in all samples analysed from the Sherbrook Group. It is therefore reasonable to conclude (with the exception perhaps of some of the sands) that the entire Sherbrook Group was deposited in marine environments. Except for the low diversity microplankton assemblage recorded at 1200m all samples from the Sherbrook Group were successfully assigned to microplankton zones.

4. Commencing from total depth the oldest unit penetrated in Fenton Creek–1 is the Eumeralla Formation at the top of the Otway Group. The two deep sidewall cores at 1790m and 1810m both gave typical Eumeralla assemblages which are assigned to the *P. pannosus* Zone. As no microplankton were identified in either sample both are considered to represent deposition in fluviatile environments. The 12 sidewall cores recovered between 1790m and top of the formation were either barren or gave only low palynomorph recoveries and were not analysed for this report.

5. The log pick for the top of the Eumeralla Formation at 1655m lies immediately below the first good assemblage from the Waarre Formation at 1654m. The occurrence of marine dinoflagellates immediately above the top of Otway unconformity (in this case one metre above) is consistent with all other wells in the Otway Basin where there is close sampling across this unconformity. The final erosion on this surface, prior to deposition of the marine Waarre Formation, is therefore interpreted as a classic ***plain of marine denudation*** (Bates & Jackson, 1987; p.507).

6. The 102 metre thick Waarre Formation identified between 1552.5–1655m is subdivided into the three units recognised by Buffin (1989) using both electric logs and palynological data. Unit A, containing the basal sands is identified between 1624–1654m while Unit B is considered to be restricted to the shale between 1612.5–1624m. The palynomorph assemblages from these two units are dominated by spores with different species prominent in each of the samples. The samples also contain frequent to common marine dinoflagellate assemblages (average 7% of combined SP and MP counts) which are of low diversity. Overall the environment of deposition is marine but probably near shore and shallow water with possibly some lagoonal or estuarine environments near the base of the section. Units A and B belong to the new *H. trinalis* Subzone of the *P. mawsonii* spore-pollen Zone and the new *C. edwardsii* Acme of the *P. infusorioides* microplankton Zone both of which are assigned an early Turonian age.

7. A 60 metre thick Unit C of the Waarre Formation is identified between 1552.5–1612.5m but only the two closely spaced claystone sidewall core samples at 1566m and 1567m were analysed for palynology. The recorded assemblages are assigned to the new *L. musa* spore-pollen Subzone and *I. evexus* microplankton Subzone and both are dominated by the enigmatic microplankton or algal cyst *Amosopollis cruciformis* which averages 37% of total assemblage count. This cyst has been found in abundance associated with both marine dinoflagellates in the Otway Basin and with the endemic non-marine algal cyst assemblages found in the Turonian large lakes of the Gippsland and Bass Basins (Marshall, 1989; Partridge, 1996b). In Fenton Creek–1 deposition of the shale unit between 1564–1568m is interpreted to have occurred in a very shallow marine to brackish marginal marine environment. Relative to the underlying Units A and B, and the overlying Flaxman Formation, Unit C is more regressive in character. This is consistent with its higher sand ratio.

   It is also tentatively suggested that Unit C can be subdivided into Unit Ca between 1594–1612.5m and Unit Cb between 1552.5–1594m following Partridge (1997). If Fenton Creek-1 behaves like other wells the LAD of *Hoegisporis trinalis* n.sp. should occur in one or all of the thin shale beds at 1586m, 1603m and 1605m and a sequence boundary could be placed at 1585m.

8. A 28 metre thick Flaxman Formation is identified in Fenton Creek–1 between 1524.5–1552.5m. All samples gave palynological assemblages which are confidently assigned to the middle part of the *P. mawsonii* Zone and upper part of the *P. infusorioides* microplankton Zone. They can be more precisely assigned to the new *K. polypes* microplankton Subzone. The equivalent new *G. ancorus* spore-pollen Subzone is however only confidently identified between 1524–1543m. Both subzones provide confident biostratigraphic correlation to the recently reviewed and revised type section of the Flaxman Formation in Port Campbell–2 (Partridge, 1996a; Kelly & Partridge, 1997).

9. A 2.5 metre thick sandstone identified between 1524.5–1527m at the top of the Flaxman Formation, based on sidewall core lithology and the electric logs, is assigned to the Banoon Member recently proposed by Kelly & Partridge (1997). Palynology supports a correlation to the type section of the Banoon Member in Flaxman–1 based on the presence of the characteristic *Cupressacites* pollen spike (Kelly & Partridge, 1997). The sidewall cores at 1524m and 1526.5m which are described as "dark greenish

grey sandstone" will however need to be checked by petrology to confirm whether they contain authigenic chamosite and goethite considered diagnostic of this new member (Kelly & Partridge, 1997). The shallower sample at 1524m lies above the log pick for the top of the member. This may reflect a slight inaccuracy in the sampling depth or could be interpreted as reworking at the base the Belfast Mudstone. The latter is suggested by the mutual occurrence of *Kiokansium polypes* and *Valensiella griphus* in an assemblage dominated by *Trithyrodinium* sp., a species which is considered more typical of the overlying *I. balmei* Subzone.

10. A 107 metre thick Belfast Mudstone is identified between 1417–1524m based on biostratigraphic criteria established by Partridge (1996a). The three samples analysed confirm a Coniacian age at the base and a Late Santonian age at the top. In biostratigraphic terms the two deepest samples between 1498.5–1520m are assigned to the *I. balmei* Subzone of the *C. striatoconus* microplankton Zone as identified by McMinn (1988). Unfortunately the eponymous species for both the *C. striatoconus* Zone and the new *C. vultuosus* spore-pollen Subzone were not recorded in either sample. Above these two samples is a ~100m sampling gap before the sample at 1422m near the top of the formation which is assigned to the *I. cretaceum* microplankton Zone and Upper *T. apoxyexinus* spore-pollen Zone. The Upper subdivision of the latter zone is based on the increase in *Proteacidites* species abundance which is similar to that found in the type section of the Belfast Mudstone in Port Campbell-1 (Partridge, 1996a).

The Belfast Mudstone could not be confidently subdivided on the limited palynological sampling available, however it possible that the gamma/sonic spike at 1458m could represent a significant boundary in the formation which may correlate to the sequence boundary at the top of the informal Morum Member recognised in the Gambier Embayment (Partridge, 1997). The sonic spike and more subtle gamma change at 1452m may also be significant.

11. A 93 metre thick Nullawarre Greensand is identified on the electric logs between 1324–1417m but unfortunately was not analysed. This is overlain by a 125 metre thick Skull Creek Mudstone (GSV, 1995) between 1198.5–1324m which is sampled near its base and top. The occurrence of the new *I. rotundatum* microplankton Subzone of the *I cretaceum* Zone at the base of the formation is consistent with current data in other wells. The base of the overlying *N. aceras* microplankton is also known from other wells to lie within the Skull Creek Mudstone but precisely where is uncertain. The

sample at 1200m unfortunately does not help as key species were not found in a moderate diversity spore-pollen assemblage. Overall very little detailed palynological work has been undertaken at this stratigraphic level in the Sherbrook Group within the Port Campbell Embayment because of a current emphasis on detailed sampling of the older formations.

12. The shallowest sample analysed in Fenton Creek–1 at 1118m is from within the Paaratte Formation and is Early Campanian in age (*N. senectus* and *N. aceras* Zones). Unfortunately lack of palynological control and the overall similarity in the electric log signature makes it difficult to distinguish the Paaratte Formation from the overlying Timboon Sand so therefore this interval is left undifferentiated.

Biostratigraphy

The zone and age determinations are based on the Australia wide Mesozoic spore-pollen and microplankton zonation schemes described by Helby *et al.* (1987) with further resolution provided by the subzones recognised by McMinn (1988) and Partridge (1997). Author citations for most spore-pollen species can be sourced from Helby *et al.* (1987), Dettmann (1963), Stover & Partridge (1973) or other references cited herein, whilst author citations for dinoflagellates can be found in the index of Lentin & Williams (1993). Species names followed by "ms" or "n.sp." are unpublished manuscript names.

SPORE-POLLEN ZONES

***Nothofagidites senectus* spore–pollen Zone**
***Forcipites sabulosus* spore-pollen Subzone**
Sample at: 1118.0 metres.
Age: Early Campanian.
This angiosperm dominated assemblage with abundant *Proteacidites* spp. (37%) is assigned to the *N. senectus* Zone on the frequent occurrence *Forcipites sabulosus* (~4%). The frequent to common occurrence of the latter species and absence of *Gambierina rudata* defines the *F. sabulosus* Subzone within the lower part of the *N. senectus* Zone.

The sample at 1200m unfortunately only gave a small residue yield. Although a moderate diversity spore-pollen assemblage was recorded the absence of key index species means the sample can only be assigned to the interval of the *N. senectus* to *T. apoxyexinus* Zones.

Environment of deposition of both samples is considered marine although probably shallow water and near-shore.

***Tricolporites apoxyexinus* spore–pollen Zone**
Interval: 1320.0–1422.0 metres.
Age: Late Santonian.

Two samples are assigned to this zone on the occurrence of *Tricolporites apoxyexinus* in both samples, presence of *Ornamentifera sentosa* in the shallower sample, and absence of younger index species. The significant abundance of *Proteacidites* spp. in both samples (average 10%) suggests a position high in the spore-pollen zone and this is confirmed by the associated microplankton which are assigned to the *I. cretaceum* microplankton Zone. Aside from being characterised by an overall increase in angiosperm pollen (average 25%) both samples have abundant bisaccate pollen assigned to *Podocarpidites/Alisporites* spp. (average 24%) and common *Gleicheniidites/Clavifera* spores (average 12%).

Both samples contain common microplankton of moderate diversity and are likely to have been deposited in an offshore marine environment in moderate water depths (~mid to outer shelf).

***Phyllocladidites mawsonii* spore–pollen Zone**
Interval: 1498.5-1654.0 metres.
Age: Coniacian–Turonian.

Nineteen samples over an interval of 155+ metres are assigned to the *P. mawsonii* Zone in the lower third of the Sherbrook Group in Fenton Creek–1. The index species *Phyllocladidites mawsonii* is very rare and recorded from only the lowest 2 of the 5 deepest samples, but is consistent, varying from rare to common, in the 14 shallowest samples. *Clavifera triplex* the index species originally proposed by Dettmann & Playford (1969) for this zone interval is also recorded from 2 of the 5 deepest samples and 9 of the next 14 samples. It tends to be rarer than *P. mawsonii* in the assemblages. Further details of these assemblages are discussed under the new subzones.

