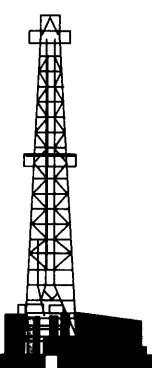


# McINTEE 1

## Well Completion Report



**Santos**

PEP 154, OTWAY BASIN  
VICTORIA

**SANTOS - BEACH****COMPILED FOR****SANTOS LTD**

(A.C.N. 000 670 575)

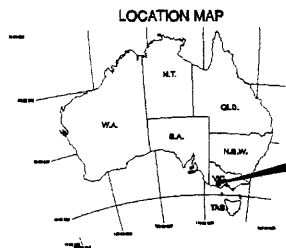
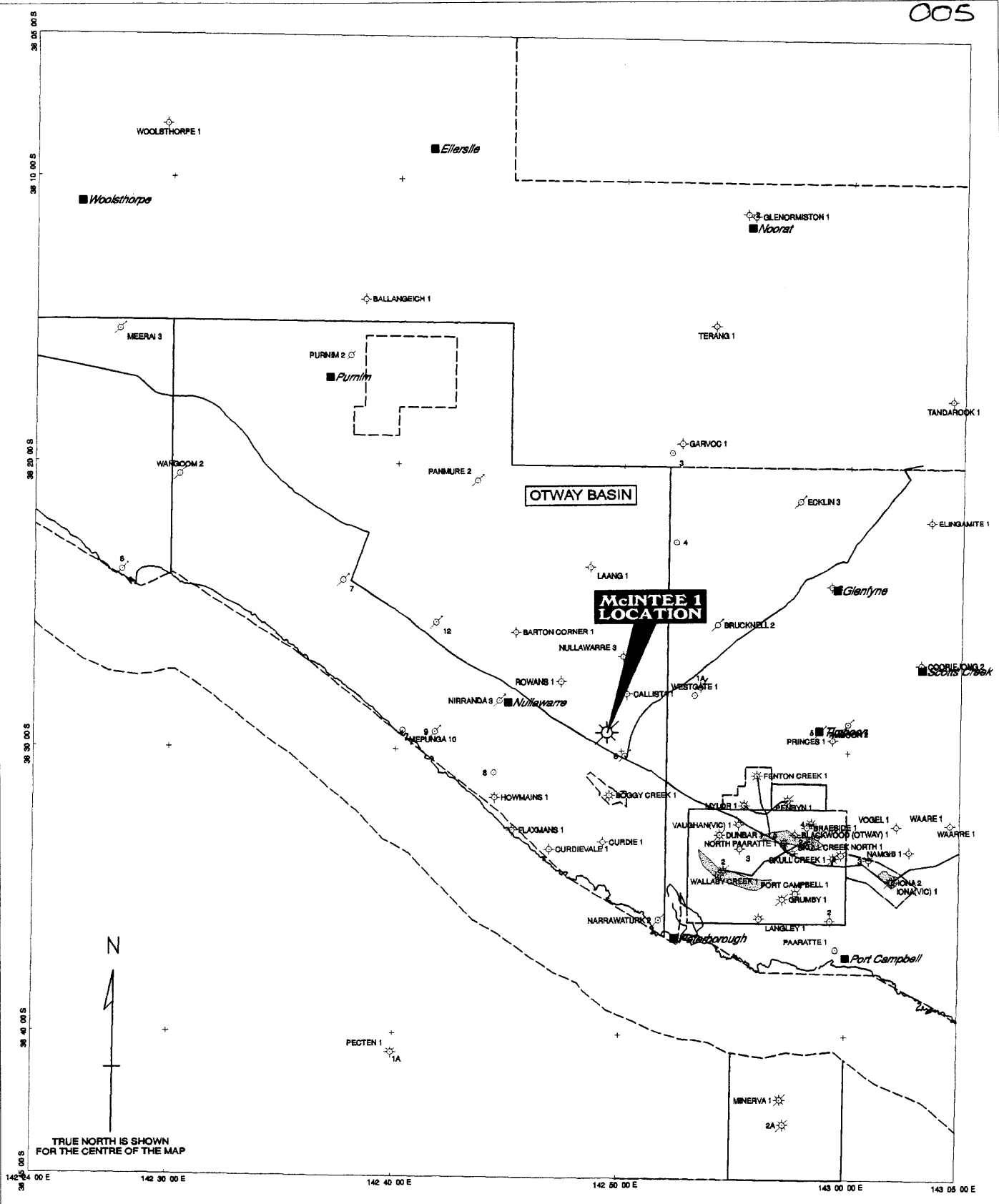
**Petroleum Development****20 AUG 2001****McINTEE 1****WELL COMPLETION REPORT****Prepared By:  
D. ZURCHER  
April, 2001**

## McINTEE 1 WCR

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## LOCATION MAP



**LEGEND**

- ◊ Dry hole
- ⊙ Dry hole with gas show(s)
- ⊕ Dry hole with oil show(s)
- ⊙⊕ Dry Hole with oil & gas show(s)
- ☀ Gas well
- ☀⊕ Gas well with oil show(s)
- Oil well
- ☀⊕ Oil and gas well
- Gas Pipeline
- - - Oil Pipeline

**EXPLORATION & DEVELOPMENT**

**Santos**

South Australia Business Unit  
 Author: J. K. ...  
 Designer: ...  
 Original Date: 1980000  
 Current Version: ...  
 Date: April 6, 2001  
 Revison: ...  
 No. ...  
 ENCL.

**McINTEE 1 LOCATION MAP**



SANTOS LTD A.G.N. 007 860 863

**WELL CARD**

WELL: McINTEE 1		WELL CATEGORY: EXP (WILDCAT)		SPUD: 10/02/01 11:00hrs TD REACHED: 19/02/01 06:00hrs		
		WELL INTENT: GAS		RIG RELEASED: 23/02/01 06:00hrs		
LAT: 38° 29' 21.10" S		LONG: 142° 49' 21.18" E (AGD84)		RIG: OD&E 30 STATUS: C&S GAS WELL		
LAT: 38° 29' 15.78" S		LONG: 142° 49' 26.12" E (GDA94)		CURRENT STATUS: COMPLETED GAS WELL		
SEISMIC STATION: INLINE 2447 CURDIEVALE 3D CDP 10254				REMARKS: NEW FIELD WILDCAT DISCOVERY		
ELEVATION GND: 59.5 m		RT: 64.5m (Prelim)				
BLOCK/LICENCE: PEP 154 (VICTORIA - OTWAY BASIN)						
TD: 1799.5m (Logr Ext)		1803m (Drlr)				
PBDT: m (Logr)		m (Drlr)				
TYPE STRUCTURE: HORST BLOCK				CASING SIZE	SHOE DEPTH	TYPE
TYPE COMPLETION: 3 1/2" MONOBORE				7 5/8"	428m	L80 26.4#/ft BTC
ZONE(S): WAARRE SANDSTONE				3 1/2"	1677m	J55 9.3#/ft NEW NK35B

AGE	FORMATION OR ZONE TOPS	DEPTH (m)		THICKNESS TVD (m)	HIGH (H) LOW (L)
		LOGGERS	TVD SS		
MIDDLE-LATE MIOCENE	PORT CAMPBELL LIMESTONE	Surface	64.2	162	-
EARLY MIOCENE	GELLIBRAND MARL	162	-97.8	317	N/P
E-L OLIGOCENE - E AQUITANIAN	CLIFTON FM	479	-414.6	16	-3L
LATE EOCENE	NARRAWATURK MARL	495	-430.6	35	N/P
MIDDLE EOCENE	MEPUNGA FM	530	-465.6	92	N/P
EARLY - MIDDLE EOCENE	DILWYN FM	622	-557.6	239	N/P
L PALEOCENE - EARLY EOCENE	PEMBER FM	861	-796.5	43	N/P
E-L PALEOCENE	PEBBLE PT FM	904	-839.5	20	-32L
LATE SENONIAN	PAARATTE FM	924	-859.4	314	-11L
LATE SENONIAN	SKULL CK MUDSTONE	1238	-1173.3	113	-8H
LATE SENONIAN	NULLAWARRE	1351	-1286.3	96	-2L
LATE SENONIAN	BELFAST MUDSTONE	1447	-1382.3	74	-151H
LATE SENONIAN	FLAXMANS FM	1521	-1456.2	17	-163H
LATE SENONIAN	WAARRE FM - UNIT C	1539	-1474.2	16	-171H
	UNIT B	1555	-1490.2	10	N/P
	UNIT A	1565	-1500.2	36	N/P
EARLY NEOCOMIAN	EUMERALLA FM	1601	-1536.2	-	-163H
	TD	1799			

PRELIMINARY LOG INTERPRETATION (Interval Averages)						PERFORATIONS				
INTERVAL (m)	Ø %	SW %	INTERVAL (m)	Ø %	SW %	FORMATION		INTERVAL		
1540-1556	23.1	18				WAARRE SST		1539.5-1543.5m		
1556-1565	13.0	55								
1565-1601	13.9	49								
						CORES				
						FORM	NO.	INTERVAL	CUT	REC
						NIL				

LOG	SUITE/RUN	INTERVAL (m)	BHT/TIME/REMARKS	LOG	SUITE/RUN	INTERVAL (m)	BHT/TIME/REMARKS
REEVES LOGGING				PDS-	1 / 2	1791-1300	70°C / 13.5 hrs
DLL	1/1	1789-425	64°C / 6.35 hrs	CNS		1791-1300	
MLL		1793-425		GR		1790-1300	
SLL		1793-425		RFS	1/3	1756-1356.5	72.2°C / 34 hrs
GR		1791-18					22 TESTS, 3 CURTAILED,
LSC		1783-425					2 SPURIOUS, 17 NORMAL
SP		1775-425					SEGREGATED SAMPLE TAKEN AT 1545.7m
CAL		1793-425		SWC	1 / 4	1702.5-1424.5	22 SHOT, REC 20

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
										NO TESTS CONDUCTED

**SUMMARY:**

McIntee 1 is situated in Southern Victoria, in the onshore portion of the Otway Basin (Port Campbell Embayment). The well is located in the PEP 154 licence (90% Santos (operator) and 10% Beach Petroleum N.L.), and sited at CDP 10254, inline 2447, on the Curdievale 3D Seismic Survey. It is approximately 13km north of the town of Peterborough, and 10km west of the Mylor and Fenton Creek gas fields. The McIntee prospect is a relatively flat-lying horst structural closure defined by 3D seismic.

As the well could not be located crestally, the wellbore was slightly deviated to target the reservoir zone at the preferred location.

The primary objective of McIntee 1 was the Waarre Sandstone. The geological section penetrated was as predicted. Formations younger than the Nullawarre Formation (2m low) were intersected close to prognosis, however deeper formations were intersected considerably higher than prognosed (av. 160m high, -due to an arithmetic error in the original estimates). The top of the primary objective, the Waarre, was 171m high (at -1474mSS).

During drilling, excellent gas shows of up to 4000/200 units were detected in the 'unit C' the Waarre Formation (reservoir). Gas levels decreased in the lower Waarre and a background level of 100 units was maintained to total depth.

One suite of wireline logging was carried out by Reeves Logging after reaching total depth, and consisted of the following: Run 1: DLL-SLL-MLL-SP-CSS-GR-CAL; Run 2: PDS-CNS-GR-CAL; Run 3: RFS; Run 4: SCG.

Log analysis and formation pressure data indicate the following:

16.2m of net pay, average porosity of 23.1% with a water saturation of 18% in the Waarre 'C' Sandstone,  
3.8m of net pay, average porosity of 13.0% with a water saturation of 55% in the Waarre 'B' Sandstone,  
7.1m of net pay, average porosity of 13.9% with a water saturation of 49% in the Waarre 'A' Sandstone.

McIntee 1 reached a total depth of 1803m (D), 1799.5m (Logger extr.), and has been cased with 3.5" production tubing.

McIntee 1 is a new field gas discovery and has been suspended as a future gas producer.

**AUTHOR:** D. Zurcher

**DATE:** APRIL 2001



## WELL HISTORY

**1. GENERAL DATA**

Well Name:	McIntee 1
Well Classification:	Exploration (Wildcat)
Interest Holders:	Santos Ltd (90%) Beach Petroleum (10%)
Participating Interests:	Santos Ltd (90%) Beach Petroleum (10%)
Operator	Santos
Block/Licence	PEP 154, Onshore Otway Basin, Victoria
Surface Location	Latitude: 38° 29' 21.10" South Longitude: 142° 49' 21.18" East
Surveyed Elevation	Ground Level: 59.5m Rotary Table: 64.2m
Seismic Survey	CURDIEVALE 3D
Seismic Location	CDP 10254, LINE 2447
Total Depth	Driller: 1803.0m Logger: 1799.5m
Completion	174 joints of 3.5" 9.3 ppft J55 New NK3SB Tubing, set at 1677.05m
Status	Completed Gas Well.

**2. DRILLING DATA**

Date Drilling Commenced	1100 hours, 10 <sup>th</sup> February 2001
Date Drilling Completed	0600 hours, 19 <sup>th</sup> February 2001
Date Rig Released	0600 hours, 23 <sup>rd</sup> February 2001
Contractor	Oil Drilling & Exploration Pty Ltd (OD&E)
Rig	OD&E 30
Rig Specifications	Refer to Appendix XII

3. **DRILLING SUMMARY**

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

McIntee 1 was spudded at 1100 hours on the 10<sup>th</sup> February 2001. Tables I and II summarise the casing, cementing and mud systems used in this well. A more comprehensive summary is appended to this report (Appendix XI: (Drilling - Final Well Report).

**TABLE I: CASING, HOLE, AND CEMENT DETAILS**

<b>BIT SIZE</b>	<b>DEPTH</b>	<b>CSG SIZE</b>	<b>CSG DEPTH</b>	<b>JNTS</b>	<b>CSG TYPE</b>	<b>CEMENT</b>
9.875"	433m	7 5/8"	427.7m	36	26.4ppf L80 BT & C	138sx, 70 bbls Class 'G' Plus 85sx, 18bbls "G" tail
6.75"	1803m	3 1/2"	1677.1m	174	9.3ppf J55 New NK3SB	332sx, 168 bbls Class 'G' Plus 130sx, 28 bbls Class 'G' tail

**TABLE II: SUMMARY OF MUD SYSTEMS**

<b>MUD TYPE</b>	<b>INTERVAL (m)</b>
Spud Mud (Gel/Water) KCL/PHPA	Surface - 433 433 - 1803

(b) **Lost Time**

Lost time at McIntee 1 – Please refer to Appendix XI (Drilling - Final Well Report,.: Time Breakdown Data).

(c) **Water Supply**

No water analysis was done.

(d) **Mudlogging**

Mudlogging services were provided by Geoservices Ltd. Samples were collected, washed, and described at 10m intervals from the surface to 870m, 3m intervals from 870m to 918m, 6m intervals from 918m to 1584m, and at 3 m intervals from 1584m to total depth at 1803m. 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 include rate of penetration, weight on hook and mud pit levels.

(e) **Testing**

No DSTs were conducted in McIntee 1.

**(f) Coring**

No cores were cut in McIntee 1.

**(g) Wireline Logging**

One suite of wireline logs was run in McIntee 1, as detailed below:

**TABLE III: ELECTRIC LOG SUMMARY**

LOG	SUITE/ RUN	INTERVAL (m)	BHT/TIME/ REMARKS	LOG	SUITE/ RUN	INTERVAL (m)	BHT/TIME/ REMARKS
SGS (GR)	1/1	1791-18	64°C/6.35hrs	SGS (GR)	1/2	1790-1300	70°C/13.5hrs
SLS (sonic)	1/1	1783-425	64°C/6.35hrs	PDS (RHOB)	1/2	1791-1300	70°C/13.5hrs
DLL	1/1	1789-425	64°C/6.35hrs	CNS (NPHI)	1/2	1791-1300	70°C/13.5hrs
MLL	1/1	1793-425	64°C/6.35hrs	RFS (MDT)	1/3	20 points (1356.5m – 1756m)	72.24°C/34.0hrs
SP	1/1	1775-425	64°C/6.35hrs				
CAL	1/1	1793.5-425	64°C/6.35hrs	SCG (SWC)	1/4	20 recovered (1702.5m – 1424.5m)	38.0hrs

\*Logger Contractor - REEVES

**(h) Geothermal Gradient**

A measured static bottom hole temperature of 75°C at 1800m is calculated. This gives a geothermal gradient of 3.1°C/100m. An ambient temperature of 20°C was employed. Data used for calculations is as follows:

- 64.0°C at 1795.0m after 6.35 hours from Logging Run 1, Suite 1.
- 70.0°C at 1795.0m after 13.5 hours from Logging Run 2, Suite 1.
- 72.2°C at 1756.0m after 34.0 hours from Logging Run 3, Suite 1.

**(i) Hole Deviation**

The McIntee 1 well is a vertical hole. Directional surveys indicate a maximum deviation from vertical of 1.8° inclination 303°T at 1090m.

**(j) Velocity Survey**

No velocity survey was run in McIntee 1.

**(k) Completion Summary**

McIntee 1 was cased and suspended.

**GEOLOGY**

## 1. PRE-DRILLING SUMMARY (after Well Proposal)

McIntee 1 is proposed as an Otway Basin gas exploration well to be located in the PEP 154 licence (90% Santos (operator) and 10% Beach Petroleum N.L). It lies approximately 13 km north of the town of Peterborough, 4 km north of the Boggy Creek CO<sub>2</sub> field and 10 km west of the producing Mylor and Fenton Creek Gas Fields (Santos 100%). The McIntee Structure is situated within the Port Campbell Embayment and the productive Waarre Sandstone play fairway.

The McIntee Prospect is a relatively flat-lying horst structural closure defined by 3D seismic. The well is expected to intersect a Waarre Sandstone reservoir with mean average net pay of 21 m. The prospect exhibits a strong amplitude anomaly which where present in other wells in the area has proven to indicate the presence of gas.

The risk of major CO<sub>2</sub> is considered to be low as structurally McIntee is quite different to Boggy Creek structure (90% CO<sub>2</sub>), which lies within a "shattered" zone, believed to provide the conduit for the migration of CO<sub>2</sub>. Spill from Boggy Creek is to the northeast, away from McIntee 1.

McIntee 1 is an attractive project with a mean prognosed success case of 7.7 BCF sales gas (18.1 BCF OGIP) and a Pc (probability of commercial success) of 48%, resulting in expected mean reserves of 3.7 BCF sales gas.

## 2. DRILLING RATIONALE (after Well Proposal)

### GEOLOGICAL RISK ASSESSMENT

#### Play Analysis

The McIntee Prospect is mapped as a horst block closure, with the primary reservoir the Waarre Sandstone. Vertical seal is provided by the Belfast Mudstone, with the critical cross-fault seal possibly relying on Belfast shale smear due to large fault throws and the potential for juxtaposition of Waarre reservoir against the Nullawarre Sandstone. Structures are charged from mature source beds located within the underlying Eumeralla and / or Crayfish Group with migration directly into the reservoir or via fault conduits. The play has proven successful to the east in the nearby Mylor, Fenton Creek, Penryn, North Paaratte, Wallaby Creek and Iona Fields as well as at the Boggy Creek CO<sub>2</sub> field to the south. McIntee, as with each of these fields, exhibits a strong amplitude anomaly at the Waarre Sandstone horizon, interpreted as being well-developed gas-saturated reservoir.

#### Trap

Interpretation and mapping of the McIntee prospect was based on the Curdievale 3D survey, which was recorded in early 2000. The Curdievale 3D data quality is good in the McIntee area.

Several migrated volumes including migrated stacks with and without spectral whitening, near and far offset migrated stacks were generated and used for interpretation. Due to better horizon continuity and amplitude preservation the migrated stack volume without spectral whitening was used for horizon interpretation. Far and near offset volumes were used for amplitude extraction and AVO analysis.

A coherency cube (similarity volume) was also generated and used in conjunction with other volumes for fault interpretation.

Main mapping was carried out at near top Waarre Sandstone, which is the primary target reservoir. The Waarre sand package has a distinctive seismic characteristic and therefore a high degree of consistency was maintained with mapping of this unit. It should be noted however, due to uncertainty in phase and polarity of the Curdievale volume and lateral variations within the Waarre, alternative options for the top Waarre event, were investigated across different parts of the surveyed area.

Well ties were performed for Boggy Creek 1, Callista 1 and Curdie 1. The Curdie 1 tie however may not be a valid tie for the Waarre Sandstone as the well appears to have penetrated a fault plane at this level.

A phase analysis trial was conducted using Boggy Creek 1 and Callista 1 but the results obtained are considered to be inconclusive. Boggy Creek 1 showed data to be between  $-75$  and  $60$  degrees from zero phase whilst Callista 1 showed between  $30$  and  $135$  degrees.

As a consequence of the uncertainties associated with the seismic pick for the top Waarre sand, a few alternative options were considered as possibly representing the near top Waarre sand over the McIntee structure. The integrity of the closure area was also examined using alternative picks and the structure proved robust. The final mapping was carried out using the preferred pick which ties with Callista 1 and forms a consistent pick throughout the Curdievale data volume but is one leg high at the Boggy Creek 1 welltie.

The McIntee prospect is a horst block structure within a much broader McIntee Structural Complex situated south of Callista 1 (Enclosure III). Three independent structural closures are present within the greater McIntee Structural Complex which are separated by shallow troughs and faulting. The McIntee Structural Complex forms a major NW-SE trending horst block. The southern margin fault dies out just south of McIntee prospect but extends to the northwest beyond the Curdievale surveyed area. The throw of this fault increases towards the northwest and as a result the Waarre sand reservoir in the footwall is in juxtaposition with the Belfast Mudstone in the hanging wall to the southeast, and with the Skull Creek Formation to the northwest.

Such a situation could provide a critical side-seal problem along the fault plane where Waarre sand is juxtaposed against the Nullawarre Sandstone somewhere between McIntee and McIntee C prospects. In addition there is some risk of Nullawarre / Waarre sand juxtaposition within the McIntee structure. This has been considered in assessing the P90 area which relies on closure only along the NE fault. The spill from the McIntee prospect, however is expected to be toward the McIntee C prospect through the saddle between the two features, probably at the northwest corner of the McIntee closure area.

The top Belfast Mudstone was interpreted on a selected grid in order to adequately evaluate the seal efficiency over the McIntee structure. A time-interval map; Belfast to Waarre, was generated to investigate the seal thickness.

A strong amplitude event is present within the Waarre sand unit over the McIntee prospect. Similar events over all gas fields within the Port Campbell region suggest that the amplitude anomaly is likely related to the presence of gas in these structures. Furthermore, near and far offset volumes were also used to evaluate the amplitude anomaly over McIntee. Seismic data display of far offset amplitude minus near offset amplitude clearly indicates an AVO anomaly over the McIntee structure.

The location for the proposed McIntee 1 was selected on inline 2447, CDP 10254. This location is at near-crestal position, and is within the highest expression of amplitude. Depth conversion for the prognosis was performed using Callista 1 velocities.

## **Reservoir**

The Waarre Sandstone reservoir was deposited as the initial post-rift sequence at the commencement of the Turonian time under non-marine to marginal marine conditions. The section is divided into three sub-units – Waarre “A”, “B” & “C”. The lower A unit represents a basal transgressive systems tract (TST) characterised by the flooding of an incised valley with sediments deposited under marginal marine / estuarine conditions. The basal portion of Unit A is represented by either shale (as in Callista 1 or Boggy Creek 1 - interfluvial?) or sand (Curdie 1). This section was overlain by the widespread predominantly argillaceous Unit B, deposited under estuarine conditions. Unit C followed and is characterised by initial estuarine/deltaic conditions succeeded by high energy sands as the transgression pushed sediments up the valley system.

The Waarre Sandstone thins to the north and in the Callista 1 well located 2.8 km north, the section appears to be relatively shaley (based on the gamma ray log) with only a thin well developed section at the top of unit C. To the south at Boggy Creek 1 a thick well-developed Waarre sand was penetrated. Between Callista 1 and McIntee there is significant change in the seismic character at the top Waarre level. This possibly is indicative of better sand development at the McIntee location.

The well intersected a total of 48 metres of gross pay encompassing both units C & A with a Net : Gross ratio of 68. At the McIntee location, the amount of vertical closure (25 ms) will likely allow Unit A to be hydrocarbon filled.

## **Seal**

All Otway Basin successes in the Port Campbell Embayment area have been in high-side, tilted fault blocks, or tilted horst blocks. The ultimate top seal to Waarre reservoirs is the marine Belfast Mudstone. While a potential waste or “thief” zone exists between the Waarre sands and the Belfast seal, the Flaxmans Formation, deposited under transitional marginal marine conditions is most likely to act as a seal.

Cross-fault seal is considered the key risk for prospects within the Port Campbell Embayment area. For structures where the fault throw is greater than the thickness of the overlying Belfast Mudstone there is considerable risk that cross-fault seal will leak due to Waarre sands being juxtaposed against sands of the Nullawarre Greensand. If the throw is great enough, the reservoir could however be juxtaposed against the Skull Creek Mudstone.

The McIntee structure is controlled primarily by two faults lying to the northeast and southwest of the prospect. The fault to the northwest demonstrates relatively minor offset at Belfast level and is regarded as unlikely to leak. The seal across the southwest bounding fault appears to be more problematic as the fault demonstrates both growth during the time of Belfast deposition and potential Waarre/Nullawarre sand juxtaposition in the northwestern portion of the structure where fault displacement increases.

The appearance within the proximal hanging wall zone of high angle reflectors may indicate the presence of shale smear along the fault zone that would provide additional confidence in fault seal. The presence of the higher amplitudes and AVO anomaly over the prospect (if reflecting the presence of gas as seems likely) provide corroboration of seal validity.

## **Charge**

Hydrocarbons are produced in the Port Campbell Embayment, with the Eumeralla Formation and/or the Crayfish Group being the source beds. Analysis of the condensates and oils from the area suggest a non-marine origin with both algal and higher land plant components (Type III kerogen). Maturation



studies indicate that the top of the hydrocarbon window lies at about 2500m. Thus mature Eumeralla source units underlie the local gas fields are most likely to charge directly into the overlying structures through source-reservoir juxtaposition or via fault conduits. This model is proposed for McIntee 1.

The formation of the McIntee structure commenced at the time of Belfast Mudstone deposition in the Late Cretaceous although its current configuration was not completed until the end of the Eocene. Generation and migration commenced in the Late Cretaceous and has continued through until the present day.

### **CO2 Issues**

The distribution of CO<sub>2</sub> within the Port Campbell area appears to be related to the introduction of a restricted CO<sub>2</sub> volume at a number of locations and its subsequent migration. The CO<sub>2</sub> is considered to be from a mantle source, and is likely to have occurred in conjunction with the emplacement of an igneous body during the Miocene.

A review of high-resolution aeromagnetic data has been undertaken in an effort to understand the distribution of deep-seated faulting, believed to be the conduit for CO<sub>2</sub> migration and the location of igneous bodies. The preliminary results of the study indicate the presence of an intrusive marginal to the coast and proximal to a major NNE-SSW lineament. This lineament appears to be co-incident with major faulting identified on the seismic and is seen as a likely conduit for the Langley and Grumby CO<sub>2</sub>. While an intrusive is not identified at nearby Boggy Creek, a similar trending lineament is mapped through the Boggy Creek well location. Further details are available in the report from the aeromagnetic interpretation.

### 3. RESULTS OF DRILLING

#### (a) Stratigraphy

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

TABLE IV: STRATIGRAPHY IN THE McINTEE 1 WELL

AGE	FORMATIONS	DEPTH (m)	THICK. (m)	ELEV. (m)
	<u>HEYTESBURY GRP</u>			
MIDDLE-LATE MIOCENE	PORT CAMPBELL LIMESTONE	Surface	162	65
EARLY MIOCENE	GELLIBRAND MARL	162	317	-98
E-L OLIGOCENE – E AQUITANIAN	CLIFTON FM <u>NIRRANDA GRP</u>	479	16	-415
LATE EOCENE	NARRAWATURK MARL	495	35	-431
MIDDLE EOCENE	MEPUNGA FM	530	92	-466
EARLY – MIDDLE EOCENE	DILWYN FM	622	239	-558
L PALEOCENE – EARLY EOCENE	PEMBER FM	861	43	-797
E-L PALEOCENE	PEBBLE PT FM <u>SHERBROOK GRP</u>	904	20	-840
LATE SENONIAN	PAARATTE FM	924	314	-860
LATE SENONIAN	SKULL CK MUDSTONE	1238	113	-1174
LATE SENONIAN	NULLAWARRE	1351	96	-1287
LATE SENONIAN	BELFAST MUDSTONE	1447	74	-1383
LATE SENONIAN	FLAXMAN FM	1521	17	-1457
LATE SENONIAN	WAARRE FM –UNIT C	1539	16	-1474
LATE SENONIAN	UNIT B	1555	10	-1490
LATE SENONIAN	UNIT A	1565	36	-1500
EARLY NEOCOMIAN	EUMERALLA FM	1601	198+	-1536
	TD	1799		

Samples were collected, washed, and described at 10m intervals from the surface to 870m, 3m intervals from 870m to 918m, 6m intervals from 918m to 1584m, and at 3 m intervals from 1584m to total depth at 1803m.

A brief summary of the formations penetrated in McIntee 1, their ages and interpreted environments of deposition follows:- (For more detailed lithological descriptions refer to Appendix I). For specific relationships between the units, refer to the stratigraphic column in Appendix VIII)

Total depth for McIntee 1 was reached at 1803m (D), 1799.5m (L), in the Early Cretaceous **Eumeralla Formation**, of the **Otway Group**. The well intersected 198m of the Eumeralla, the top coming in at 1601m (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. The sandstones are translucent to off-white, commonly light-dark grey and medium bluish grey. Quartz grains are dominantly medium-sized with rare coarse-very coarse grains. They are angular to subangular, poorly to moderately sorted, better sorted toward the base, contain weak to moderate silica cement, and have a common to abundant white argillaceous matrix. In part the sandstone is matrix supported, increasing with depth. Characteristically, the Eumeralla contains a high percentage of volcanic rock fragments (38-53%--Abele *et al*, 1995) and in McIntee 1 these are commonly pale green and brick red. There are trace carbonaceous flakes in part, and the sandstone varies from friable to occasionally moderately hard, but only exhibits a poor to fair porosity. No oil fluorescence was observed.

The claystone comprises approximately 30% of the section drilled and is pale grey to pale medium brown. It is moderately to very silty in parts, has rare coaly detritus, is locally micro-micaceous, and also contains minor pale green glauconite. The claystone is soft to firm and amorphous to sub blocky.

The Eumeralla was deposited in a low-energy fluvial environment, probably in a major braided stream system where there was an abundant supply of sand-sized volcanic detritus. The landscape also

included occasional high energy streams, lakes and channel tracts. The source of the volcanic material is unknown, but due to results from age dating, it appears that volcanism was contemporaneous with sedimentation (Foster and Hodgson, 1995). In the eastern portion of the Otway Basin the Eumeralla has been dated to be Aptian to Albian.

The Late Cretaceous **Sherbrook Group** unconformably overlies the Early 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", is generally called the Flaxmans Formation, after Flaxmans-1, by Bain (1961). Of the approximate 48.1m of good 'clean' sand in the Waarre, 27.1m is expressed as net pay (see Appendix IV for Log Analysis). The sandstone is off-white to light pale grey, very fine to very coarse, but dominantly medium. The grains are subangular to subrounded, moderately sorted, contains a weak to moderate silica cement. There is trace to common white argillaceous matrix throughout. The sandstone is loose to friable, and occasionally moderately hard, has a poor to fair visible porosity, and no fluorescence. The claystone is medium to dark grey and pale brown-grey, moderately silty, has common glauconite, with a trace of pyrite and carbonaceous material. It is soft to dispersive, occasionally firm and sub-blocky.

The sandstone packages are from 3 to 15m thick and are generally blocky in shape, although the Waarre B sand package exhibits a fining upward signature. The basal Waarre is interpreted to be shallow marine to marginal marine. 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 **Flaxmans Formation**. In the McIntee well it was intersected at 1521m (-1457m SS), thus is 17m thick. It consists of a coarsening upward package of approximately equal amounts of sandstone and claystone. The claystone is medium to dark brown grey and olive brown, moderately silty, has common glauconite, with a trace of very fine siltstone laminae in part, and slightly calcareous. The sandstone is light grey, dominantly medium and occasionally very coarse grained. It is moderately to poorly sorted, subangular to subrounded, has a weak siliceous cement and minor argillaceous matrix. The sand contains abundant glauconite pellets, is loose and exhibits fair porosity. The Flaxmans is dated as being Turonian (Partridge, 1997) in age, and is defined as the initial sediments of the major marine transgression to the overlying Belfast Mudstone. Both the Flaxmans and Belfast are considered part of the regional seal and side seal for the Waarre Formation.

The **Belfast Mudstone** conformably overlies the Flaxmans Formation. It was penetrated at 1447m (-1383m SS), and is 74m thick. The claystone is medium grey and olive brown, moderately silty, has common glauconite, with a trace of very fine siltstone laminae in part, and slightly calcareous. It is dominantly firm, occasionally soft and sub-blocky. The sandstone is pale grey and pale yellow, dominantly medium and occasionally coarse, with a weak siliceous cement and minor argillaceous matrix. It contains abundant glauconite, is dominantly loose, and exhibits fair porosity. The Belfast has been dated as Turonian to Campanian (Abele *et al.*, 1995), but Partridge (1997) considered it to be only Coniacian to Santonian. It was deposited below storm wave base in low-energy marine conditions, in a pro-delta environment.

The **Nullawarre Greensand** conformably overlies the Belfast with a top intersected at 1351m (-1287m SS), and is 96m thick. It is predominantly made up of a light to medium green, in part yellow, medium to coarse, trace very coarse-grained sandstone. The sandstone is subangular to subrounded, moderately to well sorted, with weak silica cement (including occasional quartz overgrowths), rare off white argillaceous matrix, common glauconite especially at the top, and trace nodular and disseminated pyrite. The sandstone is loose and exhibits fair-good 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).