***Gleicheniidites ancorus* spore-pollen Subzone**
Interval: ?1498.5m to 1524.0–1543.0m to ?1549.0 metres.
Age: Late Turonian to Coniacian?.

The *G. ancorus* Subzone is the interval between the last consistent and frequent occurrence of *Laevigatosporites musa* n.sp. (which is also approximately the local FAD of *Gleicheniidites ancorus* n.sp.) to the FAD of *Clavifera vultuosus* n.sp. This new subzone is confidently recognised in the Flaxman Formation between 1524–1543m on the presence of the *Gleicheniidites ancorus* n.sp. The eponymous species was not found in the three deepest samples from the between 1544.5-1549m and

it is dubious whether the two samples from the basal Belfast Mudstone which contain *G. ancorus* but lack *Clavifera vultuosus* n.sp. should be assigned to this zone. The upper part of the subzone between 1524–1530m is also characterised by an common *Cupressacites* pollen (7% to 14%). The continued presence of *Rugulatisporites admirabilis* ms and rare specimens of *Appendicisporites distocarinatus* are considered as secondary features characteristic of this subzone. The rare occurrences of *Laevigatosporites musa* ms at 1533.5m, 1543m and 1548m are considered atypical.

The composition of all assemblages from the upper part of the *P. mawsonii* Zone between 1498.5m to 1549m is also distinctive. With exception of low yielding sample at 1538m all samples are dominated by gymnosperm pollen (average 64%). The most conspicuous increase is in the abundance of *Araucariacites* and *Dilwynites* pollen which combined average 26% of the spore-pollen count through this interval. Based on work in the Gippsland Basin were high counts of *Dilwynites* pollen correlate directly to high microplankton abundances (Partridge, 1989) it is empirically deduced that high *Dilwynites* and *Araucariacites* abundances in marine or lacustrine assemblages are a manifestation of a "Neves Effect" on the assemblages (Traverse, 1988: p.413). This suggests that the Flaxman Formation and basal Belfast Mudstone in Fenton Creek–1 have been deposited in distal offshore environments, which may also have been fairly deep. These observations are consistent with the higher microplankton abundances and species diversities over this interval in Fenton Creek–1.

***Laevigatosporites musa* spore–pollen Subzone**
Interval: 1566–1567.0 metres.
Age: Mid? Turonian.

The *L. musa* Subzone is defined as the interval between the LAD for *H. trinalis* ms and the last consistent appearances of *Laevigatosporites musa* ms within the *P. mawsonii* Zone. In Fenton Creek–1 only the two closely spaced samples at 1566m and 1567m are assigned to the subzone. The assemblages are dominated by *Podocarpidites/Alisporites* spp. (~27%), *Cyathidites* spp. (19%) and *Gleicheniidites* spp. (11%). Contrast also the dominance of gymnosperm pollen in these two samples (average 57%) with the dominance of spores (average 68%) in the count of the samples from the underlying *H. trinalis* Subzone (Table 4).

In the Port Campbell Embayment this zone is found in the upper part of the Unit C of the Waarre Formation. Unfortunately definition of the top of the subzone is somewhat problematical as it is obscured by poor sampling associated with the unconformity and major facies change between the Waarre and Flaxman Formations.

***Hoegisporis trinalis* spore-pollen Subzone**
Interval: 1622.0–1654.0 metres.
Age: Early? Turonian.

The *H. trinalis* Subzone is defined as the interval from the LAD of *Hoegisporis uniforma* to the LAD of *H. trinalis* ms. It is recorded in the five deepest samples from the Sherbrook Group in Fenton Creek–1 over an interval of 32 metres. The zone is characterised by the rare but consistent occurrences of the eponymous species in each sample together with consistent occurrences of *Appendicisporites distocarinatus* (in all samples), *Rugulatisporites admirabilis* ms (in 4 of 5 samples) and *Laevigatosporites musa* ms (in 3 of 5 samples). The presence of very rare specimens of *Phyllocladidites mawsonii* at 1650.5m and 1654m and *Clavifera triplex* at 1650.5m and 1635m confirms that the interval still belongs to the *P. mawsonii* Zone.

The assemblages have similar compositions on counts being dominated by the species groups *Gleicheniidites* (average 20%), *Cyathidites* (average 18%), *Podocarpidites/Alisporites* (average 11%) and *Araucariacites/Dilwynites* (average ~9%). The consistent high abundance of *Gleicheniidites* (from 6% to 44%) is a key compositional feature which distinguishes assemblages from the basal Sherbrook Group from those of the underlying Eumeralla Formation. Average spore-pollen diversity in the subzone is 35+ species with a total species diversity of 50+ species.

The *H. trinalis* Subzone has previously been documented from Units A, B and basal part of Unit C of the Waarre Formation (Partridge, 1994).

***Pimopollenites pannosus* spore-pollen Zone.**
Interval: 1790.5–1810.0 metres
Age: Late Albian.

The two sample analysed from the Eumeralla Formation gave very low yield, spore dominated residues in which *Cyathidites* spp. (34%), and *Baculatisporites/ Osmundacidites* spp. (25%) were the dominant species complexes. The gymnosperm pollen were dominated by *Alisporites/Podocarpidites* spp. (17%) with *Corollina* spp. showing a secondary but distinct abundance averaging ~4%. This latter species abundance has proved to be a key difference in distinguishing between assemblages from the Eumeralla and Waarre Formation even in spore dominated assemblages like those found near the base of the latter formation in Fenton Creek–1. In this well fortunately the samples can be confidently assigned to the *P. pannosus* Zone on the rare presence of the eponymous species.

MICROPLANKTON ZONES

***Nelsoniella aceras* microplankton Zone.**
Sample at 1118 metres.
Age: Early Campanian.
The shallowest samples analysed can be assigned to the *N. aceras* Zone on the presence of a single specimen of the eponymous species. Other species in the low diversity microplankton assemblage are not considered zone diagnostic. The underlying sample at 1200m also contains a low diversity microplankton assemblage which potentially could belong to this zone.

***Isabelidinium cretaceum* microplankton Zone.**
Interval: 1320.0–1422.0 metres.
Age: Late Santonian.
Multiple specimens of the eponymous species recorded from both samples confirm the zone assignment. The samples also contain a variety of morphologically related types many of which have been assigned to new subspecies by Marshall (1984). Most significant is *Isabelidinium belfastense* subsp. *rotundatum* which is here considered to be a separate species whose FAD defines the base of the new *I. rotundatum* Subzone. This subzone has previously been recorded from the Nullawarre Greensand and base of the overlying Skull Creek Mudstone (eg. Partridge, 1994), as is the case in Fenton Creek–1. Other subspecies recorded were *I. cretaceum* subsp. *contractum* and *I. cretaceum* subsp. *elongatum*, which were both found in the deeper sample. Although the *Isabelidinium* species show the most diversity, *Heterosphaeridium* species tend to dominate the assemblages counts.

***Isabelidinium balmei* microplankton Subzone.**
Interval: 1498.5–1520.0 metres.
Age: Coniacian.
The *Isabelidinium balmei* Interval Subzone was erected as a subzone of the *C. striatoconus* Zone by McMinn (1988) for the interval from the FAD for *I. balmei* to the FAD for *Gillinia hymenophora* and was considered to lie within the total range of *C. striatoconus*. In Fenton Creek–1 the two samples assigned to this zone contain *I. balmei* but lack *C. striatoconus* even though all slides from the two samples were searched. The samples may therefore be considered equivalent to the *C. striatoconus* Zone or may represent a previously unrecorded and slightly older interval in the Otway Basin between the FAD of *I. balmei* to the FAD *C. striatoconus*. Supporting the latter proposition is the lack of the spore *Clavifera vultuosus* n.sp. which on recent work in the Otway Basin appears to have a similar FAD to *C. striatoconus*. In Dunbar–1 the nearest well to Fenton Creek–1,

containing the *C. striatoconus* Zone, the eponymous species of the latter zone occurs with both *C. vultuosus* and *I. balmei* in a lower sample but *I. balmei* is missing from the association in an upper sample (Partridge, 1995). These differences in species associations may represent real range differences, or may just reflect serendipidous factors of sampling and palynology processing. Because of this uncertainty it is considered best to refrain from assigning the two samples in Fenton Creek–1 to the *C. striatoconus* Zone.

***Palaeohystrichophora infusorioides* microplankton Zone.**
Interval: 1524–1654.0 metres.
Age: Turonian.
Although the seventeen samples assigned to this zone only showed low diversity in the Waarre Formation (average 6+ species per sample) and moderate diversity in the Flaxman Formation (average 14+ species per sample) the total diversity over the interval is high with 40+ species recorded.

The zone was originally defined on negative criteria of the absence of the index species for the underlying and overlying zones (Helby *et al.*, 1987; p.62). In Fenton Creek–1, as in other wells in the Otway Basin, the characteristic species of the underlying Cenomanian *D. multispinum* Zone are not found. Such species looked for and not found included *Diconodinium multispinum, Pseudoceratium ludbrookiae, Litosphaeridium siphoniphorum* and *Canninginopsis denticulata*. The top of the zone is usually better defined as *Conosphaeridium striatoconus,* the index species for the overlying zone, has been recorded from wells in the Otway Basin, although not in this well. Within the *P. infusorioides* Zone in Fenton Creek–1 three subzones are recognised as described below:

***Kiokansium polypes* microplankton Subzone.**
Interval: 1524.0m? to 1526.5m–1549.0 metres.
Age: Late? Turonian.
In the Otway Basin this subzone is defined as the interval between the FAD of *Valensiella griphus* to the LAD of *Kiokansium polypes* which is usually concurrent with the LAD of *V. griphus*. In the Port Campbell–2 well this zone conforms exactly with the type section of the Flaxman Formation (Partridge, 1996a) and therefore its identification is used as a key method for confirming the presence of that formation. The zone is recorded from ten samples in which the index species are usually prominent components of the microplankton assemblages. *Valensiella griphus* ranges in abundance from 4% to 17% (average ~17%), and *Kiokansium polypes* ranges in abundance from <1% to 14% (average ~10%) of MP count. The most abundant marine dinoflagellate however is *Heterosphaeridium* spp. ranging in abundance from 4% to 38% (average ~17%). Although overall the

microplankton are common to abundant through the zone (10% to 59%; average 39% of total SP and MP count) a significant component of this abundance is the algal cyst *Amosopollis cruciformis* which varies from <1% to a maximum of 37% (average ~12%) of total SP and MP count. In what are otherwise relatively homogeneous microplankton assemblages, through the Flaxman Formation, this variation in abundance of *A. cruciformis* is interpreted to reflect some type of cyclical phenomenon. As *A. cruciformis* has been observed to occur in abundance in both non-marine and marine environments the changes in abundance in this instance could be reflecting influxes of fresh or brackish water containing *A. cruciformis* into the basin.