In this locality, the **Skull Creek Mudstone**, (often considered part of the Paaratte Formation), conformably overlies the Nullawarre Greensand. The top of the mudstone was encountered at 1238m (-1174m SS), and is 113m thick. It comprises a pale to medium brownish-grey and pale grey, moderately silty, claystone and approximately 30m of 80-90% sandstone at the base. The claystone has common dispersed very fine quartz, trace:- black coaly detritus, micro-mica, and glauconite. It is soft, sticky and slightly subfissile. The sandstone is pale grey, occasionally iron oxide stained, medium to coarse, occasionally fine, moderately to poorly sorted, with rare white argillaceous matrix, and 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 intersected at 924m, (-860m SS). The formation is 314m thick and is made up of thin (1-5m) to fairly thick (10-35m), sandstone packages, which are interbedded with claystone (1-3m thick), and minor siltstone. The sandstone is pale grey and pale grey-brown, becoming off-white toward the base. Quartz grains are predominantly coarse, ranging from medium to pebbly, are angular to subrounded, and very poorly sorted, though improve to moderate at the base. There is weak pyrite and silica cement (including quartz overgrowths) throughout the section. A trace of dark greyish brown argillaceous matrix occurs in the upper portion of this formation. The sandstone is dominantly loose and exhibits poor to fair porosity, improving slightly toward 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, commonly calcareous, with trace to common pyrite, minor glauconite, increasingly fossiliferous with depth, trace carbonaceous specks, soft to firm, in part very dispersive and sub-blocky.

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.

Unconformably overlying the Paaratte Formation is the oldest unit in the **Wangerrip Group**, the **Pebble Point Formation**. At McIntee, the Pebble Point is 20m thick, from 904m (-840m SS) to 924m, and consists of interbedded sandstone and claystone. Claystone content decreases with depth, is pale to medium brown and pale grey, moderately to very silty, with common dispersed very fine to mainly grit-sized iron oxide stained quartz grains, trace:- glauconite, minor iron oxide pellets, fossil fragments and pyrite. It is soft, sticky and sub-blocky. The sandstone is medium yellow-brown, pale grey, very fine to grit, dominantly medium to coarse, angular to subrounded, very poorly sorted with minor pyrite cement and abundant olive-brown argillaceous and silty matrix (matrix supported). There are common orange iron oxide stained quartz grains, and trace nodular pyrite. The sand is dominantly loose with some moderately hard aggregates, and no visible porosity or fluorescence.

The environment of deposition for the Pebble Point is interpreted to be shallow water, near-shore, restricted marine with periodic influxes of coarse detrital material. Various megafossils and microfossils have been identified in the formation that indicate a Palaeocene age (Abele *et al*, 1995).

Conformably overlying the Pebble Point is the **Pember Mudstone**, between 861m (-797m SS) and 904m, thus is 43m thick. This claystone is light to medium brown and pale green-grey, 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, micro-mica, pyrite and it is soft, sticky and sub-blocky.

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 Paleocene 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 622m (-558m SS) and 861m (239m thick). The section consists predominantly of sandstone with minor interbedded silty claystone. The sandstone is a pale brownish-grey, very fine to trace 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, 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, common fossil fragments, trace to common pyrite and is very soft, very dispersive and sub-blocky.

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 portions representing shore-face 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 inter-distributary 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 McIntee well the Mepunga was intersected at 530m (-466m SS) and is 92m thick. The massive sandstone is pale brownish orange and very fine to medium in part, commonly coarse to grit-sized, angular to subrounded (dominantly subangular), moderately sorted, becoming poorer with depth, with in part, weak calcareous and siliceous cement generally decreasing with depth, minor medium brown argillaceous and silty matrix, and abundant brown-stained quartz grains, decreasing to common with depth. There is trace fossil fragments and coarse muscovite flakes, and the sand is generally loose, and has a very poor, to in part, very good visible porosity.

The trace 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, trace to common pyrite and is very soft, very dispersive and sub-blocky.

According to dating of forams, molluscs and palynomorphs discovered within the Mepunga, an age of Late Eocene has been given. The sandstones have been interpreted as being deposited in beach and near-shore locations as barrier islands, whereas the claystone is 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 495m (-431m SS), and is 35m thick. The formation is made up of a medium brown to medium olive grey, and medium green grey marl. It contains abundant fossil fragments, including fenestrate 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 sub-blocky.

The fossil fragments have been dated to be Late Eocene to Early Oligocene. 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 16m thick formation of calcarenite, found from 479m (-415m SS) to 495m in the McIntee 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 firm 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 317m thick, from 162m (-98m SS) to 479m. It is a medium olive grey with common to abundant fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules. There is a trace of pyrite, appearing as fossil replacement in places, trace of very fine grained glauconite, and it is very soft, sticky and non fissile.

The Early to Middle Miocene Gellibrand Marl 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 McIntee 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 162m in depth. The calcarenite is light grey, off white, fine-grained with a moderate to strong calcareous cement. It contains common fossil fragments, and is friable to hard with a very poor to poor intergranular porosity.

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 McIntee 1, refer to **Appendix I** of this report.

**(b) Stratigraphic Prognosis (after Well Proposal)**

The geological section penetrated was within tolerance to prognosis. Prognosed tops ranged from 32 m low to prognosis to 171m high. The primary objective, the Waarre Formation, was 171m high, while the secondary contingent objective, the Eumeralla Formation was 163m high. The top of the Eumeralla Formation tends to be difficult to pick on seismic in this region.

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

**TABLE V: ACTUAL VERSUS PREDICTED DEPTHS AND THICKNESSES McINTEE 1**

FORMATION	PROG SS DEPTH	ACTUAL SS DEPTH	DEPTH DIFF	PROG THICK	ACTUAL THICK	THICK DIFF
Port Campbell Lst	-	64.5m	-	-	162m	-
Gellibrand Marl	-	-98m	-	-	317m	-
Clifton Fm	-412m	-415m	3mL	-	16m	-
Narrawaturk Marl	-	-431m	-	-	35m	-
Mepunga Fm	-	-466m	-	-	92m	-
Dilwyn Fm	-	-558m	-	-	239m	-
Pember Mdst	-	-797m	-	-	43m	-
Pebble Point Fm	-808m	-840m	32mL	41m	20m	-21m
Paaratte Fm	-849m	-860m	11mL	333m	314m	-19m
Skull Creek Mdst	-1182m	-1174m	8mH	103m	113m	+10m
Nullawarre Greensand	-1285m	-1287m	2mL	249m	96m	-153m
Belfast Mdst	-1534m	-1383m	151mH	86m	74m	-12m
Flaxmans Fm	-1620m	-1457m	163mH	25m	17m	-7m
Waarre Fm	-1645m	-1474m	171mH	54m	62m	+8m
Eumeralla Fm	-1699m	-1536m	163mH	-	-	-
TD	-1734m	-1799m				

(c) **Hydrocarbon Summary**

Total gas was recorded from the surface to total depth (1799.5m RT) using a FID total gas detector run by Geoservices Ltd. One unit of gas is equal to 200 ppm methane equivalent. Chromatographic analysis was determined using a FID chromatograph and these values are quoted as percentages (C1-C4). Ditch cuttings were washed, described and checked for fluorescence using ultraviolet light.

**Surface to mid Mepunga Formation (spud to 746m)**

No gas was detected through the Port Campbell Limestone, Gellibrand Marl, Clifton Formation, or in the Narrawaturk Marl. No hydrocarbon fluorescence in the drill cuttings was recorded within these formations.

**Mid Mepunga Formation – Mid Skull Creek Formation (746-1282m)**

Total gas recorded within the lower portion of the Mepunga, Dilwyn, Pember, Pebble Point, Paaratte and upper portion of the Skull Creek Formations was less than 2 units and often nil. The gas analysed was predominantly 100% C1, with minor amounts of C2 in the upper portion of the Skull Creek formation. No hydrocarbon fluorescence was noted. CO<sub>2</sub> was present from ~800m onward at levels below 0.2%.

**Mid Skull Creek Mudstone – Top Belfast Formation (1282-1447m)**

The mid to lower portion of the Skull Creek Mudstone saw a rapid rise in background gas to 10 units which was maintained to the top of the Belfast Formation. The highest recorded gas in this interval was 40 units. An unusual inversion of gas ratios occurs from the mid Skull Creek Formation to the Top of the Nullawarre Formation, where there exists a higher percentage of heavier (C3 and C4) than lighter components (C1 and C2). No hydrocarbon fluorescence was recorded. CO<sub>2</sub> levels continued to rise throughout this interval to a maximum of 0.38%.

### Belfast Mudstone (1447-1521m)

Total gas rose steadily throughout the Belfast Mudstone, reaching a maximum of almost 300 units with a background of 100 units. The gas ratios for the high readings in the lower portion of the Belfast Mudstone are: C1=89%, C2=7%, C3=3%, and C4=1%. No hydrocarbon fluorescence was recorded within this formation. CO<sub>2</sub> levels again continued to steadily rise throughout this interval to a maximum of 0.83%.

### Flaxmans Formation (1521-1539m)

Gas levels continue to rise through this formation to just over 800 units with a background of 100 units. Gas breakdown is similar to that in the lower Belfast Formation; C1=88%, C2=7%, C3=3%, and C4=2%. No hydrocarbon fluorescence was recorded for this interval. CO<sub>2</sub> levels rose to 1.13% toward the end of this interval.

### Waarre Formation (1539-1601m)

#### **Waarre Unit "C" (1539-1555m)**

The primary objective of the McIntee 1 well was the Waarre Unit "C". The Waarre Unit "C" yielded significant values in the two top sands associated with excellent reservoir qualities. At the wellsite, during the drilling it was assessed as being gas saturated, and that it would likely flow gas at economic recovery rates. Two gas peaks with readings between 3000 and 3500 units occur between 1543 and 1550m, with components being: C1=82%, C2=11%, C3=5%, and C4=2%. No oil fluorescence was documented at the wellsite. CO<sub>2</sub> levels rose to 1.13% toward the end of this interval. CO<sub>2</sub> levels rose their maximum of 2.66% at 1564m, before beginning a steady decline to 0.63% at the base of the Waarre.

Log analysis and formation pressure data indicate a gross column of 16.3m with 16.2m of net pay. Average porosity calculated in this interval was 23.1% and average water saturation 18%. A sample was recovered at 1547.7m (analysis contained in Appendix VII). Mudlog gas peaks, log evaluation, combined with MDT tests indicate that the Waarre Unit "C" has good potential at this location.

#### **Waarre Unit "B" (1555-1565m)**

Gas readings are slightly higher again in this unit, with a maximum total gas of just over 4000 units and background gas of 200 units, C1=80%, C2=13%, C3=5%, and C4=2%. No hydrocarbon fluorescence was recorded for this interval. Log analysis and formation pressure data indicate a gross column of 5.5m with 3.8m of net pay. Average porosity calculated in this interval was 13.0% and average water saturation 55%. This interval is also very prospective.

#### **Waarre Unit "A" (1565-1601m)**

Gas readings decrease in the Waarre Unit "A", with a maximum total gas of 1000 units and background gas of 200 units, C1=90%, C2=6%, C3=3%, and C4=1%. No hydrocarbon fluorescence was recorded for this interval. Log analysis and formation pressure data indicate a gross column of 26.3m with 7.1m of net pay. Average porosity calculated in this interval was 13.9% and average water saturation 49%. This interval is also prospective.

### Eumeralla Formation (1601-1799.5m TD)

The formation was intersected 163m high to prognosis. Poor sand development was encountered in the upper half of the drilled section of the Eumeralla Formation, as it tended to contain abundant argillaceous matrix with varying degrees of both silica and calcareous cements. Gas levels declined



slowly to 17 units at 1679m, before rising to almost 200 units in the next 12m and remaining steady at a background level of 100 units to total depth. No fluorescence was documented in this formation. Typical breakdown: C1=92%, C2=6%, C3=1%, and C4=1%. No hydrocarbon fluorescence was recorded for this interval. CO<sub>2</sub> continued to decrease to 0.06% toward the end of this interval.

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

#### 4. SUMMARY

McIntee 1 was drilled as a Wildcat (WCNF) gas exploration well within PEP 154, at CDP 10254, Inline 2447, located on the Waarre 3D Seismic Survey. The McIntee structure is situated near the northern border of the Port Campbell Embayment of the Otway Basin, in southern Victoria. The McIntee prospect is a horst block structure within a much broader McIntee Structural Complex situated south of Callista 1. Three independent structural closures are present within the greater McIntee Structural Complex which are separated by shallow troughs and faulting.

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

Drilling of McIntee 1 was terminated 198m into the Eumeralla Formation. Formation tops younger than the Nullawarre Formation (2m low) were intersected close to prognosis, however deeper formations were intersected higher than prognosed. The top of the primary objective, the Waarre, was 171m high (at -1474mSS).

Wireline logging at total depth of 1822.5m consisted of the following: Run 1: DLL-SLL-MLL-SP-CSS-GR-CAL; Run 2: PDS-CNS-GR-CAL; Run 3: RFS; Run 4: SCG. No full hole cores were cut in McIntee 1.

Log analysis and formation pressure data indicate the following:

- 16.2m of net pay, average porosity of 23.1% with a water saturation of 18% in the Waarre 'C' Sandstone,
- 3.8m of net pay, average porosity of 13.0% with a water saturation of 55% in the Waarre 'B' Sandstone,
- 7.1m of net pay, average porosity of 13.9% with a water saturation of 49% in the Waarre 'A' Sandstone.

McIntee 1 has established the presence of hydrocarbons reservoired in the Waarre Formation at this location within PEP 154.

McIntee 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 870m, 3m intervals from 870m to 918m, 6m intervals from 918m to 1584m, and at 3 m intervals from 1584m to total depth at 1803m.

**HEYTESBURY GROUP****Port Campbell Limestone (Middle to Late Miocene)****162m thick**

Spud-162m      CALCARENITE: light grey, off white, occasionally yellow to orange, clear to translucent grains, fine to medium crystalline, very fossiliferous, common to abundant shell fragments and corals.

**Gellibrand Marl (Early to Middle Miocene)****317m thick**

162-479m      MARL: light grey - medium grey, pale to medium greenish/grey, commonly silty and also argillaceous, very calcareous, common to abundant fossil fragments, echinoid spines, gastropods, fenestrate bryozoans, forams, rare pyrite in parts, rare carbonaceous specks, soft-dispersive, sticky, competency and firmness increases with depth, predominantly sub blocky, occasionally blocky again increasing with depth.

**Clifton Formation (Late Oligocene to Early Miocene)****16m thick**

479-495m      CALCARENITE: (60%) orange-brown, off white, dark brown, common Fe oxide, common dark brown Fe oxide pellets, there are instances where Fe oxide has replaced fossil fragments, common echinoid spines, gastropods, and bryozoans, common to abundant medium to coarse grained, Fe stained, well rounded quartz grains, some of the quartz grains exhibit good quartz overgrowths and euhedral faces, cryptocrystalline calcareous matrix, friable, poor inferred porosity, quartz grains probably float in the matrix, no shows.

MARL: (40%) dark greenish/grey, commonly silty, commonly calcareous, common to abundant fossil fragments, echinoid spines, gastropods, fenestrate bryozoans, forams, rare carbonaceous specks, soft to firm, predominantly sub blocky, occasionally blocky increasing with depth.

**NIRRANDA GROUP****Narrawaturk Marl (Late Eocene to Early Oligocene)****35m thick**

495-530m      MARL: pale grey to medium green grey, medium olive brown, moderately calcareous, argillaceous, silty in part, common very fine carbonaceous specks, common to abundant fossil fragments, echinoid spines, gastropods, fenestrate bryozoans, forams, soft to firm, predominantly sub blocky.

**Mepunga Formation (Late Eocene)****92m thick**

530-622m SANDSTONE: (80%) pale brown/orange, clear, translucent, off white, fine to very coarse, predominantly medium to coarse lower, sub rounded to rounded, poor to moderately sorted, minor weak siliceous cement, rare weak siliceous cement, rare pale brown argillaceous matrix, common flat grain boundaries, common Fe staining, minor bituminous looking quartz inclusions, predominantly loose, fair to good inferred porosity, no fluorescence.

MARL: (20%) medium green/grey, dark olive brown to dark grey, very calcareous, argillaceous, rare very fine glauconite and carbonaceous specks, rare fossil fragments, echinoid spines, shells, forams, soft to firm, sub blocky.

**WANGERRIP GROUP****Dilwyn Formation (Palaeocene to Eocene)****282m thick**

622-861m SANDSTONE: (90-100%) clear, light brown, translucent, common light orange/brown Fe stained grains in part, fine to medium grain size, minor coarse, poor to moderately sorted, sub rounded to rounded, trace sub angular, minor very weak calcareous cement, trace pyrite cement, minor pale brown argillaceous matrix, trace lithics, predominantly loose, poor inferred porosity, no fluorescence.

CLAYSTONE: (0-10%) pale to medium green/grey, occasionally dark grey, common medium to dark olive brown, commonly very calcareous, commonly very argillaceous, rare very fine carbonaceous specks, rare fossil fragments including echinoid spines, bryozoan fragments and forams, soft to firm, sub blocky.