The top sample at 1524m is described as a greenish grey sandstone. This contrasts with its log character which appears to indicate a shale or claystone. The samples also lies just half a metre above the top of the Banoon Member picked at 1524.5m. It is therefore possible the recorded depth at which this sidewall core was shot may be slightly in error. Alternatively, the sample may represent a reworking and mixing event at the flooding surface at the base of the Belfast Mudstone. Supporting this latter interpretation is the high abundance of *Trithyrodinium* sp. cf *T.* sp. A of Marshall 1990 which represents 50% of the microplankton count. This species is not recorded in the underlying samples but is common in younger samples and therefore is potentially indicating the sample at 1524m should be assigned to the Belfast Mudstone.

Overall the Flaxman Formation assemblages have the highest abundance and diversity of microplankton of all the stratigraphic units analysed in Fenton Creek–1. The marked change in both abundance and diversity of marine microplankton compared to the underlying Waarre Formation is the reason the formation is interpreted to represent the base of the major flooding event as well as the base of the regional seal within the Port Campbell Embayment (Partridge, 1997). The environment of deposition at Fenton Creek–1 is interpreted to be outer shelf in fairly deep water.

***Isabelidinium evexus* microplankton Subzone.**
Sample at: 1566.0 metres.
Age: Late? Turonian.
This subzone is defined as the interval between the FAD of *Isabelidinium evexus* n.sp. to the local Otway Basin FAD of *Valensiella griphus*. The zone represents the oldest appearance in the Sherbrook Group succession of a small *Isabelidinium* species with a faint but distinct intercalary archeopyle (Type 2I). In Fenton Creek–1 this species is recorded in the shallowest sample analysed from the Waarre Formation, and from a few samples in the Flaxman Formation. The zone

is thought to be partly equivalent to the *Ascodinium parvum* Zone of Evans (1966, 1971). *Ascodinium parvum* although having a similar outline, is distinguished by its characteristic combination archeopyle involving both intercalary and apical paraplates. Unfortunately, this latter species has not been identified in any palynological studies on new wells drilled in the Otway Basin during the last five years. It is therefore concluded that the early records of *A. parvum* in the Otway Basin are all misidentifications. Another morphologically similar species is *Isabelidinium acuminatum* which can be distinguished from *I. evexus* by the presence of a small but distinct apical horn on the endocyst. Although *I. acuminatum* has been recorded in the Otway Basin by various palynologists I have never seen, nor can I confirm that any of the previously identified specimens actually have this apical horn which is so characteristic of the type specimens of *I. acuminatum.* In the absence of this distinguishing characteristic the option followed here is to assign all similar but distinct specimens to the new species *Isabelidinium evexus*. The zone based on such morphological criteria may then be partly equivalent to the *Isabelidinium acuminatum* Interval Zone of McMinn (1988), because small specimens of *Isabelidinium*, without a distinct apical horn on the endocyst, are included within McMinn's (1985) concept of *Isabelidinium acuminatum*.

The low diversity and abundance of marine dinoflagellates associated with abundant *Amosopollis cruciformis* in the samples at 1566m and 1567m is interpreted to indicate a shallow marine inner-shelf depositional environment.

Cribroperidinium edwardsii microplankton Acme Subzone.
Interval: 1622.0-1654.0 metres.
Age: Early? Turonian.

The *Cribroperidinium edwardsii* Acme Subzone was established for marine dinoflagellate assemblages found in the lower part of the Waarre Formation which are of relatively low diversity and low abundance, yet contain a dominance of the eponymous species (Partridge, 1994). In the five samples in Fenton Creek–1 referred to this zone average microplankton abundance is only ~7% and average diversity 7+ species per sample. In these assemblages *C. edwardsii* has an abundance ranging from 7% to 50% (average ~30%) of the total MP in what are very low assemblage counts (see Table 4). Although rarely dominant in the total palynomorph assemblages *C. edwardsii* is certainly the most conspicuous and often the dominant dinoflagellate, thereby justifying the use of the term Acme Zone. The LAD for *C. edwardsii* in the Port Campbell Embayment appears to be within or at the top of the Flaxman Formation, but as its occurrence in the latter formation is both rare and sporadic it is considered highly likely that most of these younger occurrences represent reworking. Because of this significant

difference between total range versus dominance in the assemblages the weight given to the records of *C. edwardsii* in early palynological reports in the Otway Basin should be treated with extreme caution unless there is some indication of the relative abundance of the species.

Environment of deposition during this zone in Fenton Creek–1 is interpreted to be shallow marine to marginal marine. The low abundance and diversity of the microplankton associated with coaly laminations and unusual high abundances of *Gleicheniidites* spores suggest that some deposition occurred landward of the palaeoshoreline in lagoons or estuaries (eg. SWC at 1650.5m which is an interbedded coal and claystone with 44% *Gleicheniidites*).

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Table–2: Interpretative Palynological Data for Fenton Creek–1								
Sample Type	**Depth (m)**	**Spore-Pollen Zone (and Subzone)**	**CR**	**Microplankton Zone (and Subzone)**	**CR**	**MP%**	**Ac%**	**Key Species Present**
SWC 48	1118.0	*N. senectus*	B2	*N. aceras*	B3	~4%	1%	FAD of *Forcipites sabulosus* at ~4% *Proteacidites* spp. abundant at 37%.
SWC 47	1200.0	*N. senectus* to *T. apoxyexinus*				~6%	NR	Low yield sample without key species. *Proteacidites* spp. common at 11%.
SWC 46	1320.0	*T. apoxyexinus* (Upper)	B1	*I. cretaceum* *(I. rotundatum)*	B2	7%	2%	FAD of *Isabelidinium rotundatum* ms. *Proteacidites* spp. common at 9%
SWC 45	1422.0	*T. apoxyexinus* (Upper)	B1	*I. cretaceum*	B2	13%	1%	FAD of *Tricolporites apoxyexinus* *Proteacidites* spp. common at 12%
SWC 44	1498.5	*P. mawsonii*	B1	*I. balmei*	B2	24%	14%	*Cupressacites* pollen decreasing at ~3% *Proteacidites* spp. rare at <1%.
SWC 43	1520.0	*P. mawsonii*	B1	*I. balmei*	B3	11%	9%	FAD of *Isabelidinium balmei* *Cupressacites* pollen spike of 14%
SWC 42	1524.0	*P. mawsonii* *(G. ancorus)*	B1	*P. infusorioides* *(K. polypes)*	B2	20%	<1%	LAD of *Kiokansium polypes* *Cupressacites* pollen spike of ~8%
SWC 41	1526.5	*P. mawsonii* *(G. ancorus)*	B2	*P. infusorioides* *(K. polypes)*	B2	10%	2%	*Cupressacites* pollen spike of 13% *Dilwynites* spp. abundant at 50%
SWC 40	1530.0	*P. mawsonii* *(G. ancorus)*	B1	*P. infusorioides* *(K. polypes)*	B3	12%	3%	FAD of *Tanyosphaeridium salpinx* *Cupressacites* pollen spike of 7%.
SWC 39	1533.5	*P. mawsonii* *(G. ancorus)*	B1	*P. infusorioides* *(K. polypes)*	B2	49%	23%	LAD of *Laevigatosporites musa* ms *Cupressacites* pollen increasing at ~3%
SWC 38	1535.5	*P. mawsonii* *(G. ancorus)*	B1	*P. infusorioides* *(K. polypes)*	B2	43%	15%	*Cupressacites* pollen not recorded in count.
SWC 37	1538.0	*P. mawsonii* *(G. ancorus)*	B2	*P. infusorioides* *(K. polypes)*	B3	44%	10%	Low yield sample with poor assemblage. LAD of *Rugulatisporites admirabilis* ms
SWC 36	1543.0	*P. mawsonii* *(G. ancorus)*	B1	*P. infusorioides* *(K. polypes)*	B2	52%	37%	FAD of *Gleicheniidites ancorus* ms
SWC 35	1544.5	*P. mawsonii*	B1	*P. infusorioides* *(K. polypes)*	B2	51%	19%	Maximum MP diversity of 21+ species. *Heterosphaeridium* spp. 24% of MP count.
SWC 34	1548.0	*P. mawsonii*	B1	*P. infusorioides* *(K. polypes)*	B2	58%	5%	Maximum MP diversity of 20+ species. *Heterosphaeridium* spp. 22% of MP count.

Table–2: Interpretative Palynological Data for Fenton Creek–1

Sample Type	Depth (m)	Spore-Pollen Zone (and Subzone)	CR	Microplankton Zone (and Subzone)	CR	MP%	Ac%	Key Species Present
SWC 33	1549.0	*P. mawsonii*	B1	*P. infusorioides (K. polypes)*	B2	46%	12%	*Heterosphaeridium* spp. 38% of MP count. Base of marine flooding event.
SWC 31	1566.0	*P. mawsonii (L. musa)*	B1	*P. infusorioides (I. evexus)*	B3	45%	40%	LAD of consistent *Laevigatosporites musa* ms FAD of *Isabelidinium evexus* ms.
SWC 30	1567.0	*P. mawsonii (L. musa)*	B1	*P. infusorioides*	B3	36%	33%	Oldest occurrence of *Phyllocladidites mawsonii* in count at ~4%.
SWC 22	1622.0	*P. mawsonii (H. trinalis)*	B1	*P. infusorioides (C. edwardsii* Acme)	B3	12%	1%	LAD of *Hoegisporis trinalis* ms LAD of consistent *A. distocarinatus.*
SWC 21	1635.0	*P. mawsonii (H. trinalis)*	B1	*P. infusorioides (C. edwardsii* Acme)	B3	9%	1%	Maximum SP diversity of 42+ species. LAD of *Paleoperidinium cretaceum.*
SWC 19	1646.0	*P. mawsonii (H. trinalis)*	B1	*P. infusorioides (C. edwardsii* Acme)	B3	~5%	NR	*Cyathidites* spp. dominant at 34%. *H. trinalis* ms frequent at ~3%.
SWC 18	1650.5	*P. mawsonii (H. trinalis)*	B1	*P. infusorioides (C. edwardsii* Acme)	B3	7%	1%	*Glechnilidites* spp. at 44% dominant. FAD of *Clavifera triplex.*
SWC 17	1654.0	*P. mawsonii (H. trinalis)*	B1	*P. infusorioides (C. edwardsii* Acme)	B3	~3%	NR	FADs of *P. mawsonii, Hoegisporis trinalis* ms and *Appendicisporites distocarinatus.*
SWC 4	1790.5	*P. pannosus*	B2			NR	NR	*Cyathidites* spp. dominant at ~30% Rare *Phimopollenites pannosus* present.
SWC 2	1810.0	*P. pannosus*	B2			NR	NR	FAD of *Phimopollenites pannosus.* *Corollina* spp. conspicuous at 6.5%.