**Pember Mudstone (Palaeocene to Early Eocene)****63m thick**

861-904m CLAYSTONE: (100%) medium brown/ dark grey, pale green grey, argillaceous, commonly silty in part, occasionally grading to clay rich SILTSTONE, in part very fine quartz grains are entrained in the CLAYSTONE, trace to common medium to dark green glauconite which is generally associated with the pale grey CLAYSTONE, common carbonaceous specks in part especially associated with the siltier and dirtier looking CLAYSTONE, minor very fine carbonaceous specks, soft to firm, sub blocky.

**Pebble Point Formation (Late Palaeocene)****20m thick**

904-924m SANDSTONE: (90%) moderate yellow-brown, clear, translucent, fine to very coarse, predominantly medium to coarse, occasionally granular, sub rounded to rounded, fine to medium fraction is more subangular to subrounded, potentially diagenetic surface features, poorly sorted, trace pyrite cement, minor weak siliceous cement, pale brown silty matrix, large flat grain boundaries, predominantly loose, poor inferred porosity, no fluorescence.



**Skull Creek Mudstone (Campanian)****113m thick**  
**1238-1351m**

- 1238-1282m CLAYSTONE: (70%) pale brown/grey, medium grey/brown, pale grey, predominantly argillaceous, silty in part, trace very fine arenaceous grading to SILTSTONE, locally common very fine carbonaceous specks and flecks which along with trace mica specks make the CLAYSTONE look dirty, soft, sticky, amorphous, minor sub blocky.  
SANDSTONE: (20%) clear, translucent, smoky in part, minor off white to pale grey, dominantly medium to coarse, minor very coarse, trace fine to very fine aggregates, poorly sorted, sub angular to sub rounded, moderate weak siliceous cement, trace pyrite cement in part, rare off white argillaceous matrix, common quartz overgrowths, trace pyrite nodules, dominantly loose, trace firm to moderately hard aggregates, fair inferred porosity, poor visual porosity, no fluorescence.  
SILTSTONE: (10%) dark grey to dark brown, arenaceous, abundant pyrite nodules, common carbonaceous flecks, trace mica specks, soft to firm sub blocky.
- 1282-1318m CLAYSTONE: (90%) medium to dark brown grey, minor medium grey, predominantly argillaceous, silty in part, trace to locally common very fine carbonaceous specks and flecks, trace micro-micaceous, soft, amorphous, sub blocky.  
SANDSTONE: (10%) clear, translucent, pale grey, dominantly medium to coarse, minor very coarse, poorly sorted, sub angular to sub rounded, moderate weak siliceous cement, trace pyrite cement in part, rare off white/pale grey argillaceous matrix, minor quartz overgrowths, trace pyrite nodules, dominantly loose, fair inferred porosity, no fluorescence.
- 1318-1351m SANDSTONE: (90%) pale grey, clear, translucent, fine to very coarse, predominantly medium to coarse, minor very coarse, poorly sorted, sub rounded to rounded, minor weak siliceous cement, minor off white/pale grey argillaceous matrix, minor quartz overgrowths, common disseminated pyrite, occasional Fe stained grains, moderately flat grain boundaries on the larger grains, dominantly loose, fair inferred porosity, no fluorescence.  
CLAYSTONE: (10%) pale grey, pale grey brown, trace pale green grey, very argillaceous, locally commonly silty, trace to locally common very fine carbonaceous specks, minor micro-micaceous, soft, dispersive in part, amorphous, sub fissile.

**Nullawarre Greensand (Late Santonian)****96m thick**  
**1351-1447m**

- 1351-1447m SANDSTONE: (100%) dominantly pale green, clear, translucent, occasionally yellow, fine to very coarse, dominantly medium to coarse, moderate to poorly sorted, predominantly sub rounded to rounded, occasionally well rounded, minor weak siliceous cement, common light green/grey matrix, common to abundant glauconite pellets, minor disseminated pyrite, loose, fair to good inferred porosity, no fluorescence. Grading to 20% CLAYSTONE at the base of this formation.



**Belfast Mudstone (Coniacian to Santonian)**

74m thick

1447-1521m

- 1447-1521m SANDSTONE: (45%) dominantly clear to translucent, common light yellow and light green, dominantly medium to coarse, trace very coarse, well to very well sorted, sub angular to sub rounded, minor weak siliceous cement, rare off white argillaceous matrix, abundant green/black glauconite pellets increasing with depth, occasional quartz overgrowths, fair inferred porosity, no fluorescence.
- CLAYSTONE: (55%) medium to dark grey, olive brown, very argillaceous, silty in part, grading to glauconitic SILTSTONE, trace calcareous in part, abundant green/black glauconite pellets, dominantly firm, minor soft, sub-blocky.

**Flaxmans Formation (Turonian)**

18m thick

1521-1539m

- 1521-1539m SANDSTONE: (65%) pale grey, pale brown/yellow, clear translucent, fine to coarse, predominantly medium, sub rounded to rounded, moderately well sorted, trace weak siliceous cements, abundant off white silty kaolin matrix (10-20micron booklet size, micro-sucrosic), kaolin lines the pore network and would preserve some permeability, common glauconite, predominantly loose, minor friable, fair to good inferred porosity, fair visible porosity (most visible porosity is associated with the kaolin matrix), no fluorescence.
- CLAYSTONE: (35%) pale grey, pale medium grey/green, minor olive/brown, argillaceous, commonly locally silty, trace pyrite nodules, abundant glauconite, grading to glauconitic SILTSTONE, commonly micro-micaceous, common very fine carbonaceous specks, soft, sticky, dispersive, amorphous.

**Waarre Formation (Turonian)**

(62m thick)

1539-1601m

- 1539-1555m WAARRE 'UNIT C'
- SANDSTONE: (80%) clear, translucent, pale to medium grey/green, fine to very coarse, predominantly fine to medium, sub angular to sub rounded, trace rounded, poor to moderate sorting, minor weak siliceous cement, minor off white silty kaolin matrix (5-15micron booklet size, micro-sucrosic), kaolin lines the pore network and would preserve some permeability, abundant green/black glauconite pebbles, common quartz overgrowths, predominantly loose, minor friable, fair to occasionally good inferred porosity, poor visible porosity (most visible porosity is associated with the kaolin matrix), no fluorescence.
- CLAYSTONE: (20%) pale grey, pale medium brown/grey, medium to dark grey, argillaceous, commonly silty in part, occasionally grading to argillaceous SILTSTONE, trace pyrite, common dark green glauconite, common fine carbonaceous specks, minor micro-micaceous, soft, dispersive, occasionally firm, sub-blocky.

- 1555-1565m WAARRE 'UNIT B'  
SANDSTONE: (90%) off white, clear, translucent, pale grey, very fine to medium, occasionally very coarse, predominantly fine to medium, sub angular to sub rounded, moderate sorting, minor weak siliceous cement, minor off white silty kaolin matrix (5-15micron booklet size, micro-sucrosic), kaolin lines the pore network and would preserve some permeability, common quartz overgrowths, predominantly loose, minor friable, trace moderately hard, poor to fair inferred porosity, poor visible porosity, (as above most visible porosity is associated with the kaolin matrix, no fluorescence.  
CLAYSTONE: (10%) pale grey, pale medium brown/grey, medium to dark grey, argillaceous, commonly silty in part, common dark green glauconite, trace pyrite, common fine carbonaceous specks, minor micro-micaceous, soft, dispersive, occasionally firm, sub-blocky.
- 1565-1601m WAARRE 'UNIT A'  
SANDSTONE: (65%) off white, clear, translucent, pale grey, fine to medium, occasionally very coarse, predominantly medium, sub angular to sub rounded, moderate sorting, minor weak siliceous cement, trace off white silty kaolin matrix, minor quartz overgrowths, minor to common locally medium to dark green glauconite, predominantly loose, minor friable, poor inferred porosity, poor visible porosity, no fluorescence.  
CLAYSTONE: (35%) pale to medium olive brown, pale grey/green, silty in part, occasionally grading to slightly argillaceous glauconitic SILTSTONE, abundant medium to dark, glauconite, commonly micro-micaceous, common very fine carbonaceous specks associated preferentially with the olive brown CLAYSTONE, dispersive, soft, occasionally sub-fissile.

**Eumeralla Formation (Late Albian)**

**(198.5+m)**

**1601-1799.5m TD**

- 1601-1704m SANDSTONE: (60%) (1) pale to medium grey becoming off white with depth, very fine to fine grained, subrounded to sub angular, moderately well sorted, trace calcareous and moderate siliceous cement, common pale green volcanic lithics, firm to moderately hard, poor visual porosity, no fluorescence. (2) clear to opaque to translucent quartz, medium to coarse grain size, predominantly medium, sub angular to sub rounded, poorly sorted, off white silty matrix, poor to fair inferred porosity, no fluorescence.  
SILTSTONE: (TRACE) off white, minor pale brown, common very fine arenaceous grading to very fine SANDSTONE, minor carbonaceous specks, trace volcanic lithics, soft to firm, occasionally moderately hard, sub-blocky.  
CLAYSTONE: (40%) pale green/grey, pale brown, very argillaceous, minor to , trace volcanic lithics, soft, dispersive, amorphous.

- 1704-1799.5m SANDSTONE: (70-80%) off white, pale grey/green, clear, translucent, very fine to medium, sub angular to sub rounded, moderately well sorted, trace siliceous cement, common pale grey/off white argillaceous matrix, matrix supported quartz grains, common pale green volcanic lithics, minor brick red lithics, loose, poor to fair inferred porosity, no fluorescence.
- CLAYSTONE: (20%) pale grey, pale medium brown, silty in part grading to argillaceous SILTSTONE, locally micro-micaceous, rare carbonaceous specks, dispersive, soft to amorphous, pale medium brown aggregates are commonly sub-fissile.
- SILTSTONE: (TRACE-10%) off white, minor pale brown, commonly very fine arenaceous, grading to very fine SANDSTONE, common micro-micaceous, soft to firm, occasionally moderately hard.

**APPENDIX I (b): SIDE WALL CORES**

## SANTOS LIMITED

## SIDEWALL CORE DESCRIPTION

WELL: McINTEE 1 DATE: 20-2-01 PAGE: 1 OF 1GUN NO.: 1 SHOTS FIRED: 22 SHOTS BOUGHT: 20GEOLOGIST: TIM CONROY

CORE NO.	DEPTH	REC.	PALYN EVAL. REJECT	LITH.	COLOUR	GRAIN SIZE	HYDR. INDIC. (Y/N)	SUPPLEMENTARY INFORMATION
1	1702.5	F	N	SLTST	Pale grey	2-65µm	N	Occasional carb lams, minor mica
2	1685	F	Y	SST	Pale grey	62-160 µm	N	Com silty matrix and lithics
3	1642	F	Y	SST	Pale grey	62-160 µm	N	Com silty matrix and lithics
4	1598	F	N	CLYST	Olive/grey	<2 µm	N	Very arg with minor mica spks
5	1596	F	N	CLYST	Olive/grey	<2 µm	N	Very arg with minor mica spks
6	1591	F	Y	SST	Off white	62-160 µm	N	Com off wh silty matrix, friable
7	1586.5	F	Y	SST	Off white	62-130 µm	N	Abdt off wh silty matrix, friable
8	1573.5	F	Y	SST	Off white	62-130 µm	N	Abdt off wh silty matrix, mnr carb frags
9	1564	F	Y	SST	Off white	62-130 µm	N	Com off wh silty matrix
10	1560.5	F	Y	SST/SLTST	Off white	40-100 µm	N	Com off wh silty matrix, g/t SLTST
11	1559	F	Y	SST/SLTST	Off white	40-100 µm	N	G/t SLTST, com dissem pyrite
12	1556.5	F	N	CLYST	Olive/grey	<2 µm	N	Very arg, minor mica & carb spks
13	1553	POOR	N	SST	Off white	100-500 µm	N	Com off wh silty matrix, minor crs
14	1547	F	Y	SST	Off white	100-250 µm	N	Com off wh silty matrix, carb lams, good perm, com kaolin
15	1542	F	Y	SST	Off white	200-500 µm	N	Com off wh silty matrix, minor carb lams, excellent perm, kaolin
16	1540	F	N?	SST/SLTST	Off white	80-190 µm	N	Com off wh silty matrix, minor carb lams, minor shale bands, trace coarse grns, fine g/t SLTST
17	1539	F	N?	SST & SLTST & CLYST	Off wh/org Off white Med grey	100-800 µm 50-80 µm <5 µm	N	Pr srt, org & wh mtx Off white, very f arenaceous Dirty CLYST with floating grns
18	1533.5	MOD	N	CLYST	Pl/brn gy	<5 µm	N	Common glauconite grains
19	1515	F	N	CLYST	Dk Gn/gy	<2 µm	N	Very argillaceous, homogeneous
20	1497	F	N	CLYST	Dk Gn/gy	<2 µm	N	Abdt large glauconite grains
21	1473.5	F	N	CLYST	Dk Gn/gy	<2 µm	N	Abdt large glauconite grains
22	1451	Lost	-	-	-	-	-	Lost
23	1431	-	-	-	-	-	-	Not Shot
24	1424.5	-	-	-	-	-	-	Not Shot

## COMMENTS:

Good sidewall coring run. 24 side-wall cores originally planned. 22 shot, 2 did not fire, 1 side-wall core lost, 1 insufficient recovery. 19 good recoveries and 1 moderate recovery in all. The side wall core that was lost was a result of the bullet getting excellent penetration and not coming off the wall of the wellbore. After several attempts to retrieve the bullet from the wall of the wellbore it was pulled from the tool.

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## **APPENDIX II: HYDROCARBON SHOW REPORTS**

No oil shows were seen in McIntee 1

**APPENDIX III: WIRELINE LOGGING REPORTS**

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**APPENDIX III (a): LOGGING ORDER FORM**



**Santos**

A.C.N. 007 550 923

REVISION 1.0  
(DATE: 22/11/96)

**LOGGING ORDER**

COMPANY: SANTOS LTD & BEACH PETROLEUM

WELL: McINTEE #1 FIELD: WILDCAT

RIG: OD & E 30 STATE: VIC

LOCATION: INLINE 2447, CDP 10254 BLOCK: PEP 154  
CURDIEVALE 3D

LATITUDE: 38° 29 21.10" S LONGITUDE: 142° 49 21.18" E

ELEVATIONS GL: 59.8m RT: 64.5m DF: 4.7m

9 7/8" HOLE: 433m 7 5/8" CSG: 425m WT: 26.4 LB/FT

6 3/4" HOLE: 1803m TD 3 1/2" CSG: 1677.5m WT: 9.3 LB/FT

TD (Drlr.): 1803m TD TD (Logr.): 1794.8m

MUD SYSTEM: KCL/PHPA/POLYMER CIRCULATION STOPPED: 12:40 HRS ON 19-2-01

WT: 9.4 VISC: 47 PV/YP: 12/14 PH: 9 FLUID LOSS: 6 CHL: 22,000

GEOLOGIST: TIM CONROY

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

**HOLE CONDITIONS:** (TIGHT SPOTS, DEVIATION, COALS, BARITE IN MUD, ETC)  
LEDGES AROUND 684M CAUSED PROBLEMS WITH TRIPPING IN AND OUT OF THE HOLE. EXPECT IT TO BE HARD STINGERS OF CALCIFIED SANDSTONE. IT HAS BEEN REAMED. WORKED TIGHT HOLE AT 1370M-1430M THIS MORNING, NO PROBLEMS TRIPPING IN AND OUT OF THE HOLE FOR WIRELINE LOGS. NO WELL DEVELOPED COALS PRESENT.

KCL 4.5%.  
INTERNAL DIAMETER OF 7 5/8" CASING IS 6.969"

**DRILL STEM TESTS/CORED INTERVALS:**

NO DRILL STEM TESTS OR FULL HOLE CORES ARE PLANNED FOR THIS WELL.

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

KCL 4.5%.  
INTERNAL DIAMETER OF 7 5/8" CASING IS 6.969"

**LOGS:**

PROGRAM CONFIRMED WITH OPERATIONS GEOLOGIST AT 15:00 HOURS ON 19/2/01.