Abbreviations:

CR = Confidence Ratings

MP% = Microplankton as percentage of total MP and SP count

Ac% = *Amosopollis cruciformis* as percentage of total SP and MP count.

FAD = First Appearance Datum

LAD = Last Appearance Datum

NR = Not Recorded

Confidence Ratings

The Confidence Ratings assigned to the zone identifications on Table 2 are quality codes used in the STRATDAT relational database developed by the Australian Geological Survey Organisation (AGSO) as a National Database for interpretive biostratigraphic data. Their purpose is to provide a simple relative comparison of the quality of the zone assignments. The alpha and numeric components of the codes have been assigned the following meanings:

Alpha codes: Linked to sample type

- **A** Core
- **B** Sidewall core
- **C** Coal cuttings
- **D** Ditch cuttings
- **E** Junk basket
- **F** Miscellaneous/unknown
- **G** Outcrop

Numeric codes: Linked to fossil assemblage

1	**Excellent confidence:**	High diversity assemblage recorded with key zone species.
2	**Good confidence:**	Moderately diverse assemblage recorded with key zone species.
3	**Fair confidence:**	Low diversity assemblage recorded with key zone species.
4	**Poor confidence:**	Moderate to high diversity assemblage recorded without key zone species.
5	**Very low confidence:**	Low diversity assemblage recorded without key zone species.

Species Diversity

The use of relative diversity terms equate to the following number of species. Both spore-pollen and microplankton diversity excludes reworked or caved species in the samples

Very low	=	1–5	species
Low	=	6–10	species
Moderate	=	11–25	species
High	=	26–74	species
Very high	=	75+	species

Table–3: Basic Sample and Palynomorph Data for Fenton Creek-1							
Sample Type	**Depth (m)**	**Lithology**	**Visual Yield**	**Palynomorph Concentration**	**Preservation**	**Number SP Species**	**Number MP Species**
SWC 48	1118.0	SANDSTONE, light grey (60%) inter-bedded with dark grey CLAYSTONE (40%).	Moderate	Low	Fair-good	18	4
SWC 47	1200.0	SANDSTONE, light grey.	Very low	Very low	Poor-fair	25	4
SWC 46	1320.0	CLAYSTONE, dark brownish grey.	High	High	Poor-good	44	11
SWC 45	1422.0	CLAYSTONE, brownish black with common glauconitic.	High	High	Poor-fair	41	12
SWC 44	1498.5	CLAYSTONE, brownish black.	High	Low-high	Poor-fair	40	14
SWC 43	1520.0	CLAYSTONE, dark grey.	Moderate	Moderate	Poor-fair	34	9
SWC 42	1524.0	SANDSTONE, dark greenish grey.	High	Moderate	Poor-fair	30	16
SWC 41	1526.5	SANDSTONE, dark greenish grey.	Very low	High	Fair-good	19	10
SWC 40	1530.0	CLAYSTONE, dark grey.	Moderate	Low-moderate	Poor	21	8
SWC 39	1533.5	CLAYSTONE, dark grey.	High	Moderate	Poor-fair	28	19
SWC 38	1535.5	CLAYSTONE, dark grey.	High	High	Poor-fair	23	14
SWC 37	1538.0	CLAYSTONE, dark grey.	Very low	Low	Poor	14	8
SWC 36	1543.0	CLAYSTONE, dark grey.	High	High	Poor-fair	32	21
SWC 35	1544.5	CLAYSTONE, dark grey.	High	High	Poor-good	32	20
SWC 34	1548.0	CLAYSTONE, dark brownish grey.	High	High	Poor-good	33	17
SWC 33	1549.0	CLAYSTONE, dark brownish grey.	High	High	Fair	37	16
SWC 31	1566.0	CLAYSTONE, brownish black, carbonaceous.	Moderate	Moderate	Poor-fair	27	5
SWC 30	1567.0	CLAYSTONE, brownish black, carbonaceous.	Moderate	Moderate	Poor-fair	27	4
SWC 22	1622.0	CLAYSTONE, dark brownish grey.	Moderate	Low-Moderate	Fair-good	31	8
SWC 21	1635.0	CLAYSTONE, dark brownish grey with off-white SANDSTONE laminations.	Moderate	High	Fair-good	42	12
SWC 19	1646.0	CLAYSTONE, brownish black.	High	Low-high	Fair-good	41	5
SWC 18	1650.5	Interbedded COAL and brownish black CLAYSTONE.	High	High	Fair-good	31	8
SWC 17	1654.0	CLAYSTONE, brownish grey with COAL microlaminations.	High	Low-high	Fair-good	34	5
SWC 4	1790.5	SILTSTONE, medium green-grey.	Low	Moderate	Poor	25	NR
SWC 2	1810.0	SANDSTONE, very light grey.	Low	High	Poor	17	NR
					Averages:	**29.8**	**10.9**

Table–4: Fenton Creek–1 Range and Abundance Chart for Palynomorphs	SWC 48	SWC 47	SWC 46	SWC 45	SWC 44	SWC 43	SWC 42	SWC 41
Sample Type & Depth (m)	1118.0	1200.0	1320.0	1422.0	1498.5	1520.0	1524.0	1526.5
SPORES								
Aequitriradites spp.								
Appendicisporites spp.								
Baculatisporites spp.		5.0%		0.9%	2.1%	0.9%		0.6%
Cicatricosisporites spp.			0.6%	0.9%	1.4%		1.9%	0.6%
Clavifera spp.		2.0%	1.7%	0.9%	2.8%			1.2%
Cyathidites (large) >40μm	1.8%	3.0%	1.1%	1.8%	2.1%	5.6%	1.9%	0.6%
Cyathidites (small) <40μm	1.8%	7.9%	3.4%	3.6%	4.9%	5.6%	2.9%	3.7%
Dictyophyllidites spp.		1.0%	1.7%	0.9%	3.5%			
Foveogleicheniidites confossus								
Gleicheniidites spp.	0.9%	6.9%	6.9%	14.5%	14.8%	5.6%	4.9%	4.3%
Herkosporites & Ceratosporites spp.			2.9%	1.8%			1.9%	
Laevigatosporites spp.	1.8%	2.0%	2.3%	3.6%	1.4%	1.9%		
Marratisporites scabratus						0.9%	1.9%	
Osmundacidites spp.		1.0%	1.1%	0.9%		0.9%	1.0%	
Peromonolites spp.								
Retitriletes spp.	1.8%	1.0%	0.6%		1.4%	0.9%	2.9%	0.6%
Rugulatisporites spp.								
Stereisporites spp.		1.0%				0.9%	1.0%	
Triletes undiff.	0.9%	3.0%	2.3%	0.9%	2.1%	3.7%	1.0%	0.6%
Triporoletes reticulatus								
Total Spores	**9%**	**34%**	**25%**	**31%**	**37%**	**27%**	**21%**	**12%**
GYMNOSPERMS								
Araucariacites australis		1.0%	1.1%	1.8%		1.9%	1.0%	1.2%
Corollina spp.						2.8%		
Cupressacites sp.			0.6%	0.9%	2.8%	13.9%	7.8%	13.4%
Dilwynites pusillus		1.0%	4.0%	2.7%	3.5%	9.3%	13.6%	15.9%
Dilwynites spp.		2.0%	0.6%	3.6%	4.9%	9.3%	24.3%	34.1%
Hoegisporis trinalis ms								
Lygistepollenites florinii		2.0%						
Microcachryidites antarcticus	4.5%	3.0%	6.3%	4.5%	15.5%	7.4%	11.7%	5.5%
Phyllocladidites eunuchus ms								
Phyllocladidites mawsonii	14.5%	6.9%	6.3%	2.7%	2.1%	4.6%	2.9%	2.4%
Podocarpidites spp.	20%	20%	26%	23%	27%	17%	12%	12%
Podosporites microsaccatus	2.7%	5.0%	1.7%	8.2%	5.6%	5.6%	2.9%	3.0%
Vitreisporites signatus			0.6%		0.7%		1.0%	0.6%
Total Gymnosperms	**42%**	**41%**	**47%**	**47%**	**62%**	**71%**	**77%**	**88%**
ANGIOSPERMS undiff.			1.7%	0.9%				
Asteropollis asteroides			1.7%					
Australopollis obscurus	0.9%	8.9%	10.3%	2.7%	0.7%		1.0%	
Forcipites sabulosus	3.6%	2.0%						
Forcipites spp.	2.7%	2.0%		0.9%				
Liliacidites spp.					0.7%			
Nothofagidites senectus								
Proteacidites spp.	37%	11%	9%	12%		0.9%		
Tricolpites/Tricolporites spp.	4.5%	3.0%	5.1%	4.5%		0.9%	1.0%	
Triporopollenites spp.		1.0%		0.9%				
Total Angiosperms	**49%**	**26%**	**28%**	**22%**	**1%**	**2%**	**2%**	
TOTAL SPORE-POLLEN COUNT:	**110**	**101**	**175**	**110**	**142**	**108**	**103**	**164**