PROGRAM VARIES FROM PRE-SPUD NOTES: YES:  NO:

LOG	INTERVAL	REPEAT SECTION
<p><b>RUN 1</b></p> <p>SGS (GR) LCS</p> <p>DLS (LLS, LLD) MRS (MLL, CALIPER)</p>	<p>TD TO SURFACE</p> <p>TD TO SCS WAVEFORM TAPING TD TO 1250M</p> <p>TD TO SCS TD TO SCS (SCS = SURFACE CASING SHOE)</p>	<p>AQUIRE RUNNING IN HOLE</p> <p>AQUIRE RUNNING IN HOLE</p> <p>AQUIRE RUNNING IN HOLE</p>
<p><b>RUN 2</b></p> <p>SGS (GR) PDS (RHOB) CNS (NPHI)</p>	<p>TD TO SURFACE</p> <p>TD TO 1250M TD TO 1250M</p>	<p>AQUIRE RUNNING IN HOLE</p> <p>AQUIRE RUNNING IN HOLE</p> <p>AQUIRE RUNNING IN HOLE</p>
<p><b>RUN 3</b></p> <p>RFS (20 POINTS COSTED)</p>	<p>20 POINTS TO BE PICKED</p>	<p>TIE IN EVERY 50M</p>
<p><b>RUN 4</b></p> <p>SCG(SIDE WALL CORE GUN) 1 FULL GUN</p>	<p>SWC POINTS TO BE PICKED, PALYNOLOGY AND PROJECT TEAM</p>	<p>CORRELATE DEPTH</p>

**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

<b>WELL:</b>	McIntee 1	<b>GEOLOGIST:</b>	Tim Conroy
<b>LOGGING ENGINEER:</b>	M. Barnes, J. Casalecno		
<b>RUN NO.:</b>	1-2-3-4	<b>DATE LOGGED:</b>	19-21/02/01
<b>DRILLERS DEPTH:</b>	1803m	<b>LOGGERS DEPTH:</b>	1794.8 m
<b>ARRIVED ON SITE:</b>	18/2/01		
<b>ACTUAL LOG TIME:</b>	15.5 HRS	<b>LOST TIME LOGGER:</b>	11 HRS
<b>TOTAL TIME:</b>	48.25 HRS	<b>LOST TIME OTHER:</b>	0 HRS

TYPE OF LOG	DLL-SLL-LCS-GR-CAL-CSS-SP	PDS-CNS	RFS-GR	SCG
TIME CIRC. STOPPED	6.35 HRS	13.5 HRS	34 HRS	38 HRS
TIME TOOL RIG UP	0.75 HRS	0.25 HRS	0.75 HRS	4.0 HRS
TIME TOOL RIH	4.25 HRS	1 HR	2 HRS	0.75 HRS
TIME TOOL RIG DOWN	0.75 HRS	0.25 HRS	1 HR	2.75 HRS
TOTAL TIME	10.5 HRS	3.75 HRS	17.75 HRS	11.75 HRS

TYPE OF LOG	FROM	TO	REPEAT SECTION	TIME SINCE LAST CIRCULATION	BHT
DLL-SLL-MLL-SP-CSS-JR-CAL	1793.5M	SURFACE	DOWNLOG	6:35 HRS	64 °C
PDS-CNS-GR	1791.3M	1300M	DOWNLOG	13.5 HRS	70 °C
RFS	1356.5M	1756M	TIE IN	34 HRS	72.24 °C
SCG	1702.5M	1424.5M	TIE IN	38 HRS	-

<b>MUD SYSTEM:</b> KCL/PHPA/POLYMER <b>HOLE CONDITIONS:</b>  Very good borehole conditions. PHPA mudcake could potentially be plugging the snorkel of the RFS tool.	<b>WEIGHT:</b> 9.4 PPG
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**REMARKS / RECOMMENDATIONS**  
 Good log quality for the resistivity/ sonic and density neutron runs. Good side wall core run. Waveform acquisition was problematical due to two magnetic tape drives failing and one hard drive failing. RFS run was sub-standard.

WELLSITE LOG QUALITY CONTROL CHECKS

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

LOG TYPE	SLS	GR	CAL	DLL	MLL	PDS	CNS	CSG	RFS	REMARKS
CASING CHECK	X		X							
SCALE CHECK	X	X	X	X	X	X	X	X	X	
DEPTH Casing Total	X	X	X	X		X				
CALIBRATIONS OK	X	X	X	X	X	X	X	X	?	
REPEATABILITY	X	X	X	X	X	X	X	X	N	
LOGGING SPEED	X	X	X	X	X	X	X	X	X	
OFFSET WELL Repeatability	X	X	X	X	X	X	X	X	N	
NOISY / MISSING DATA										
CURVES/LOGS Depth Matched	X	X	X	X	X	X	X			
Rm MEASUREMENT				X	X					
LLS / LLD / CHECK				X	X					
PERF / RHOB CHECK						X	X			
LOG HEADER / TAIL	X	X	X	X	X	X	X	X	X	
PRINT/FILM QUALITY	X	X	X	X	X	X	X	X	X	

COMMENTS:

RFS run was very problematical. Pressures were not increasing with depth and were not repeatable within 20 psi (unacceptable). Good sample was taken. Reeves specialist will investigate the RFS run. Potentially the PHPA mud system mudcake was causing plugging of the snorkel. Density/neutron and resistivity/sonic runs were good. MLL reads a little low due to limited penetration (pad is for a 3/4" borehole). RFS run went well. Lost contact with the tool at the end of the run missed two points. Make sure reeves has redundancy for all equipment to be run and make sure they have a truck with DAT drive capabilities and experienced engineers.

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

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## APPENDIX IV: LOG EVALUATION

**McINTEE 1 - LOG ANALYSIS**

McIntee 1 wireline logs were analysed over the Waarre Sandstone (1540-1601m) interval. Gas pay was identified in the Waarre A, B & C Sandstones. McIntee 1 was cased as a potential gas producer.

A 9 7/8" surface hole was drilled to 433.5 metres and 7 5/8" casing set at 428 meters. A 6 3/4" hole was then drilled with KCl/PHPA mud to 1803 metres (D). Wireline logging was carried out by Reeves as described below. Twenty Repeat Formation Sampler (RFS) pressure points were attempted (17 valid, 3 curtailed).

Unless otherwise specified, all depths mentioned below are logger's depths referenced to the drill floor.

**Pay Summary**

Waarre C	Gas Pay <b>16.2m</b> , Ave Porosity 23.1%, Ave S <sub>w</sub> 18%
Waarre B	Gas Pay <b>3.8m</b> , Ave Porosity 13.0%, Ave S <sub>w</sub> 55%
Waarre A	Gas Pay <b>7.1m</b> , Ave Porosity 13.9%, Ave S <sub>w</sub> 49%

**Note: Net gas pay assumes a 5% porosity cut-off and a 65% water saturation cut-off**

**Logs Acquired**

Run 1	GR	1791-Surface
	CSS (Compensated Sonic Sonde)	1783-425m (Waveform Sonic from 1783-1495m)
	DLS (Dual Laterolog Sonde)	1789-425m
	MRS (Micro Resistivity Sonde)	1793-425m
Run 2	PDS (Compensated Density Sonde)	1791-1300m
	CNS (Compensated Neutron Sonde)	1791-1300m
Run 3	SCG (Side wall cores)	1702.5-1425.5m (24 shot gun)
Run 4	RFS	1756-1356.5m

**Mud Parameters**

Mud Type	KCl/polymer
Mud Density	9.4ppg
KCl	4.5%
Rm	0.204 ohmm @ 25.1°C
Rmf	0.174 ohmm @ 24.3°C
Rmc	0.336 ohmm @ 27.8°C
MRT	72.3°C from Run 4 at 1756m

**Remarks**

- The laterolog and sonic was run with 1 inch stand-offs.

Log Processing

- Regional salinity data as well as an *in-situ* calculation of  $R_{wa}$  in water sands was used to derive the  $R_w$  used for this analysis.

Interpretation Procedures and Parameters

An interpretation over the Waarre Sandstone interval was conducted using a combination of gas corrected density-neutron cross-plot porosity (PHIX) and sonic porosity (SPHI) from sonic. A gamma-ray derived volume of shale was calculated with water saturations computed using a pseudo-Archie Equation (Parameters used for the interpretation are detailed in Table 1).

- The GR from Run 1 was environmentally corrected for mud-weight and borehole size using measurements made from the MRS caliper.
- Borehole corrections for the Dual Laterolog LLS and LLD curves using 1.5" stand-offs were applied (Table 1). These are ratios illustrated in the Reeves charts Lat-1 and Lat-2 respectively.
- The borehole corrected deep resistivity curve (LLD<sub>BC</sub>) was further corrected for shoulder effects (LLD<sub>c</sub>).
- The invasion corrected  $R_T$  was derived using the following tornado chart emulation relationship:

$$R_T = (1.59 * LLD_c - 0.59 * LLS_{BC})$$

where:

LLD<sub>c</sub> = Deep resistivity response borehole and shoulder bed corrected.

LLS<sub>BC</sub> = Shallow resistivity response borehole corrected.

- Density porosity was calculated over the Waarre Sandstone:

$$DPHI = (2.65 - DEN) / (1.65)$$

where;

DEN = Bulk Density in g/cc.

- Cross-plot porosity was determined:

$$PHIX = (DPHI + NPRL_{ss}) / 2$$

where;

NPRL<sub>ss</sub> = Environmentally corrected neutron porosity in sandstone units.

- A Hunt-Raymer sonic porosity curve was calculated:

$$SPHI = (DTC2 - 55.5 / DTC2) * 0.5$$

Where;

DTC2 = 3-4ft Compensated Sonic ( $\mu$ s/ft).

- PHIT was primarily produced from the minimum value of DPHI and PHIX with some editing to SPHI and porosity interpreted from the MLL.



- A shale corrected porosity (PHIE to be used in the psuedo-Archie equation) was calculated as follows:

if  $V_{sh} < V_{shSt}$ ..... PHIE = PHIT

elseif  $V_{shSt} < V_{sh} < V_{shCO}$ ... PHIE = a proportional percentile correction from PHIT to  $(PHIT - (V_{sh} * PHIsh))$

elseif  $V_{sh} > V_{shCO}$  ..... PHIE =  $PHIT - (V_{sh} * PHIsh)$

where:  $V_{shSt}$  = The start of the sliding scale  $V_{sh}$  correction.  
 $V_{shCO}$  = Shale volume cut-off.  
 $V_{sh}$  = Shale volume.  
 $PHIT$  = Combination of density/neutron and sonic porosity.  
 $PHIsh$  = Apparent shale porosity.

- A variable cementation exponent “m” was used in the calculation of  $S_w$ . The derivation of “m” was porosity based and results in “m” decreasing as porosity increases. Currently there is no SCAL data available to confirm this relationship. This relationship is given as;

$$MEXP = (-0.2413 * \text{Log}_{10} PHIE) + 2.4657$$

- Water saturations were calculated using a psuedo-Archie equation.

$$SW = \sqrt[n]{\frac{F * R_w}{RT}}$$

where: F = formation factor  $F = \frac{a}{PHIT^m}$

$R_w$  = Resistivity of formation water at formation temperature.  
 $RT$  = True resistivity, i.e. resistivity of the non-invaded reservoir (i.e. LLD corrected for borehole, invasion and shoulder beds).  
 $PHIT$  = Input as shale corrected PHIE (derived above).  
 $a$  = Porosity coefficient (default = 1).  
 $m$  = Cementation factor or exponent from the variable “m” relationship.  
 $n$  = Saturation exponent (default = 2).

## Conclusions

1. McIntee 1 log analysis identified a total of 27.1 metres of pay in the Waarre Sandstone.
2. The Waarre C sandstone contains 16.2 metres of pay. This interval has an average porosity of 23.1% and an average water saturation of 18%.
3. The Waarre B sandstone contains 3.8 metres of pay. This interval has an average porosity of 13% and an average water saturation of 55%.
4. The Waarre A sandstone contains 7.1 metres of pay. This interval has an average porosity of 13.9% and an average water saturation of 49%.

5. Formation pressure points in these sandstones indicated a reservoir pressure of around 2100 psi.
6. Conventional pay, porosity and water saturations for McIntee 1 are tabulated in Table 2.
7. Low bulk density and high sonic transit time would indicate gas-bearing sands down to 1576m. Below this depth are shales and shaly sands interpreted as water bearing.
8. McIntee 1 was cased as a future gas producer.

Attached is the well evaluation summary (WES) plot for McIntee 1 (01.041)  
*wes/wessa/mcintee\_01.041\_permian.wes*

**TABLE 1**

**Log Analysis Parameters**

PARAMETERS	WAARRE SANDSTONE
R <sub>w</sub> (ohmm) @ 25°C	0.3
a	1
m	Variable
n	2
Borehole cor RD	0.87
Borehole cor RS	0.92
RD Shoulder Corr.	1.07
GR matrix (API)	45
GR shale (API)	120
VSHST	0
VSHCO	0.4
PHISH	0.13

**TABLE 2**

**Conventional Pay Summary**

FORMATION	SAND	SAND INTERVAL	NET PAY (m)	NET SAND (m)	AVG Porosity (wt%)	AVG Sw (wt %)
WAARRE C		1540 -1556	16.2	16.3	23.1	18
WAARRE B		1556 -1565	3.8	5.5	13	55
WAARRE A		1565 -1601	7.1	26.3	13.9	49

	<b>NET PAY</b>	<b>Avg Porosity</b>	<b>Avg Sw</b>
	(ft)	(wt%)	(wt%)
<b>Waarre Fm</b>	<b>27.1</b>	<b>16.9</b>	<b>29</b>

**Net Pay identified where PHIE>5% & S<sub>w</sub><65%, Net Sand identified where PHIE>5%**

PE605266

This is an enclosure indicator page.  
The enclosure PE605266 is enclosed within the  
container PE908035 at this location in this  
document.

The enclosure PE605266 has the following characteristics:

ITEM\_BARCODE = PE605266  
CONTAINER\_BARCODE = PE908035  
NAME = McIntee-1 Well Evaluation Summary Log  
BASIN = OTWAY  
ONSHORE? = Y  
DATA\_TYPE = WELL  
DATA\_SUB\_TYPE = WELL\_LOG  
DESCRIPTION = McIntee-1 Well Evaluation Summary Log  
Scale 1:200, by Santos Limited, W1316,  
PEP154. Appendix IV Log Evaluation  
contained within "Well Completion  
Report" [PE908035]  
REMARKS =  
DATE\_WRITTEN = 30-APR-2001  
DATE\_PROCESSED =  
DATE\_RECEIVED = 20-AUG-2001  
RECEIVED\_FROM = Santos Ltd  
WELL\_NAME = McIntee-1  
CONTRACTOR =  
AUTHOR =  
ORIGINATOR = Santos Ltd  
TOP\_DEPTH =  
BOTTOM\_DEPTH =  
ROW\_CREATED\_BY = DN07\_SW

(Inserted by DNRE - Vic Govt Mines Dept)

## APPENDIX V: PRESSURE SURVEY

**SANTOS LIMITED  
PRESSURE SURVEY**

WELL: McINTEE 1 K.B.: 64.5M TOOL AND GAUGE TYPE: HP QUARTZ/STRAIN PAGE: 1 OF 2  
 WITNESS: TIM CONROY TIME SINCE LAST CIRC.: 12:40 19-2-01 34HRS PROBE / PACKER TYPE: NORMAL DATE: 19-2-2001

TEST	FORMATION UNIT SANDS	DEPTH		DEPTH S.S.	EXPECT. FORM PRESS.	EXPECT. TEMP.	FILE NO.	TEST RESULTS			INTERPRETATION			COMMENTS (FLUID TYPE)		
		M	M					HYDR. BEFORE PSI	FORM. PRESS PSI	HYDR. AFTER PSI	TEMP. °C	DRAW D. MOBILITY MD/CP	TYPE D/D		TYPE BUILDUP	DEPLET -S/C
1	NULLAWARRE	1356.5	1292	1292	1900	54		2225.63	1867.41	2225.77	-	N/A	N	RAPID	N	GOOD TEST
2	NULLAWARRE	1389	1324.5	1324.5	1900	55		2279.44	1914.17	2279.50	-	N/A	N	RAPID	N	GOOD TEST
3	NULLAWARRE	1397	1332.5	1332.5	1900	55		2292.48	1925.49	2292.60	61.01	N/A	N	RAPID	N	GOOD TEST
4	NULLAWARRE	1406.8	1342.3	1342.3	1900	55		2308.72	1939.1	2308.80	61.01	N/A	N	GOOD	N	GOOD TEST
5	WAARRE	1541.5	1477	1477	2100	58		2531.03	2094.53	2531.11	61.01	N/A	N	GOOD	N	GOOD TEST
6	WAARRE	1543.5	1479	1479	2100	58		2534.42	2089.36	2534.49	64.91	N/A	N	GOOD	N	GOOD TEST
7	SAMPLE 3 CHAMBER/ AIR CUSHION	1545.7	1481.2	1481.2	2100	59		2533.47	2113.69	2535.68	65.4	N/A	N	RAPID	N	GOOD TEST GOOD SAMPLE
8	WAARRE	1547.3	1482.8	1482.8	2100	59		2540.72	2106.16	2540.80	64.91	N/A	N	GOOD	N	GOOD TEST
9	WAARRE	1550.2	1485.7	1485.7	2100	59		2545.56	2101.59	2545.55	65.40	N/A	N	RAPID	N	GOOD TEST
10	WAARRE	1553.7	1489.2	1489.2	2100	59		2551.43	2115.53	2551.52	64.91	N/A	N	RAPID	N	GOOD TEST
11	WAARRE	1554.8	1490.3	1490.3	2100	59		2553.40	2092.80	2553.15	65.79	N/A	N	RAPID	N	GOOD TEST

ANTICIPATED GEOTHERMAL GRADIENT: 0.025 °C/M DRAWDOWN NORMAL : PRESSURE DOES NOT DROP TO ZERO  
 ANTICIPATED WATER GRADIENT: 0.45 PSI/FT LIMITED : PRESSURE DROPS TO ZERO  
 MUD WEIGHT / GRADIENT: 9.2 PPG BUILD UP TYPES : IMMEDIATE - RAPID - GOOD - SLOW

908035

053

**SANTOS LIMITED  
PRESSURE SURVEY**

WELL: McINTEE 1 K.B.: 64.5 M TOOL AND GAUGE TYPE: HP QUARTZ/STRAIN PAGE: 2 OF 2  
 WITNESS: TIM CONROY TIME SINCE LAST CIRC.: 12:40 19-2-01 34HRS PROBE / PACKER TYPE: NORMAL DATE: 19-20-2001