Table–4: Fenton Creek–1 Range and Abundance Chart for Palynomorphs	SWC 48	SWC 47	SWC 46	SWC 45	SWC 44	SWC 43	SWC 42	SWC 41
Sample Type & Depth (m)	1118.0	1200.0	1320.0	1422.0	1498.5	1520.0	1524.0	1526.5
MICROPLANKTON % of MP COUNT								
Microplankton undiff.	40%		23%	6%	11%	21%	31%	33%
Amosopollis cruciformis	20%		31%	6%	59%	7%		17%
Chatangiella spp./Isabelidinium spp.		14%		29%	7%			
Chlamydophorella nyei								
Cleistosphaeridium ancoriferum							4%	
Cribroperidinium edwardsii								
Cyclophelium spp.								
Heterosphaeridium spp.	40%	57%	8%	41%	23%	14%	8%	
Kallosphaeridium spp.								
Kiokansium polypes							4%	6%
Lecaniella spp.								
Microdinium spp.								17%
Nummus spp.		14%						
Odontochitina spp.		14%	8%	6%				
Oligosphaeridium spp.						7%		
Palaeohystrichophora infusorioides			23%					
Palambages spp.				12%				6%
Sigmopollis spp.								6%
Spiniferites spp.								
Trithyrodinium spp.			8%			50%	50%	
Valensiella griphus							4%	17%
TOTAL MICROPLANKTON COUNT:	**5**	**7**	**13**	**17**	**44**	**14**	**26**	**18**
Microplankton as % of total SP & MP	**4%**	**6%**	**7%**	**13%**	**24%**	**11%**	**20%**	**10%**
A. cruciformis as % of total SP & MP	1%		2%	1%	14%	1%		2%
TOTAL SP and MP COUNT:	**115**	**108**	**188**	**127**	**186**	**122**	**129**	**182**
Other fossils as % of Total Count								
Fungal fruiting bodies								
Fungal spores	1.7%		0.5%	0.8%		0.8%		
Fungal hyphae			1.0%	1.5%	0.5%	2.4%	3.0%	0.5%
Total Fungii	**2%**		**2%**	**2%**	**1%**	**3%**	**3%**	**1%**
Reworked Fossils			1.0%	3.0%	0.5%	0.8%		
TOTAL COUNT:	**115**	**108**	**192**	**133**	**188**	**126**	**133**	**183**

Table–4: Fenton Creek–1 Range and Abundance Chart for Palynomorphs	SWC 40	SWC 39	SWC 38	SWC 37	SWC 36	SWC 35	SWC 34	SWC 33
Sample Type & Depth (m)	1530.0	1533.5	1535.5	1538.0	1543.0	1544.5	1548.0	1549.0
SPORES								
Aequitriradites spp.								
Appendicisporites spp.								
Baculatisporites spp.	3.8%	2.7%		4.3%	1.9%	3.7%	1.8%	1.0%
Cicatricosisporites spp.		0.9%	3.8%	2.9%	2.9%	2.8%		1.9%
Clavifera spp.				1.4%	1.0%			1.0%
Cyathidites (large) >40μm	1.9%	4.5%	3.8%	18.8%	3.8%	5.6%	4.5%	
Cyathidites (small) <40μm	9.6%	13.4%	10.5%	8.7%	12.5%	11.2%	13.6%	11.7%
Dictyophyllidites spp.	1.9%	0.9%	1.0%	2.9%		1.9%	3.6%	
Foveogleicheniidites confossus								
Gleicheniidites spp.	1.0%	6.3%	10.5%	10.1%	6.7%	5.6%	5.5%	10.7%
Herkosporites & Ceratosporites spp.								
Laevigatosporites spp.	1.9%	4.5%	3.8%		2.9%	1.9%	5.5%	3.9%
Marratisporites scabratus								
Osmundacidites spp.	1.9%		1.0%	2.9%			0.9%	1.0%
Peromonolites spp.								
Retitriletes spp.	1.9%		1.9%			1.9%	1.8%	1.0%
Rugulatisporites spp.				1.4%	2.9%	0.9%		
Stereisporites spp.		1.8%			1.0%	0.9%	0.9%	1.0%
Triletes undiff.	6.7%	5.4%	2.9%	4.3%	1.0%	5.6%	7.3%	4.9%
Triporoletes reticulatus			1.0%				0.9%	
Total Spores	**31%**	**40%**	**40%**	**58%**	**37%**	**42%**	**46%**	**38%**
GYMNOSPERMS								
Araucariacites australis	3.8%	6.3%	2.9%	5.8%	1.9%	6.5%		1.9%
Corollina spp.						1.9%	1.8%	
Cupressacites sp.	6.7%	2.7%						2.9%
Dilwynites pusillus	9.6%	4.5%	4.8%		12.5%	8.4%		5.8%
Dilwynites spp.	17.3%	21.4%	23.8%	10.1%	22.1%	8.4%	11.8%	10.7%
Hoegisporis trinalis ms								
Lygistepollenites florinii								
Microcachryidites antarcticus	6.7%	7.1%	8.6%	4.3%	5.8%	14.0%	14.5%	18.4%
Phyllocladidites eunuchus ms								
Phyllocladidites mawsonii	1.0%	1.8%	1.0%	4.3%	1.0%	0.9%	3.6%	1.9%
Podocarpidites spp.	13%	13%	14%	17%	13%	16%	14%	16%
Podosporites microsaccatus	5.8%		1.9%		3.8%	0.9%	1.8%	2.9%
Vitreisporites signatus		0.9%			1.0%			
Total Gymnosperms	**64%**	**57%**	**57%**	**42%**	**62%**	**57%**	**47%**	**60%**
ANGIOSPERMS undiff.	1.0%							
Asteropollis asteroides								
Australopollis obscurus	1.9%	1.8%	1.9%		1.9%		0.9%	
Forcipites sabulosus								
Forcipites spp.								
Liliacidites spp.	1.9%		1.0%			0.9%		
Nothofagidites senectus							0.9%	
Proteacidites spp.							0.9%	
Tricolpites/Tricolporites spp.		0.9%					3.6%	1.9%
Triporopollenites spp.								
Total Angiosperms	**5%**	**3%**	**3%**		**2%**	**1%**	**6%**	**2%**
TOTAL SPORE-POLLEN COUNT:	**104**	**112**	**105**	**69**	**104**	**107**	**110**	**103**

Table-4: Fenton Creek-1 Range and Abundance Chart for Palynomorphs	SWC 40	SWC 39	SWC 38	SWC 37	SWC 36	SWC 35	SWC 34	SWC 33
Sample Type & Depth (m)	1530.0	1533.5	1535.5	1538.0	1543.0	1544.5	1548.0	1549.0
MICROPLANKTON % of MP COUNT								
Microplankton undiff.	21%	10%	8%	15%	6%	12%	14%	12%
Amosopollis cruciformis	21%	47%	34%	22%	71%	38%	8%	27%
Chatangiella spp./Isabelidinium spp.		5%	13%		1%			
Chlamydophorella nyei		2%	6%			2%	3%	6%
Cleistosphaeridium ancoriferum		5%				5%		
Cribroperidinium edwardsii								
Cyclophelium spp.						1%		
Heterosphaeridium spp.	21%	8%	6%	36%	4%	24%	22%	38%
Kallosphaeridium spp.		1%	1%				31%	
Kiokansium polypes	14%	8%	4%	5%		3%	4%	6%
Lecaniella spp.								
Microdinium spp.								
Nummus spp.								
Odontochitina spp.			3%	4%	1%	1%	6%	2%
Oligosphaeridium spp.								
Palaeohystrichophora infusorioides		8%	10%		2%	3%		
Palambages spp.		1%	4%		1%			
Sigmopollis spp.				2%				
Spiniferites spp.			10%		1%			
Trithyrodinium spp.								
Valensiella griphus	21%	5%	3%	16%	13%	12%	12%	9%
TOTAL MICROPLANKTON COUNT:	**14**	**108**	**80**	**55**	**113**	**110**	**154**	**86**
Microplankton as % of total SP & MP	**12%**	**49%**	**43%**	**44%**	**52%**	**51%**	**58%**	**46%**
A. cruciformis as % of total SP & MP	3%	23%	15%	10%	37%	19%	5%	12%
TOTAL SP and MP COUNT:	**118**	**220**	**185**	**124**	**217**	**217**	**264**	**189**
Other fossils as % of Total Count								
Fungal fruiting bodies		0.4%						
Fungal spores					0.5%		0.4%	
Fungal hyphae	0.8%	3.9%	1.1%	0.8%		0.5%	0.4%	0.5%
Total Fungii	**1%**	**4%**	**1%**	**1%**	**0%**	**0%**	**1%**	**1%**
Reworked Fossils		0.4%	0.5%	0.8%	0.5%		0.7%	
TOTAL COUNT:	**119**	**230**	**188**	**126**	**218**	**218**	**267**	**190**

Table-4: Fenton Creek-1 Range and Abundance Chart for Palynomorphs	SWC 31	SWC 30	SWC 22	SWC 21	SWC 19	SWC 18	SWC 17	SWC 4	SWC 2
Sample Type & Depth (m)	1566.0	1567.0	1622.0	1635.0	1646.0	1650.5	1654.0	1790.5	1810.0
SPORES									
Aequitriradites spp.							7.1%		
Appendicisporites spp.		0.9%	1.9%	2.0%	1.7%	0.8%			
Baculatisporites spp.	0.9%	3.8%	2.8%	2.0%	0.9%	3.4%	0.8%	16.8%	20.1%
Cicatricosisporites spp.			0.9%	3.3%	1.7%	0.8%	12.7%	2.0%	1.4%
Clavifera spp.	0.9%			0.7%					
Cyathidites (large) >40μm	4.7%	3.8%	4.7%	5.3%	8.7%	2.5%	4.0%	3.0%	6.5%
Cyathidites (small) <40μm	8.4%	11.3%	18.9%	10.0%	25.2%	3.4%	4.0%	26.7%	31.7%
Dictyophyllidites spp.	0.9%	4.7%	6.6%	2.7%	1.7%	1.7%	0.8%		
Foveogleicheniidites confossus	1.9%		0.9%	0.7%					
Gleicheniidites spp.	10.3%	12.3%	18.9%	17.3%	6.1%	44.1%	11.1%	5.0%	1.4%
Herkosporites & Ceratosporites spp.				1.3%		0.8%			0.7%
Laevigatosporites spp.	0.9%	1.9%		3.3%	2.6%	13.6%	12.7%		
Marratisporites scabratus				0.7%					
Osmundacidites spp.		0.9%	1.9%		1.7%			6.9%	6.5%
Peromonolites spp.						0.8%			
Retitriletes spp.				0.7%	3.5%		0.8%	4.0%	
Rugulatisporites spp.	6.5%	0.9%	0.9%	1.3%	6.1%	0.8%			
Stereisporites spp.				1.3%	0.9%	0.8%		2.0%	
Triletes undiff.	0.9%	3.8%	8.5%	7.3%	8.7%	5.1%	4.0%	3.0%	4.3%
Triporoletes reticulatus					0.9%		4.8%		
Total Spores	**36%**	**44%**	**67%**	**60%**	**70%**	**79%**	**63%**	**69%**	**73%**
GYMNOSPERMS									
Araucariacites australis	9.3%	6.6%	4.7%	6.0%	6.1%	0.8%	4.8%	3.0%	3.6%
Corollina spp.	0.9%				0.9%		0.8%	2.0%	6.5%
Cupressacites sp.	1.9%	3.8%	2.8%	2.0%					
Dilwynites pusillus	4.7%	2.8%	9.4%	6.7%		0.8%	0.8%		
Dilwynites spp.	4.7%	2.8%	0.9%	6.0%					
Hoegisporis trinalis ms			0.9%	1.3%	2.6%	0.8%	0.8%		
Lygistepollenites florinii									
Microcachryidites antarcticus	7.5%	4.7%	0.9%	5.3%	2.6%	3.4%	6.3%	5.9%	1.4%
Phyllocladidites eunuchus ms					0.9%				
Phyllocladidites mawsonii	2.8%	3.8%							
Podocarpidites spp.	28%	27%	13%	9%	15%	11%	8%	20%	14%
Podosporites microsaccatus		0.9%		1.3%	0.9%	3.4%	15.9%		1.4%
Vitreisporites signatus	0.9%					0.8%			
Total Gymnosperms	**61%**	**53%**	**33%**	**38%**	**29%**	**21%**	**37%**	**31%**	**27%**
ANGIOSPERMS undiff.		1.9%							
Asteropollis asteroides					0.9%				
Australopollis obscurus	1.9%								
Forcipites sabulosus									
Forcipites spp.									
Liliacidites spp.				2.0%					
Nothofagidites senectus									
Proteacidites spp.									
Tricolpites/Tricolporites spp.	0.9%	0.9%							0.7%
Triporopollenites spp.									
Total Angiosperms	**3%**	**3%**		**2%**	**1%**				**1%**
TOTAL SPORE-POLLEN COUNT:	**107**	**106**	**106**	**150**	**115**	**118**	**126**	**101**	**139**

Table-4: Fenton Creek-1 Range and Abundance Chart for Palynomorphs	SWC 31	SWC 30	SWC 22	SWC 21	SWC 19	SWC 18	SWC 17	SWC 4	SWC 2
Sample Type & Depth (m)	1566.0	1567.0	1622.0	1635.0	1646.0	1650.5	1654.0	1790.5	1810.0
MICROPLANKTON % of MP COUNT									
Microplankton undiff.	3%	3%	36%	43%		22%	25%		
Amosopollis cruciformis	90%	90%	7%	7%		11%			
Chatangiella spp./Isabelidinium spp.	1%								
Chlamydophorella nyei									
Cleistosphaeridium ancoriferum									
Cribroperidinium edwardsii			14%	7%	50%	33%	50%		
Cyclophelium spp.		2%			50%				
Heterosphaeridium spp.	5%	5%	7%						
Kallosphaeridium spp.									
Kiokansium polypes			7%						
Lecaniella spp.	1%						25%		
Microdinium spp.									
Nummus spp.									
Odontochitina spp.						22%			
Oligosphaeridium spp.			21%	43%		11%			
Palaeohystrichophora infusorioides									
Palambages spp.									
Sigmopollis spp.									
Spiniferites spp.			7%						
Trithyrodinium spp.									
Valensiella griphus									
TOTAL MICROPLANKTON COUNT:	87	60	14	14	6	9	4		
Microplankton as % of total SP & MP	45%	36%	12%	9%	5%	7%	3%		
A. cruciformis as % of total SP & MP	40%	33%	1%	1%		1%			
TOTAL SP and MP COUNT:	194	166	120	164	121	127	130	101	139
Other fossils as % of Total Count									
Fungal fruiting bodies	1.0%								
Fungal spores	0.5%	1.7%		0.6%					
Fungal hyphae	2.5%	3.5%	0.8%	0.6%			0.8%	1.0%	
Total Fungii	4%	5%	1%	1%			1%	1%	
Reworked Fossils				1.2%	4.0%	0.8%		1.0%	0.7%
TOTAL COUNT:	199	172	121	167	126	128	131	103	140

APPENDIX X: GEOTHERMAL GRADIENT

A measured static bottom hole temperature of 67°C at 1841m is calculated. This gives a geothermal gradient of 2.55°C/100m (25.5°C/km). An ambient temperature of 20 °C was utilized. Data used for the calculations is as follows:-

65 °C at 1835.8m after 10 hours from Run 1, Suite 1

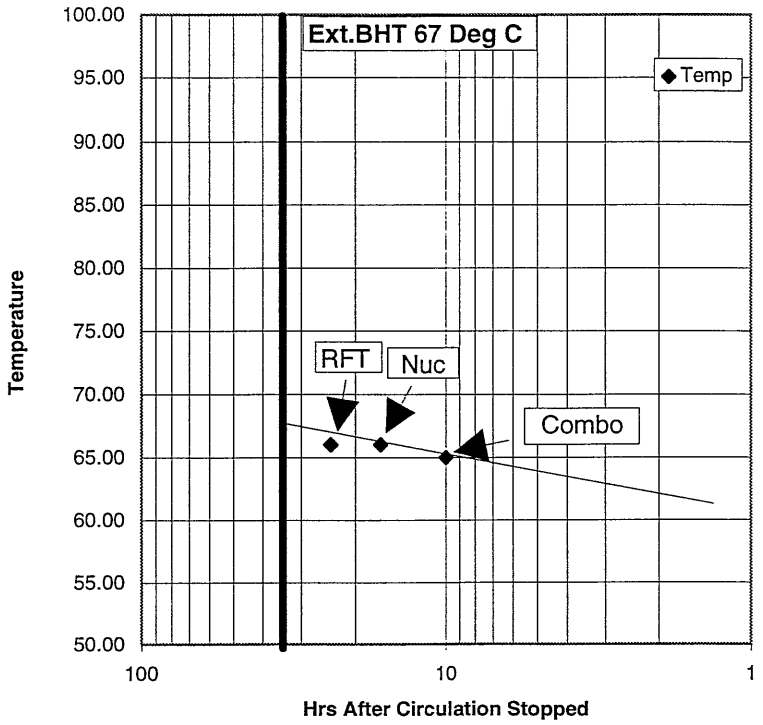
66 °C at 1835.8m after 16.5 hours from Run 2, Suite 1

66 °C at 1835m after 24 hours from Run 3, Suite 1.

Well Name: Fenton Creek 1

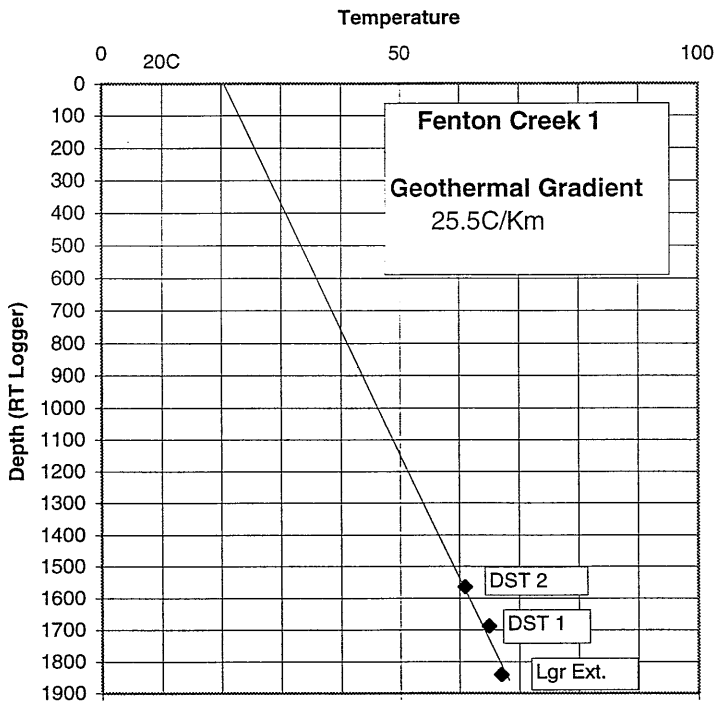
Santos

Extrapolation to Determine Static BHT



Geothermal Gradient

Santos



APPENDIX XI: WELL LOCATION SURVEY

ALAN H. SIMPSON

Licenced Surveyor, B. App. Sci. (Survey), L.S., M.I.S., Aust.

A.C.N. [illegible]

Correspondence to
P.O. Box 421,
Warrnambool, 3280

LAND SURVEYOR — WARRNAMBOOL

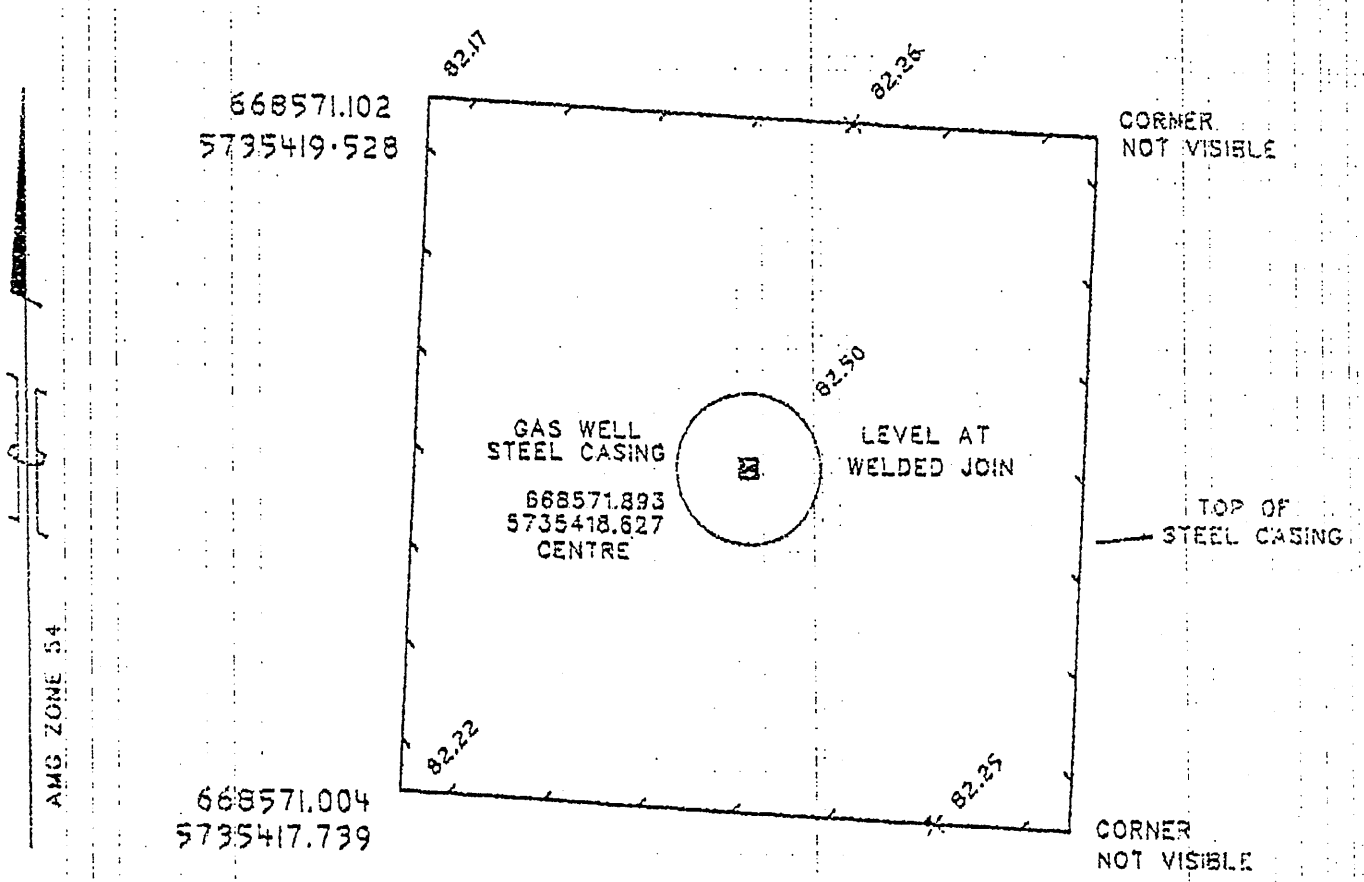
125a Kepler Street, Warrnambool.