TEST	FORMATION UNIT SANDS	DEPTH K.B.	DEPTH S.S.	EXCEPT. FORM PRESS.	EXCEPT. TEMP.	FILE NO.	TEST RESULTS			INTERPRETATION			COMMENTS (FLUID TYPE)	
							HYDR. BEFORE	FORM. PRESS	HYDR. AFTER	TEM P.	DRAWD. MOBILITY	TYPE D/D		TYPE BUILDUP
		M	M	PSIG	°C		PSI	PSI	°C	MD/CP				
12	WAARRE	1562.4	1497.9	2100	59		2565.74	2103.47	2565.95	N/A	N	SLOW	N	GOOD TEST
13	WAARRE	1563.5	1499	2100	59		2567.64	2106.25	2567.67	N/A	N	GOOD	N	GOOD TEST
14	WAARRE	1568.5	1504	2100	59		2575.78	2107.48	2575.90	N/A	N	GOOD	N	GOOD TEST
15	WAARRE	1570.5	1506	2100	59		2579.30	2108.80	2579.38	N/A	N	GOOD	N	GOOD TEST
16	WAARRE	1572	1507.5	2100	60		2581.84	2111.21	2581.79	N/A	N	GOOD	N	GOOD TEST
17	WAARRE	1577.4	1512.9	2100	61		2590.68	2117.73	2590.82	N/A	N	GOOD	N	GOOD TEST
18	EUMERALLA	1709	1644.5	2200	63		2807.4	965.53	2808.40	N/A	N	SLOW	N	CURTAILED
19	EUMERALLA	1711.2	1646.7	2200	63		2811.51	487.81	2804.06	N/A	N	SLOW	N	CURTAILED
20	EUMERALLA	1756	1678	2200	63		2888.16	233	2885.53	N/A	N	SLOW	N	CURTAILED
9A	WAARRE	1550.2	1485.7	2100	59		2545.88	2091.47	2545.72	N/A	N	GOOD	N	SPURIOUS
11A	WAARRE	1554.8	1490.3	2100	59		2553.21	2069.47	2553.26	N/A	N	GOOD	N	SPURIOUS

ANTICIPATED GEOTHERMAL GRADIENT: 0.025 °C/M  
 ANTICIPATED WATER GRADIENT: 0.45 PSI/FT  
 MUD WEIGHT / GRADIENT: 9.2 PPG

DRAWDOWN NORMAL : PRESSURE DOES NOT DROP TO ZERO  
 BUILD UP LIMITED : PRESSURE DROPS TO ZERO  
 TYPES : IMMEDIATE - RAPID - GOOD - SLOW

Very difficult to quality control Reeves RFS due to poor pressure display. Inexperienced RFS engineer running tool. Was not confident with pressures acquired. The pressures did not increase with depth as they should have. Pressures were not repeatable within reasonable accuracy. Potentially plugging of the tool was occurring. Reeves in England will be investigating the RFS logging run and getting back to operations geology.

908035

054

McINTEE 1 GAS BREAK DOWN FROM SEGREGATED RFS SAMPLE TAKEN AT 1545.7M 21-2-01.  
ANALYSIS BY GEOSERVICES UNIT.

TOTAL GAS: 2542 UNITS

79/13/6/1/1

C1 236379 PPM

C2 40027 PPM

C3 16320 PPM

iC4 3630 PPM

nC4 3901 PPM

CO2 1.33%

(NOTE: MAXIMUM CO2 GAS READING DURING THE DRILLING OF THE WELL WAS 2.66%.)

## **APPENDIX VI: DRILL STEM TEST DATA**

No Drill Stem Tests were conducted in McIntee 1.



## **APPENDIX VII: HYDROCARBON ANALYSIS**

- 1) RFS sample gas analysis.
- 2) Production test gas analysis.

## PETROLEUM SERVICES GAS ANALYSIS

Method GL-01-01

ASTM D 1945-91 (modified)

Client: SANTOS Ltd

Report # LQ10151

 Sample: McINTREE-1  
 Waarre Formation  
 1545.7m (MDRT)

GAS	MOL %
Nitrogen	5.91
Carbon Dioxide	2.15
Methane	82.56
Ethane	5.60
Propane	2.24
I-Butane	0.46
N-Butane	0.53
I-Pentane	0.15
N-Pentane	0.11
Hexanes	0.17
Heptanes	0.08
Octanes and higher h'cs	0.04
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	19.55
Lower Flammability limit	4.88
Upper Flammability limit	15.72
Ratio of upper to lower	3.22
Wobbe Index	47.56
Compressibility Factor	0.9975
Ideal Gas Density (Rel to air = 1)	0.675
Real gas Density (Rel to air = 1)	0.677
Ideal Nett Calorific Value MJ/m <sup>3</sup>	35.33
Ideal Gross Calorific Value MJ/m <sup>3</sup>	39.08
Real Nett Calorific Value MJ/m <sup>3</sup>	35.42
Real Gross Calorific Value MJ/m <sup>3</sup>	39.18
Gross calorific value of water-saturated gas MJ/m <sup>3</sup>	38.39

This report relates specifically to the sample submitted for analysis.

Approved Signatory



Accreditation No.

2013

Date :

26-02-01

AMDEL PETROLEUM SERVICES  
Method GL-02-03

Appendix A  
Page A1

Client: SANTOS Ltd

Report # LQ10293

Sample: Mc INTEE-1  
5523 kPag @ 26°C  
27/03/01, 1600h, Cyl# PDE193 & EX 208

Full Well Stream

Separator Gas	14.880	MMSCF		
Stock Tank Oil Rate	66.770	BBLs		
			Av Mol Wt	
Flash Gas Moles	1.034		32.52	
Flash Liquid Moles	1.780		111.48	
Recombination Moles	2.815			
Molar Shrinkage Factor	0.632			
Full Well Stream	110297	Moles Liquid	0.62%	
Molar ratio	17783204	Moles Gas	99.38%	

	Flash Gas Mol%	Flash Liquid Mol%	Recomb. Liquid Mol%	HP Gas Mol%	Full Well Stream Mol%
Nitrogen	0.81	-----	0.30	6.08	6.04
Carbon Dioxide	2.54	-----	0.93	2.17	2.16
Methane	47.09	-----	17.32	82.35	81.95
Ethane	14.93	0.37	5.73	5.58	5.58
Propane	16.65	1.74	7.22	2.26	2.29
I-Butane	5.18	1.47	2.83	0.46	0.47
N-Butane	6.75	3.12	4.46	0.53	0.55
I-Pentane	2.07	2.75	2.50	0.15	0.16
N-Pentane	1.46	3.24	2.58	0.11	0.13
Hexanes	1.77	13.97	9.48	0.17	0.23
Heptanes	0.56	24.98	16.00	0.10	0.20
Octanes plus	0.19	48.35	30.64	0.04	0.23
	100.00	100.00	100.00	100.00	100.00
Av.Mol.Weight	32.52	111.48	82.44	19.60	19.99

K Factors	Flash Gas/ Flash Liquid Ratio	HP Gas/ Recombined Liquid Ratio
C1	-----	4.75
C2	39.88	0.97
C3	9.55	0.31
IC4	3.52	0.16
NC4	2.16	0.12
IC5	0.75	0.06
NC5	0.45	0.04
C6	0.13	0.02
C7	0.02	0.01

## **APPENDIX VIII: WATER ANALYSIS**

No Water Analysis was conducted on McIntee 1.

## **APPENDIX IX: PALYNOLOGICAL ANALYSIS**

**SANTOS PALYNOLOGY SECTION  
EXPLORATION SERVICES DEPARTMENT**

Palynology Report No. 2001/06

Author: J.GOODALL  
Approved by: J.GOODALL  
Date: 1st June 2001

PALYNOLOGICAL REPORT NO. 2001/06  
PALYNOSTRATIGRAPHICAL ANALYSIS

MCINTEE-1 WELL

**Santos Ltd**  
A.C.N. 007 550 923

Circulation: Geology Operations, Team Leader, EIC, Palynology Files

## Introduction

Twenty sidewall core samples and four cuttings samples from McIntee-1, located in the Otway Basin, PEP 154 were examined palynologically so as to assess their palynostratigraphic position. Total hydrocarbon yield, oil proneness and maturity analysis has not been performed.

Summaries of the results of this study are presented on Table 1. The palynostratigraphic results are presented in more detail on Table 2. The known relationships of the palynological zones to the lithostratigraphy are shown on Chart 1. Range charts of the palynomorphs identified in this study are presented in Appendix 1.

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J. Goodall







## PALYNOSTRATIGRAPHICAL DATA

Table 2

SAMPLE	DEPTH (M)	PALYNOSTRATIGRAPHICAL UNIT (Age)	INFERRED STRATIGRAPHICAL UNIT	REWORKED ELEMENTS		PRESER- VATION	YIELD	DIVER- SITY	REMARKS
				%	AGE				
DC	1428M	N.ACERAS / N.SENECTUS	SKULL CREEK / PAARATTE FORMATION	<1	L.Jur Perm	FAIR - GOOD	V LOW	MOD	Presence of <i>N. tuberculata</i> and <i>N. senectus</i> . Common <i>H. heterocanthum</i> , <i>S. ramosus</i> and Protea pollen. Other notable taxa recorded include <i>I. cretaceum</i> , <i>C. victoriensis</i> , <i>B. rugulata</i> and <i>O. striatoperforata</i> . Reworked Early Jurassic and Permian taxa. Minor Palaeocene caving recorded.
DC	1434M	<i>I. ROTUNDATUM</i> / <i>T. APOXYXINUS</i>	NULLAWARRE GREENSAND			FAIR	EXT LOW	LOW	Presence of <i>I. rotundatum</i> , common <i>B. rugulata</i> and <i>T. apoxyxinus</i> . Dominance of <i>H. heterocanthum</i> . Other taxa recorded include <i>O. cribropoda</i> , <i>Chatangiella</i> spp, <i>Nummus</i> spp and <i>E. bifidum</i> . Protea pollen.
DC	1452M	<i>I. CRETACEUM</i> (? <i>I. ROTUNDATUM</i> ) / <i>T. APOXYXINUS</i>	BELFAST MUDSTONE 'C'	<1	Jur/Cre	FAIR - GOOD	EXT LOW	LOW	Relatively sparse assemblage, with <i>I. cretaceum</i> , <i>C. tripartita</i> and ? <i>I. rotundatum</i> (fragment). Assemblage dominated by <i>H. heterocanthum</i> , and <i>Isabelidinium</i> spp. Presence of <i>T. apoxyxinus</i> , Protea pollen and <i>P. mawsonii</i> . Rare reworking.
DC	1464M	<i>O. PORIFERA</i> / <i>T. APOXYXINUS</i>	BELFAST MUDSTONE 'B'	<1	Perm	FAIR - GOOD	LOW	MOD	Moderately rich assemblage. With, <i>G. hymenophora</i> , <i>O. porifera</i> , <i>O. echinata</i> and <i>O. cribropoda</i> . <i>Isabelidinium</i> spp conspicuous, including <i>I. cf bakeri</i> . Dinocyst assemblage dominated by <i>H. heterocanthum</i> . Presence of relatively common Protea pollen along with occurrence of <i>T. apoxyxinus</i> and <i>D. florini</i> .
SWC 21	1473M	<i>C. TRIPARTITA</i> / <i>T. APOXYXINUS</i>	BELFAST MUDSTONE 'B'	<1	Perm	FAIR - GOOD	LOW / MOD	MOD	Moderately rich assemblage. With common <i>C. tripartita</i> , <i>Isabelidinium</i> spp and <i>H. heterocanthum</i> . Other taxa include <i>O. cribropoda</i> , <i>Alterbia</i> spp, and <i>S. ramosus</i> . Pollen represented by <i>P. mawsonii</i> , <i>T. apoxyxinus</i> and <i>M. antarcticus</i> .

## PALYNOSTRATIGRAPHICAL DATA

Table 2

SAMPLE	DEPTH (M)	PALYNOSTRATIGRAPHICAL UNIT (Age)	INFERRED STRATIGRAPHICAL UNIT	REWORKED ELEMENTS		PRESER VATION	YIELD	DIVER SITY	REMARKS
				%	AGE				
SWC 20	1497M	C.TRIPARTITA / T.APOXYEXINUS	BELFAST MUDSTONE 'B'	1	Perm	FAIR / GOOD	EXT LOW	MOD	Predominance of <i>H.heterocanthum</i> , with rarer <i>C.tripartita</i> and <i>Isabelidium</i> spp. Presence of <i>O.porifera</i> , <i>P.infusorioides</i> , <i>M.ornatum</i> and <i>I.vevus</i> . Pollen and spores dominated by saccate pollen ( <i>M.antarticus</i> , <i>P.mawsonii</i> and undiff. bisaccates), other spores include <i>O.sentosa</i> , <i>P.mawsonii</i> and <i>T.apoxyexinus</i> . Algal cyst <i>A.cruciformis</i> rarely recorded.
SWC 19	1515M	C.STRIATOCONUS / C.VULTUOSUS	BELFAST MUDSTONE 'A'			FAIR	EXT LOW	MOD	Predominance of <i>H.heterocanthum</i> with common <i>S.ramosus</i> . Stratigraphically significant dinocyst taxa include <i>C.tubulosum</i> , <i>C.striatoconus</i> , <i>G.hymenophora</i> and <i>I.balmei</i> . Spores and pollen dominated by <i>M.antarticus</i> , <i>G.senonicus</i> , <i>Cupressacites</i> sp, and <i>Tricolpites</i> sp (undiff), with stratigraphically important taxa including <i>C.vultuosus</i> , <i>G.ancorus</i> and <i>P.mawsonii</i> . The algal cyst <i>A.cruciformis</i> is relatively common.
SWC 18	1535.5 M	K.POLYPES / G.ANCORUS	FLAXMAN FORMATION			POOR	EXT LOW	MOD - LOW	Predominance of dinocysts <i>K.polypes</i> , <i>H.heterocanthum</i> , <i>P.infusorioides</i> and <i>O.complex</i> . Rarer dinocyst elements include <i>V.gryphus</i> , <i>C.edwardsii</i> , <i>C.nyei</i> 'gp' and <i>H.pulchrum</i> . Spores and pollen subordinate, with stratigraphically significant taxa including <i>G.ancorus</i> . <i>D.pusillus</i> conspicuous but not common. Algal cyst <i>A.cruciformis</i> rarely recorded.

## PALYNOSTRATIGRAPHICAL DATA

Table 2

SAMPLE	DEPTH (M)	PALYNOSTRATIGRAPHICAL UNIT (Age)	INFERRED STRATIGRAPHICAL UNIT	REWORKED ELEMENTS		PRESER VATION	YIELD	DIVER SITY	REMARKS
				%	AGE				
SWC 17	1539M	L.MUSA	FLAXMAN FORMATION			FAIR	V LOW	MOD	Dinocysts dominated by <i>H.heterocanthum</i> , and moderate numbers of <i>K.polypes</i> . Other taxa recorded include low numbers of <i>C.distinctum</i> , <i>C.compactum</i> , <i>S.ramosus</i> and <i>Oligosphaeridium</i> spp. Spores dominant, including <i>Cicatricosporites</i> spp, <i>L.musa</i> , <i>L.ovatus</i> , <i>C.tectifera</i> and <i>A.distocarيناتus</i> . Pollen dominated by <i>D.pusillus</i> with rare <i>H.trinalis</i> , <i>Cupressacites</i> spp, <i>Diporites</i> and <i>P.mawsonii granulatus</i> . Rare <i>A.cruciformis</i> .
SWC 16	1540M	I.EVEXUS / L.MUSA	WAARRE FORMATION 'C'			FAIR	V LOW	MOD	Dinocysts subordinate to pollen and spores. Dinocysts include <i>I.evexus</i> , <i>C.edwardsii</i> , <i>P.infuserioides</i> , <i>H.heterocanthum</i> and <i>E.bifidum / robustum</i> . Pollen and spores dominated by <i>D.pusillus</i> , <i>A.australis</i> , <i>L.ovatus</i> and <i>C.minor</i> . Rarer but stratigraphically significant taxa include <i>L.musa</i> , <i>A.asteroides</i> and <i>P.mawsonii</i> . A single specimen of <i>T.apoxyexinus</i> was also noted. Rare <i>A.cruciformis</i> .
SWC 15	1542M	UNDIFFERENTIATED	WAARRE FORMATION 'C'			FAIR	V LOW	LOW	A lean assemblage is noted, with rare <i>D.pusillus</i> , <i>H.heterocanthum</i> , <i>A.distocarيناتus</i> , <i>I.primus</i> and a single specimen of <i>Isabelidium</i> spp. This assemblage is not age diagnostic.

## PALYNOSTRATIGRAPHICAL DATA

Report No. 2001/06

Santos

Study: McIntee No. 1

Table 2

Author: J. Goodall

Page 4 of 6

SAMPLE	DEPTH (M)	PALYNOSTRATIGRAPHICAL UNIT (Age)	INFERRED STRATIGRAPHICAL UNIT	REWORKED ELEMENTS		PRESER VATION	YIELD	DIVER SITY	REMARKS
				%	AGE				
SWC 14	1547M	UNDIFFERENTIATED	WAARRE FORMATION 'C'			FAIR	V LOW	LOW	Rare palynomorphs recorded. Only stratigraphically significant taxon is <i>H. trinalis</i> , with other taxa rarely recorded including <i>D. pusillus</i> and <i>K. polypes</i> . A single specimen of <i>T. apoxyxenus</i> is noted.
SWC 12	1556.5 M	<i>C. EDWARDSII</i> / <i>H. TRINALIS</i>	WAARRE FORMATION 'B'			FAIR	LOW /MOD	MOD	A distinctive palynological assemblage is noted, which includes the common occurrence of the dinocyst <i>C. edwardsii</i> , <i>S. ramosus</i> , <i>H. heterocanthum</i> (pale delicate types) and <i>O. complex</i> . The spores and pollen are dominated by <i>D. pusillus</i> and <i>G. senonicus</i> , with the stratigraphically significant <i>H. trinalis</i> noted rarely.
SWC 11	1559M	<i>C. EDWARDSII</i>	WAARRE FORMATION 'B'			FAIR	V. LOW	LOW	A lean assemblage is noted, with rare <i>C. edwardsii</i> , <i>S. ramosus</i> , <i>O. complex</i> and <i>E. bifidum/robustum</i> . Spores and pollen are dominated by <i>C. minor</i> , <i>D. pusillus</i> , <i>L. ovatus</i> and <i>Cicatricosisporites</i> spp. Some evidence for mud contamination of the swc.
SWC 10	1560.5 M	UNDIFFERENTIATED	WAARRE FORMATION 'B'			FAIR	EXT LOW	V. LOW	An extremely lean assemblage with only rare specimens of <i>H. heterocanthum</i> , <i>S. ramosus</i> , <i>O. complex</i> and <i>A. australis</i> . The assemblage is non-age diagnostic.
SWC 09	1564M	UNDIFFERENTIATED	WAARRE FORMATION 'A'	<1	Perm	POOR	EXT LOW	LOW	A lean assemblage with rare specimens of <i>G. senonicus</i> , <i>D. pusillus</i> , <i>M. antarcticus</i> , <i>P. mawsonii</i> , <i>A. distocarinatus</i> and <i>O. complex</i> . Permian reworking is conspicuous.



**PALYNOSTRATIGRAPHICAL DATA**

Table 2

Santos

Study: McIntee No. 1

Author: J.Goodall

SAMPLE	DEPTH (M)	PALYNOSTRATIGRAPHICAL UNIT (Age)	INFERRED STRATIGRAPHICAL UNIT	REWORKED ELEMENTS		PRESER VATION	YIELD	DIVER SITY	REMARKS
				%	AGE				
SWC 08	1573.5 M	C.EDWARDSII / H.TRINALIS	WAARRE FORMATION 'A'	1	Perm	FAIR	LOW	MOD	A moderately diverse assemblage with common <i>M.antarticus</i> , <i>C.minor</i> , <i>C.australis</i> , <i>R.reticulatus</i> , <i>H.trinalis</i> and 'Inaperturate granulate algae'. Other rarer taxa recorded include <i>C.edwardsii</i> , <i>O.operculata</i> , <i>H.heterocanthum</i> , <i>S.ramosus</i> , <i>Nunmus</i> spp, <i>O.dividum</i> , <i>P.mawsonii</i> , <i>Apteodinium</i> spp, <i>A.distocarinatus</i> and <i>H.pulchrum</i> .
SWC 07	1586.5 M	UNDIFFERENTIATED	WAARRE FORMATION 'A'			POOR	EXT LOW	V. LOW	Only a few specimens of <i>Dilwynites</i> are recorded, otherwise the sample is effectively barren of palynomorphs
SWC 06	1591M	UNDIFFERENTIATED	WAARRE FORMATION 'A'	<1	Perm	POOR	EXT LOW	V. LOW	Only a few specimens recorded including <i>A.australis</i> , <i>S.antiquisporites</i> and Permian reworking, otherwise the sample is effectively barren of palynomorphs
SWC 05	1596M	C.EDWARDSII / H.TRINALIS	WAARRE FORMATION 'A'	<1 <1 <1	Perm Cret ?Trias	FAIR	MOD	MOD	A moderately diverse assemblage, including common <i>C.vannophorum</i> , <i>C.distinctum</i> , <i>Circulodinium</i> spp, <i>O.complex</i> and <i>P.cretaceum</i> . Other taxa recorded include <i>H.trinalis</i> , <i>D.pusillus</i> , <i>L.ovatus</i> , <i>C.asymmetricum</i> , <i>C.edwardsii</i> , <i>Apteodinium</i> spp and <i>Cicatricosisporites</i> spp. Reworked elements include <i>P.notensus</i> and <i>C.torosa</i> .
SWC 04	1598M	C.EDWARDSII / H.TRINALIS	WAARRE FORMATION 'A'	1	Perm	FAIR	LOW / MOD	MOD	A diverse assemblage dominated by <i>Circulodinium</i> spp and <i>O.complex</i> . Stratigraphically significant taxa include <i>H.trinalis</i> , <i>C.edwardsii</i> , <i>A.distocarinatus</i> and <i>P.mawsonii</i> . Other taxa include <i>Michrystidium</i> spp and <i>K.polypes</i> .

Santos

Study: McIntee No. 1

Author: J.Goodall

PALYNOSTRATIGRAPHICAL DATA

Table 2

Report No. 2001/06

Page 6 of 6

SAMPLE	DEPTH (M)	PALYNOSTRATIGRAPHICAL UNIT (Age)	INFERRED STRATIGRAPHICAL UNIT	REWORKED ELEMENTS		PRESER- VATION	YIELD	DIVER- SITY	REMARKS
				%	AGE				
SWC 3	1642M	P.PANNOSUS	EUMERELLA FM	<1	Perm	POOR	EXT. LOW	LOW	Sparse, restricted assemblage, with a predominance of bisaccate pollen, <i>O.</i> <i>wellmanii</i> , <i>C.torosa</i> , <i>C.minor</i> and <i>A.australis</i> . Brackish water indicators include <i>Schizosporis</i> spp, <i>Sigmopollis</i> <i>carbonis</i> and <i>S.reticulatus</i> .
SWC 2	1685M	UNDIFFERENTIATED	EUMERELLA FM			POOR	EXT. LOW	V. LOW	This sample is virtually barren of palynomorphs.
SWC 1	1702.5 M	P.PANNOSUS	EUMERELLA FM	<1	Perm	POOR	EXT. LOW	LOW	Sparse, restricted assemblage, with a predominance of bisaccate pollen, <i>O.</i> <i>wellmanii</i> , <i>C.torosa</i> , <i>P.pannosus</i> , <i>C.minor</i> and <i>A.australis</i> . Brackish water indicators include <i>Schizosporis</i> spp, <i>Sigmopollis</i> <i>carbonis</i> and <i>S.reticulatus</i> . Rare <i>H.trinialis</i> was also noted.

908035

071

PE908036

This is an enclosure indicator page.  
The enclosure PE908036 is enclosed within the  
container PE908035 at this location in this  
document.

The enclosure PE908036 has the following characteristics:

ITEM\_BARCODE = PE908036  
CONTAINER\_BARCODE = PE908035  
NAME = McIntee-1 Palynology Chart  
BASIN = OTWAY  
ONSHORE? = Y  
DATA\_TYPE = WELL  
DATA\_SUB\_TYPE = BIOSTRAT  
DESCRIPTION = McIntee-1 Palynology Chart Scale  
1:2000, W1315, PEP154. Appendix IX  
Palynological Analysis contained within  
"Well Completion Report" [PE908035].  
REMARKS =  
DATE\_WRITTEN = 06-JUL-2001  
DATE\_PROCESSED =  
DATE\_RECEIVED = 20-AUG-2001  
RECEIVED\_FROM = Santos Ltd  
WELL\_NAME = McIntee-1  
CONTRACTOR =  
AUTHOR =  
ORIGINATOR = Santos Ltd  
TOP\_DEPTH = 1400  
BOTTOM\_DEPTH = 1800  
ROW\_CREATED\_BY = DN07\_SW

(Inserted by DNRE - Vic Govt Mines Dept)

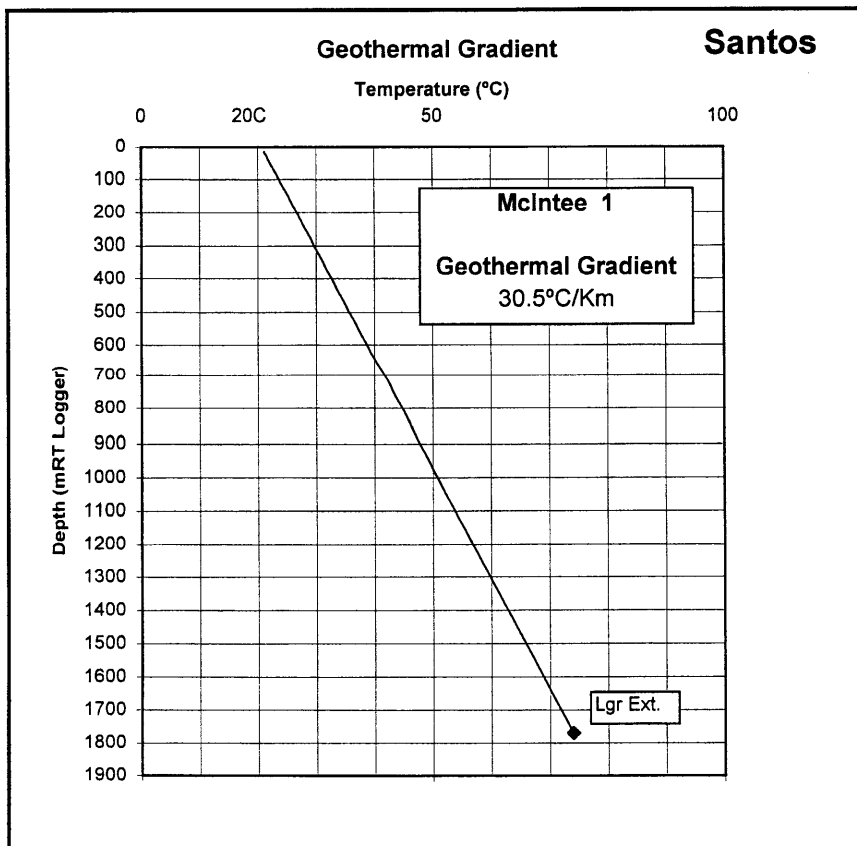
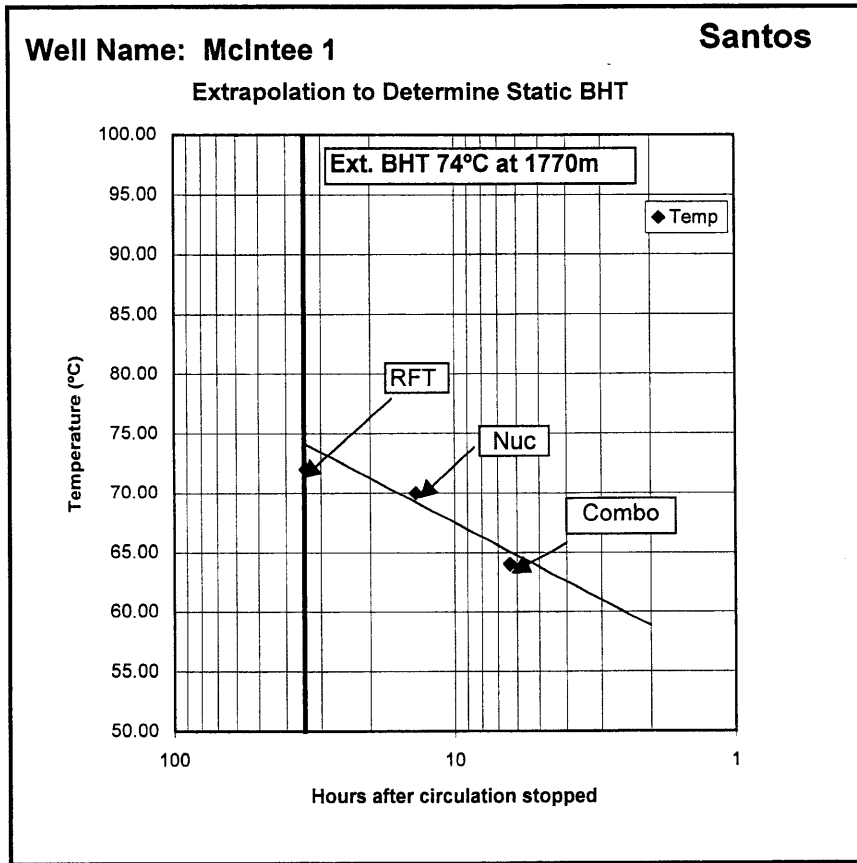


## **APPENDIX X: GEOTHERMAL GRADIENT**

Assumed surface temperature = 20°C.

Calculated BHT @ 1800m = 75°C.

Geothermal Gradient = 31°C/km.



**APPENDIX XI: WELL LOCATION SURVEY**

Paul D Crowe, B.App.Sci. (Surv), LS, M.I.S.  
Trevor W McDowell, B.App.Sci. (Surv), LS, M.I.S.

Paul Crowe  
Licensed Surveyor  
192 Koroit Street,  
WARRNAMBOOL 3280  
Ph 5561 1500  
Fax 5561 2935

ABN 5952 1601 183

27 Nov 2000

EFS  
Attention Ray Willox  
PETERBOROUGH  
Fax 55985329

**LOCATION NAME; McIntee #1**

**ORIGINAL LOCATION**  
00 - 074  
NORTHING 5 738 317.06  
EASTING 658 952.91

LAT 38° 29' 21.10"  
LONG 142° 49' 21.18"

**REVISION #1**  
00 - 074/1

**SEISMIC REFERENCE 318.0 METRES AT BEARING 273° 51' FROM ORIGINAL LOCATION**

NORTHING 5 738 338.44  
EASTING 658 635.60

LAT 38° 29' 20.61"  
LONG 142° 49' 08.07"

**REVISION #2**  
00 - 074/2

**SEISMIC REFERENCE 149.14 METRES AT BEARING 204° 25' FROM ORIGINAL LOCATION**

NORTHING 5 738 181.25  
EASTING 658 891.28 **FINAL**

LAT 38° 29' 25.54"  
LONG 142° 49' 18.75" **FINAL**

PEG PLACED ON WED 23 NOV 2000 BY RAY WILLOX AND MEASURED BY TREVOR MCDOWELL  
LICENSED SURVEYOR

  
PAUL D CROWE LICENSED SURVEYOR

**APPENDIX XII: DRILLING - FINAL WELL REPORT**

Santos

FINAL WELL REPORT

McINTEE #1

Drilling Supervisor(s) : A. Chomley  
Drilling Engineer(s) : G. Coker  
Report Author : T. Robertson / D. New *PR*  
Report Supervisor : D. New  
Date of Issue : 1st August 200

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**Section 1.0**

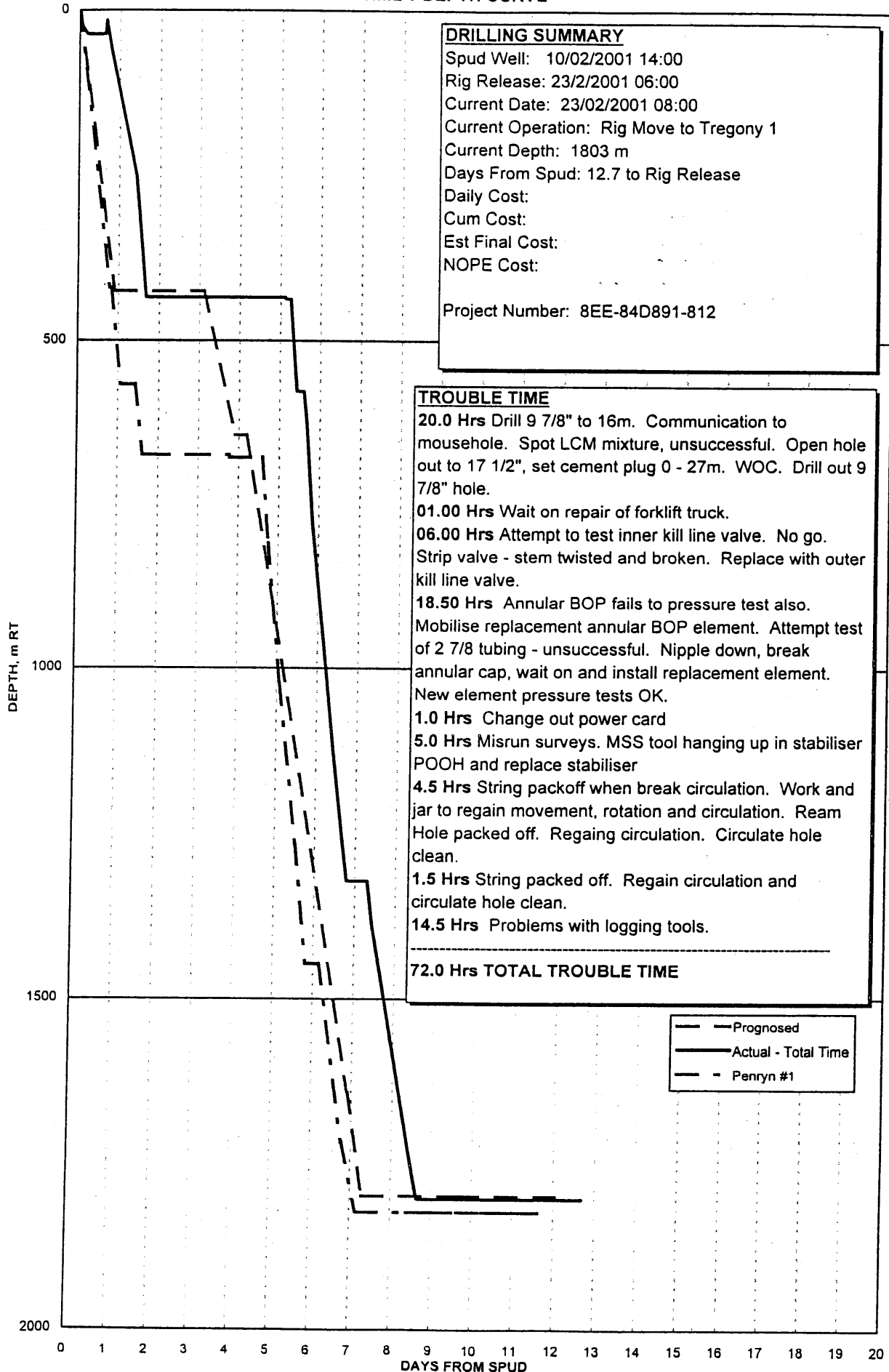
**Well Summary**

**- Time vs Depth Curve**

**- Activity Annotations Report**



McINTEE #1  
TIME v DEPTH CURVE



RT above GL: 4 m Lat : 38 deg 29 min 21.10 sec Spud Date: 10/02/2001 Release Date: 23/02/2001  
 GL above MSL : 59 m Long : 142 deg 49 min 21.18 sec Spud Time: 14:00:00 Release Time: 06:00:00

## ACTIVITY ANNOTATIONS

DATE : 11 February, 2001

REPORT NUMBER : 2

**Comment****Solution**

1. On initial drill out of cement with 3 1/2" HWDP drilling assembly to 60m there were losses of bore mud with communication to mouse hole. With controls on GPM and bore surge etc, losses stopped with formation healing. ( ROPs were lower than projection due to well bore controls ).