Phone: (03) 5561 1846
A.H. (03) 5569 2404
Fax (03) 5562 1775

FENTON CREEK #1

SCALE 1:20

DATUM OF BEARINGS IS TO AMG ZONE 54
LEVELS ARE TO APPROXIMATE AHD +/- 0·10m
LEVELS ARE SHOWN AS THUS 82.17



I CERTIFY THAT THIS SKETCH CORRECTLY REPRESENTS
THE SITE CONDITIONS ON 26/3/97

ALAN H. SIMPSON L.S.

APPENDIX XII: DRILLING, CASING, AND ABANDONMENT SUMMARY

This appendix shall be forwarded as soon as it is available from the Drilling Department of Cultus.

APPENDIX XIII: RIG SPECIFICATIONS

ODE RIG #30 SPECIFICATIONS

CONTRACTOR'S EQUIPMENT

CONTRACTOR'S RIG	:	Rig #30 - rated to 11,000 ft. with 4.1/2," drill pipe
DRAWWORKS	:	Ideco H725 Hydrair, driven by EMD D79 electric motor. Maximum input 900 hp Parmac V-80 Hydromatic brake. Transmission - 3 speed transmission with Fawick 40CB525 air clutch.
ENGINES	:	Four (4) Caterpillar Model 3412 PCTA diesel engines.
SUBSTRUCTURE	:	One piece substructure 14' high x 13'6" wide x 50' long with 12' BOP clearance. Setback area loading: 250,000 lbs Casing area loading: 275,000 lbs
MAST	:	Dreco Model #: M12713-510 Floor Mounted Cantilever Mast designed in accordance with API Specification 4E Drilling & Well Servicing Structures. Hook load Gross Nominal Capacity - 510,000 lbs with:- 10 lines strung - 365,000 lbs 8 lines strung - 340,000 Lbs Clew working height of 127' Base width of 13'6". Adjustable racking board with capacity for:- i) 108 stands of 4.1/2" drill pipe, ii) 10 stands of 6.1/2" drill collars, iii) 3 stands of 8" drill collars Designed to withstand an API windload of 84 mph with pipe racked and 100 mph with no pipe racked.
CATHEADS	:	One (1) Foster Model 37 make-up spinning cathead mounted on drillers side. One (1) Foster Model 24 break-out cathead mounted off drillers side.
CROWN BLOCK	:	215 ton with five (5) 36" sheaves and one (1) 36" fastline sheave grooved 1.1/8".
TRAVELLING BLOCK	:	One (1) 667 Crosby McKissick 250 ton combination block hook Web Wilson. 250 ton Hydra hook Unit 5 - 36" sheaves.
SWIVEL	:	One (1) Oilwell PC-300 ton swivel. 192 tons API bearing rating at 100 rpm.
RIG LIGHTING	:	Explosive proof fluorescent. As per approved State Specifications.

MUD PUMPS : Two (2) Gardner Denver mud pumps Model PZ-8 each driven by 800 HP EMD motors. 8" stroke with liner size 6".

MIXING PUMPS : Five (5) Mission Magnum 5" x 6" x 14" centrifugal pumps complete with 50 HP, 600 Volt, 60 Hz, 3 phase explosion proof electric motors.

MUD AGITATORS : Six (6) Geolograph/Pioneer 40TD - 15" 'Pitbull' mud agitators with 15 HP, 60 Volt, 60 HZ, 3 phase electric motors.

SHALESHAKER : Two (2) DFE SCR-01 Linear motion shale shakers.
Adjustable screen deck - 1° to + 5°.

DEGASSER : One (1) Drilco See-Flo.

DESILTER : One (1) Pioneer T12-4 'Siltmaster' desilter.
12 x 4" cones. Approximate output of 2,250 litres per minute.

DESANDER : Harrisburg DSN-1000 unit with 2 x 10" cones. Approximate output of 3,600 litres per minute.

GENERATORS : Four (4) Brown Boveri 600 Volt, 600 kw 3 phase, 60 HZ AC generators. Powered by four (4) Cat 3412 PCTA diesel engines.

B.O.P.'s : One (1) Hydril 13.5/8" x 3,000 psi spherical annular BOP, studded top and flanged bottom.
One (1) Hydril 13.5/8" x 5,000 psi flanged double gate BOP.

SPOOLS : Double studded adaptor, 4.1/2" H 13.5/8" 5000 BXI60 x 13.518" 3000 RX57.
Double studded adaptor, 4.1/2" H 13.5/8" 5000 BXI60 x 7.1/16" 5000 R46.
Double studded adaptor, 5.1/2" H 13.5/8" 5000 BXI60 x 7.1/16" 3000 R45.
BOP spacer spool (drilling spool), 17" H 13.5/8" 5000 BXI60 x 13.5/8" 5000 BXI60.
BOP spacer spool (drilling spool), 14.1/2," H 13.5/8" 3000 R57 x 13.5/8" 3000 R57.
BOP adaptor spool, 18" H 13.5/8" 5000 BXI60 x 11" 3000 R53.

ACCUMULATOR : One (1) Wagner Model 130-160 3 BND 160 gallon accumulator consisting of:-

- Sixteen (16) 11 gallon bladder type bottles.
- One (1) 20 HP electric driven triplex pump 600 volts, 60 HZ, 3 phase motor and controls.
- One (1) Wagner Model A - 60 auxiliary air pump 4.5 gals/minute.

- One (1) Wagner Model UM2SCB5S mounted hydraulic control panel with five (5) 1" stainless steel fitted selector valves and two (2) stripping controls and pressure reducing valves.
- Three (3) 4" hydraulic readout gauges:
  - one for annular pressure
  - one for accumulator pressure
  - one for manifold pressure

One (1) Wagner Model GMSB - 5A 5 station remote drillers control with three pressure gauges, increase and decrease control for annular pressure.

DRILL PIPE SAFETY VALVE : One (1) 4" IF inside BOP.
One (1) 4" IF Stabbing Valve.

AIR COMPRESSORS & RECEIVERS : Two (2) LeRoi Dresser Model 660A air compressor packages c/w 10 HP motors rated at 600 Volts, 60 HZ, 3 phase. Receivers each 120 gallon capacity and fitted with relief valves.

AIR WINCH : One (1) Ingersol Rand HU-40 with 5/8" wireline. Capacity 2,000 lb.

POWER TONGS : One (1) Farr 13.5/8" - 5.1/2" hydraulic casing tongs c/w hydraulic power pack and hoses and torque gauge assembly.
One (1) Farr Model LW5500 5.1/2" high torque hydraulic power tong complete w/- 3.1/2" rotating assembly.
One (1) Foster hydraulic kelly spinner with 6.5/8" LH connections.
One (1) Varco SSW-30 hydraulic spinning wench. Self adjusting 2.7/8" through to 7" OD pipe.

ROTARY TABLE : One (1) Ideco 23" rotary table shaft driven from drawworks.

MUD TANKS

(SHAKER) : One (1) Shaker tank total 236 bbls
- trip tank - 24 bbls
- sand trap - 92 bbls
- settling tank - 120 bbls

(INTERMEDIATE) : One (1) Intermediate tank total 337 bbls.
- with desilter tank - 113bbls
- with desander tank - 112bbls
- with reserve tank - 112bbls

(SUCTION) : One (1) Suction tank total 222 bbls.
- with pill tank - 23 bbls
- with two (2) suction tanks - 100 bbls each

Total system: 795 bbls

TRIP TANK PUMP	:	One (1) Mission Magnum 2" x 3" centrifugal pump complete with 20 HP, 600 Volts, 60 HZ, 3 phase explosion proof motors.
CHOKE MANIFOLD	:	One (1) Choke manifold, complete with Cameron type 'FL' 3" 5000 psi valves and Hydraulic Swaco "super" choke.
DRILL PIPE	:	2,280m - 4.1/2" OD 16.60 lb/ft Grade "G" drill pipe. 465m - 4.1/2" OD 16.60 lb/ft Grade "E" drill pipe. 2,500m - 3.1/2" OD 13.30 lb/ft Grade "G" drill pipe.
PUP JOINTS	:	One (1) - 5' 4.1/2" OD Grade 'G'. One (1) - 5' 3.1/2" OD Grade 'G'. One (1) - 10' 4.1/2" OD Grade 'G'. One (1) - 10' 3.1/2" OD Grade 'G'. One (1) - 15' 4.1/2" OD Grade 'G'.
HEVI-WATE DRILL PIPE	:	142m (15 jts) of 4.1/2" H.W.D.P. 142m (15 jts) of 3.1/2" H.W.D.P.
DRILL COLLARS	:	60m - 8" OD drill collars 230m - 6.1/4" OD drill collars 285m - 4.3/4" OD drill collars
KELLY	:	One (1) Square Kelly drive 4.1/4" x 40' complete with Scabbard - 4" IF pin connection. One (1) Hex Kelly drive 3.1/2" x 40' complete with Scabbard. 3.1/2" IF pin connection.
KELLY DRIVE	:	One (1) 20 HDP Varco kelly drive bushing to suit 4.1/4" square kelly and changeable rollers to suit 3.1/2" Hex Kelly.
KELLY COCK (UPPER)	:	One (1) Griffith Upper Kelly Cock 7.3/4" with 6.5/8" API connections.
KELLY COCK (LOWER)	:	One (1) Griffith Lower Kelly Cock 6.1/2" OD with 4" IF connections. One (1) Griffith Lower Kelly Cock 4.3/4" OD with 3.1/2," IF connections.
FISHING TOOLS	:	One (1) only 10.5/8" Bowen series 150 FS overshot c/w grapples md packoffs to fish Contractors downhole equipment. One (1) only 8.1/8" Bowen series 150 FS overshot c/w grapples and packoffs to fish Contractors downhole equipment. One (1) only 5.3/4" Bowen series 150 FS overshot c/w grapples & packoffs to fish Contractors downhole equipment. One (l) only 8" OD fishing magnet 4.1/2" reg pin. One (l) only Reverse circulating junk basket 4" IF box. One (1) only Fishing Jar 6.1/2" OD 4" IF pin & box.

One (1) only Fishing Jar 4.3/4" OD 3.1/2" IF pin & box.
One (1) only 12" Junk Mill - 6.5/8" reg pin.
One (1) only 8" Junk Mill - **4.Y2"** reg pin

SUBSTITUTES :

Two (2) Bit Subs - 6.5/8" reg double box.
Two (2) Bit Subs - 4.1/2" reg x 4" IF double box.
Two (2) Bit Subs - 3.1/2" reg x 3.1/2" IF double box.
One (1) XO Sub - 7.5/8" reg x 6.5/8" reg double box.
One (1) XO Sub - 4" IF box x 4.1/2" IF pin.
One (1) XO Sub - 3.1/2" IF box x 4" IF pin.
Two (2) XO Sub - 6.5/8" reg pin x 4" IF box.
One (1) Junk Sub - 6.5/8" reg pin x 6.5/8" reg box.
Two (2) Kelly Saver Subs 4" IF pin & box.
One (1) Kelly Saver Subs 3.1/2" IF pin & box.
Two (2) Circulating Subs - 4" IF x 2" 1502 hammer union.
One (1) 6.5/8" reg. x 4.1/2" IF double box.
One (1) 4" IF Box x 4" FH pin.
Two (2) 4" IF Box x 4.1/2" IF pin.
Two (2) 4" IF x 4.1/2" IF double box
Two (2) 4.1/2" IF Box x 4" IF pin.
One (1) 3.1/2" IF Pin x 4.1/2" IF box.
One (1) 2.7/8" Pin x 2.3/8" IF pin.
One (1) 3.1/2" IF x 2.7/8" IF pin.

HANDLING TOOLS :

1 only 13.3/8" Baash Ross 150 ton side door elevator.
1 only 13.3/8" single joint P.U. elevators.
1 only 9.5/8" Webb Wilson 150 ton side door elevators.
1 only 9.5/8 single joint P.U. elevator.
1 only 7" BJ 200 ton side door elevators.
1 only 7" single joint P.U. elevators.
1 only 5./2" BJ 200 ton side door elevator
1 only 3.1/2" BJ 150 ton 18 degree taper D/P elevators.
2·only 4.1/2" BJ 250 ton 18 degree taper D/P elevators.
1·only 3.1/2" 100 ton tubing elevator.
1·only 2.7/8" 100 ton tubing elevator.
1 only 2.3/8" - 3.1/2" YT slip type tubing elevator.
1 only 8" Webb Wilson 150 ton single door elevator D/C.
1 only 6.1/2" Webb Wilson 150 ton single door elevator D/C.
1 only 13.3/8" Varco CMS-XL casing slips.
1 only 9.5/8" Varco CMS-XL casing slips.
1 only 7" Varco CMS-XL casing slips.
1 only 5.1/2" Varco SDXL casing slips.
2·only 4.1/2" Varco SDXL D/P slips.
1·only 3.1/2" Varco SDML tubing slips.
1·only 2.7/8" Varco SDML tubing slips.
2·only 8" - 6.1/2" DCS-R drill collar slips.
2·only 3.1/2" Varco type SDML DP slips.
2·only 4.3/4" DCS drill collar slips.

ROTARY TONG	:	One set Web Wilson type 'AAX' c/w latch & lug jaws 13.3/8" - 3.1/2".
BIT BREAKERS	:	One (1) each 17.1/2", 12.1/4", 8.1/2", 6".
FUEL TANK	:	1 only 25,000 litres. 1 only 30,000 litres.
WATERTANK	:	1 only 400 bbls.
DRILLING RATE RECORDER	:	1 only 6 pen drill sentry recorder to record: • weight (D) • penetration (feet) • pump pressure (0-6,000 psi) • electric rotary torque • rotary speed (rpm) • pump spm (with selector switch)
DEVIATION INSTRUMENT	:	1 set Totco 'Double Shot' deviation instrument 0^{o}-8^{o}.
INSTRUMENTS & INDICATORS	:	1 only Martin Deck Type 'D' weight gauge. 1 only National Type 'D 'dead man anchor. • Electric rotary torque gauge • Pit scan • SPM gauge (2 per console) • Rotary rpm gauge
MUD TESTING	:	1 set Baroid mud testing laboratory (standard kit).
RATHOLE DRILLER	:	One (1) fabricated rotary table chain driven.
WATER PUMPS	:	Three (3) Mission Magnum 2" x 3" centrifugal pumps c/w 20 HP, 600 Volts, 60 HZ, 3 phase explosion proof motors.
CUP TESTER	:	One (1) Grey Cup Tester c/w test cups for 9.5/8" & 133/8".
DRILLING LINE	:	5,000' 1.1/8" - E.I.P.S.

TRANSPORT EQUIPMENT AND MOTOR VEHICLES

1 - International 530 Forklift

1 Tray Top Utility - 4WD
1 Crew Wagon - 8 perso

CAMP EQUIPMENT

4 - 8 - Man Bunkhouses
1 - Recreation/Canteen unit
1 - Ablution/Laundry/Freezer unit
1 - Kitchen/Cooler/Diner unit
2 - Toolpusher units
1 - Combined Water/Fuel Tank unit
2 - CAT 3304PC generator sets each 106 Kva, 86 KW, 50 HZ.

Note: **At Contractor's discretion any of the foregoing items may be replaced by equipment of equivalent or greater capacity.**

SAFETY EQUIPMENT

General Safety Equipment to be provided By the drilling Contractor

Wet weather gear Safety glasses Safety hats Safety footwear Safety belts c/wlines Ear protection -grade 4 Leather gloves Rubber gloves Rubber aprons Fullface visors Eye shields (for grinding machines, etc) Dust masks Rubber gloves - elbow length for chemical handling "No-Smoking" signs "Hard-Hat" signs	Sufficient personal protective equipment will be available at all times. All equipment will comply with International standards. Pictographic signs will be displayed in prominent locations around the Rig giving wanting to a specific hazard.
Eye Wash Stations	
Quantity	3
Make/model	1 x Enware eye wash Deluge shower. 2 x Protector eye wash station
Located at	Intermediate tank Dog House Mud Hopper
Derrick Safety Equipment	
Derrick escape (Geronimo)	Geronimo
Derrick safety belts	Lewis Type SC
Derrick Climbing Assist	
Make	R.T.C.
Fire Extinguishers	
Make	
Type: 1. Dry Chemical 2. Other	Quell or equivalent 10 x 9kg 2 x 11.5 BCF

First Aid Equipment

First Aid Kits	
Quantity	2
Located at office	Dog House, Toolpushers Office
Bum Kits/Fire Blankets	
Quantity	2 - H2O GEL blanket
Located at office	Toolpushers office (1), Dog House (1)
Stretchers	
Quantity	2
Type	1 MSA Stokes 1 MSA Stokes Fold canvas
Located at	Dog House/Offices

ENCLOSURE I: 1 : 200m COMPOSITE LOG

ENCLOSURE II: 1 : 500m MUDLOG

PE600633

This is an enclosure indicator page.
The enclosure PE600633 is enclosed within the container PE900817 at this location in this document.

The enclosure PE600633 has the following characteristics:

ITEM_BARCODE	= PE600633
CONTAINER_BARCODE	= PE900817
NAME	= Mud Log
BASIN	= OTWAY
PERMIT	= PEP 108
TYPE	= WELL
SUBTYPE	= MUD_LOG
DESCRIPTION	= Mud log (encl.1 of WCR) for Fenton Creek-1
REMARKS	=
DATE_CREATED	= 4/04/97
DATE_RECEIVED	=
W_NO	= W1192
WELL_NAME	= Fenton Creek-1
CONTRACTOR	= Halliburton
CLIENT_OP_CO	= Cultus Petroleum NL

(Inserted by DNRE - Vic Govt Mines Dept)

ENCLOSURE II : COMPOSITE LOG

PE600632

This is an enclosure indicator page.
The enclosure PE600632 is enclosed within the container PE900817 at this location in this document.

The enclosure PE600632 has the following characteristics:

ITEM_BARCODE	= PE600632
CONTAINER_BARCODE	= PE900817
NAME	= Composite Log
BASIN	= OTWAY
PERMIT	= PEP 108
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Composite Log (encl.2 of WCR) for Fenton Creek-1
REMARKS	=
DATE_CREATED	= 11/04/97
DATE_RECEIVED	=
W_NO	= W1192
WELL_NAME	= Fenton Creek-1
CONTRACTOR	= Santos
CLIENT_OP_CO	= Santos/Cultus

(Inserted by DNRE - Vic Govt Mines Dept)

ENCLOSURE III: STRUCTURE MAP

PE900818

This is an enclosure indicator page.
The enclosure PE900818 is enclosed within the container PE900817 at this location in this document.

The enclosure PE900818 has the following characteristics:

ITEM_BARCODE	= PE900818
CONTAINER_BARCODE	= PE900817
NAME	= Structure Map
BASIN	= OTWAY
PERMIT	= PEP 108
TYPE	= WELL
SUBTYPE	= GEOL_MAP
DESCRIPTION	= Structure Map (encl.3 of WCR) for Fenton Creek-1
REMARKS	=
DATE_CREATED	= 30/09/97
DATE_RECEIVED	=
W_NO	= W1192
WELL_NAME	= Fenton Creek-1
CONTRACTOR	=
CLIENT_OP_CO	= Santos

(Inserted by DNRE - Vic Govt Mines Dept)