Jetting was effective and well trajectory turned to North.

2. Although KCl was mixed in preparation for displacement if mud rings were encountered, this did not eventuate and KCl will be utilized on production hole section.

DATE : 13 February, 2001

REPORT NUMBER : 3

**Comment****Solution**

1. Nil indications of mud losses on wiper trip and hole slick although on double wiping DCs one limestone stringer was worked 6 times to clean up.

2. Cement programmed at 55% Excess Lead & 20% Excess Tail with 12 bbls cement to surface.

DATE : 13 February, 2001

REPORT NUMBER : 4

**Comment****Solution**

1. As a long term objective, the development of some efficient BOP handling system would greatly aid what is at present a labour intensive, time consuming and inefficient activity for this rig.

2. The Inner Kill V/V was redressed and tested during Rig Up of McIntee #1, damaged some period in the interim, nil spares to redress again, N/D Kill V/Vs and reconfigure Outer Kill to Inner position.

DATE : 14 February, 2001

REPORT NUMBER : 5

**Comment****Solution**

1. When Hydril element failed to test, ODE were requested to mobilize a replacement at 09:00 Hrs. We attempted to gain a valid test by first getting Hydril energised with a test on HiVis mud and by stroking unit past 3 1/2" to 2 7/8" and then finally to full close. Element never held more than 1200 psi. On confirmation of a load in of element to be 24:00 Hrs we kept attempting until 17:00 Hrs to allow enough time to strip and service failed unit. \*\*\*No obvious damage but note on closing sealing area is creasing in Hex form.

RT above GL: 4 m Lat : 38 deg 29 min 21.10 sec Spud Date: 10/02/2001 Release Date: 23/02/2001  
GL above MSL : 59 m Long : 142 deg 49 min 21.18 sec Spud Time: 14:00:00 Release Time: 06:00:00

**ACTIVITY ANNOTATIONS**

**DATE : 16 February, 2001**

**REPORT NUMBER : 6**

Comment	Solution
1. Although the stabilizer calipered at 1 7/8" the 1 3/4" survey tool would not drift the full length of stabilizer bore. Changed out to a 2 1/4" ID 6 1/2" Stab.	

**DATE : 17 February, 2001**

**REPORT NUMBER : 7**

Comment	Solution
1. Outer Kill Line Valve has been repaired, installed and tested. 2. Wire line unit has had sheave, counter wheels and bearings replaced. 3. Rotary pin for handling stabilizers has been fabricated. 4. Goose neck for top of survey tool to stop wire bending has been fabricated . 5. Redundant holes and penetrations on rig floor have been infilled. 6. Stair steps have been repaired and non slip treads replaced as required. 7. Upgraded Koomey remote is being overhauled for installation on next well.	

**DATE : 17 February, 2001**

**REPORT NUMBER : 8**

Comment	Solution
1. String stuck with pack-off on initial start up of pumps in readiness to precautionary ream 2 singles to bottom. Jar to string movement, rotate with nil pumps 10 min, start pumps to circulation, staging to full rate. 2. Grey valve recieved on location prior to leaving casing shoe. 3. From Survey record you will note that present projection is we need a final 3.4 deg inclination to reach the 50m boundary of target= .33 deg build rate per 30m to Target top.	

RT above GL: 4 m Lat : 38 deg 29 min 21.10 sec Spud Date: 10/02/2001 Release Date: 23/02/2001  
 GL above MSL : 59 m Long : 142 deg 49 min 21.18 sec Spud Time: 14:00:00 Release Time: 06:00:00

**ACTIVITY ANNOTATIONS****DATE : 19 February, 2001****REPORT NUMBER : 9****Comment****Solution**

1. High gas counts were recorded in Nullawarre formation ( Up to 4000 units on connection gas - although inspection of mud at shakers suggests that these readings were elevated for some reason ) but only relatively minor gas in primary target of Waarre.

**DATE : 19 February, 2001****REPORT NUMBER : 10****Comment****Solution**

1. The problems we have encountered breaking circulation (Stuck Pipe ) when we run to bottom on wiper trip and have had no troubles reciprocating, could be caused by the additions of PHPA late in the well. The cake removed from Stabs and Bit has a very elastic feel about it and this is indicative of a PHPA wall cake. It would explain our ability to slide but yet gain a full bore seal when pressure applied from under.  
 2. Correction to Formation Tops of -180m puts gas shows coming from prognosed target zone of Waarre formation.

1. Allow PHPA to deplete earlier and inhibit claystones deep in the well with KCl instead if we think they are so reactive. PHPA does not inhibit clays as such but encapsulate for their removal from well with no swelling.

**DATE : 20 February, 2001****REPORT NUMBER : 11****Comment****Solution**

1. Reece with tool failures and Wait On tools from 05:00.Hrs to 20:00Hrs.

1. The logistics of carrying full redundancy for tool strings can be a tall order for any Wire Line Co. but remote locations with no central base near-by can make it a near necessity if logs are required and we try and avoid down time.

**DATE : 23 February, 2001****REPORT NUMBER : 14****Comment****Solution**

1. Wellhead will be installed after Rig off well centre to eliminate risk of damage.

**Section 2.0**

**Well History**

**- IDS Well History Report**

McINTEE #1

Drilling Co.: OD&amp;E

Rig: OD&amp;E #30

RT above GL: 4 m Lat : 38 deg 29 min 21.10 sec Spud Date: 10/02/2001 Release Date: 23/02/2001  
 GL above MSL : 59 m Long : 142 deg 49 min 21.18 sec Spud Time: 14:00:00 Release Time: 06:00:00

## Well History

#	DATE	DEPTH	WELL HISTORY ( 24 Hr Summary )
1	10/02/2001	36	PreSpud meeting, Spud well and drill from 10 - 16m, mud communication to mouse hole, attempt to pack off and drill to 36m, mud to lease. Open hole to 17 1/2" to 24m and prepare to and cement 28m - 6m.
2	11/02/2001	250	Cement 17 1/2" / 9 7/8" hole to 28m, WOC, drill cement and formation with 3 1/2" HWDP to 60m ( Controls for losses ), change BHA and Jet / Drill & Survey from 60 - 250m.
3	12/02/2001	433	Drill & Survey 9 7/8 Hole from 250 - 433 m, circ, wiper, circ, POOH, L/O DCs, R/U and run 7 5/8" casing, circ and cement casing.
4	13/02/2001	433	Cement, WOC, N/D riser and land joint, N/U BOPs. **Failure on Inner Kill V/V unable to circulate.
5	14/02/2001	433	Reconfigure Kill V/Vs due to failure, test BOPs (Hydril failure - unresolved), M/U & RIH BHA, Test Hydril -NoGo, POOH , Retest Hydril- NoGo, Break Hydril cap and remove element, Wait on mobilization of replacement element.
6	15/02/2001	578	Wait On Hydril Element, install same, Press Test Hydril, N/U flow line etc, M/U BHA & RIH, Service power system,Drill shoe track, LOT, Drill 433-578m, (Surv failure).
7	16/02/2001	1,128	POOH, Change Stb, RIH, Drill 6 3/4" hole from 578 - 1128m.
8	17/02/2001	1,388	Drill & Survey 1128 - 1321m, wiper to shoe, slip drill line, RIH, String pack off & stuck on pump start up at 1294m, work & jar free, wash & ream, drill from 1321-1388m.
9	18/02/2001	1,736	Drill & Survey from 1388 - 1736m.
10	19/02/2001	1,803	Drill 1736 - TD 1803m, circ, wiper, circ, POOH, Logging Run #1.
11	20/02/2001	1,803	Logging Run #1 & #2. Failure on Side Wall GR, wait on tools Ex NZ for RFS Run #3. M/U Run #3 -RFS and RIH for 20 stations.
12	21/02/2001	1,803	Logging Run #3 RFS, Run #4 Sidewall cores, RIH, Circ, POOH L/D pipe.
13	22/02/2001	1,803	POOH L/D Pipe, Rig Up and run casing, circ and cement casing, WOC, Set slips and N/D BOPs.
14	23/02/2001	1,803	L/O V-Door & Catwalk, N/D BOPs, Final cut & dress casing and N/U Adaptor flange.

**Section 3.0**

**Drilling Data**

- Mud Record
- BHA Summary
- Bit Summary by Formation
- FIT/LOT Report

**McINTEE #1**

Drilling Co.: OD&E

Rig: OD&E #30

Mud Co.: Baroid

RT above GL : 4 m  
GL above MSL : 59 m

Lat : 38 deg 29 min 21.10 sec  
Long : 142 deg 49 min 21.18 sec

Spud Date: 10/02/2001  
Release Date: 23/02/2001  
Spud Time: 14:00  
Release Time: 6:00

Total Cost: \$ 21,013

**MUD RECAP**

R#	DATE	TYPE	DEPTH F	TMP F	MW ppg	VIS secs/qt	PV cps	YP lbs/100ft2	Gel10s lbs/100ft2	Gel10m lbs/100ft2	F.L. API (cm3/30min)	F.L. hthp (cm3/30min)	Sols %	Sand %	MBT %	PH	Cl ppm	HARD /Ca ppm	KCl %	DAILY \$
1	10/02/2001	GEL	36		8.6	40	5	16	10	25			0	0						2,551
2	11/02/2001	GEL SPUD	182		9.1	39	12	25	10	22			2	0						0
3	12/02/2001	GEL SPUD	433		9.0	42	8	16	9	17			4	0						523
4	13/02/2001	GEL SPUD	433		9.0	42	8	16	9	17			4	0						0
5	14/02/2001	GEL SPUD	433		9.0	42	8	16	9	17			4	0						2,253
6	15/02/2001	KCl/PHPA	562	65	8.5	33	5	3	1	2	16.0		1	0	0.0	9.0	18,500	200	4	805
7	16/02/2001	KCl/PHPA	1,109	70	8.8	36	6	3	0	1	8.0		.5	0	0.0	9.0	16,000	200	3	3,118
8	17/02/2001	KCl/PHPA	1,348	94	8.9	43	10	7	0	1	6.0		3.5	tr	4.0	9.0	17,000	280	4	4,887
9	18/02/2001	KCl/PHPA	1,715	110	9.2	43	11	7	1	2	7.0		5.4	.25	2.5	9.0	20,000	200	4	3,737
10	19/02/2001	KCl/PHPA	1,803	96	9.4	50	14	14	2	3	5.0		6.8	.5	2.5	9.5	22,000	280	5	2,437
11	20/02/2001	KCl/PHPA	1,803	96	9.4	50	14	14	2	3	5.0		6.8	.5	2.5	9.5	22,000	280	5	0
12	21/02/2001	KCl/PHPA	1,803	86	9.5	51	15	12	2	3	5.2		6.8	.5	2.5	9.0	21,000	280	4	144
13	22/02/2001	KCl Brine	1,803		8.4	28	1	0												557
14	23/02/2001	KCl Brine	1,803		8.4	28	1	0												0

908035



088



**McINTEE #1**

Drilling Co.: OD&E

Rig: OD&E #30

RT above GL 4 m  
GL above MSL 59 m

Lat : 38 deg 29 min 21.10 sec  
Long : 142 deg 49 min 21.18 sec

Spud Date: 10/02/2001  
Spud Time: 14:00  
Release Date: 23/02/2001  
Release Time: 6:00

**BHA SUMMARY**

#	Length ( m )	Weight (k-lbs)	Weight blw/Jars (k-lbs)	String Weight (k-lbs)	Pick-Up Weight (k-lbs)	Slack-Off Weight (k-lbs)	Torque Max (ft-lbs)	Torque on bottom (ft-lbs)	Torque off bottom (ft-lbs)	BHA DESCRIPTION
1	174	34		55	56	54	3,600	3,600	3,300	9 7/8" Bit, Bit Sub, X/O, X/O, 6 1/2" MDC, X/O, Stb, 11xDC, X/O, 6xHWDP
2	248	27	24	125	125	124	6,700	6,500	2,900	BIT, NB STB, FLOAT SUB, PONY DC, STB, MDC, STB, 16xDCs, JARS, 2xDCs, 6xHWDP=248.36m

**MCINTEE #1**

Drilling Co.: OD&E

Rig : OD&E #30

RT above GL : 4 mtrs  
 GL above MSL : 59 mtrs

Lat : 38 deg 29 min 21.10 sec  
 Long : 142 deg 49 min 21.18 sec

Spud Date: 10/02/2001  
 Spud Time: 14:00:00

Release Date: 23/02/2001  
 Release Time: 06:00:00

**BIT RECORD**

DATE	BIT#	SIZE "	IADC	SER	MFR	TYPE	JETS	D.IN mtrs	D.OUT mtrs	MTRG	HRS IADC	SPP psi	FLW gpm	WOB k-lbs	RPM	MW ppg	TFA sq.in	VEL mps	HHP /sq"	ROP m/hr	I O1	D	L	B	G	O2	R
10/02/2001	1	9.88	116	LY9255	SMITH	FGSS+2C	2x0.1x22	10	36	26	1.0	150	200	2.0	75	8.6	0.371	53	0.00	26.0	0	NO	A	E	IN	NO	HP
10/02/2001	2	17.50	114	125503	VAREL	L114	3x32	10	24	14	1.5	100	150	2.0	70	8.6	2.357	6	0.00	9.3	1	WT	A	E	IN	NO	HP
12/02/2001	1RR2	9.88	116	LY9255	SMITH	FGSS+2C	2x0.1x22	36	433	397	21.5	1700	558	15.0	100	9.1	0.371	147	0.00	18.5	1	WT	A	E	IN	NO	TD
19/02/2001	3	6.75		5985194 RW	DBS	FM 2465	4x11	434	1,803	1,369	51.5	1098	275	7.2	114	8.9	0.371	72	0.00	26.6	2	CT	S	X	IN	WT	TD
21/02/2001	3RR	6.75		5985194 RW	DBS	FM 2465	4x11	1,803	1,803	0	0.0	1650	295	0.0	100	9.5	0.371	78	0.00								



**Section 4.0**

**Casing and Cementing**

- Casing and Cementing Reports
- Wellhead Installation Report or
- Plug and Abandonment Report







**Section 5.0**

**Time Breakdown Data**

- Overview

- Trouble Time Breakdown



Well : McINTEE #1

Drilling Co : OD&E

Rig : OD&E #30

RT above GL: 4 m Lat : 38 deg 29 min 21.10 sec Spud Date: 10/02/2001 Release Date: 23/02/2001  
 GL above MSL : 59 m Long : 142 deg 49 min 21.18 sec Spud Time: 14:00:00 Release Time: 06:00:00

**TIME BREAKDOWN DATABASE - single well overview**

Spud date : 10/02/2001  
 TD Depth : 1,803.0  
 Final Depth : 1,803.0  
 Total Time (hrs) - Spud/Release : 304.00  
 Total Time (hrs) - Rig Move : 0.00  
 Total NPT (hrs) : 71.00

**Time-Breakdown : Times by Class and Operation**

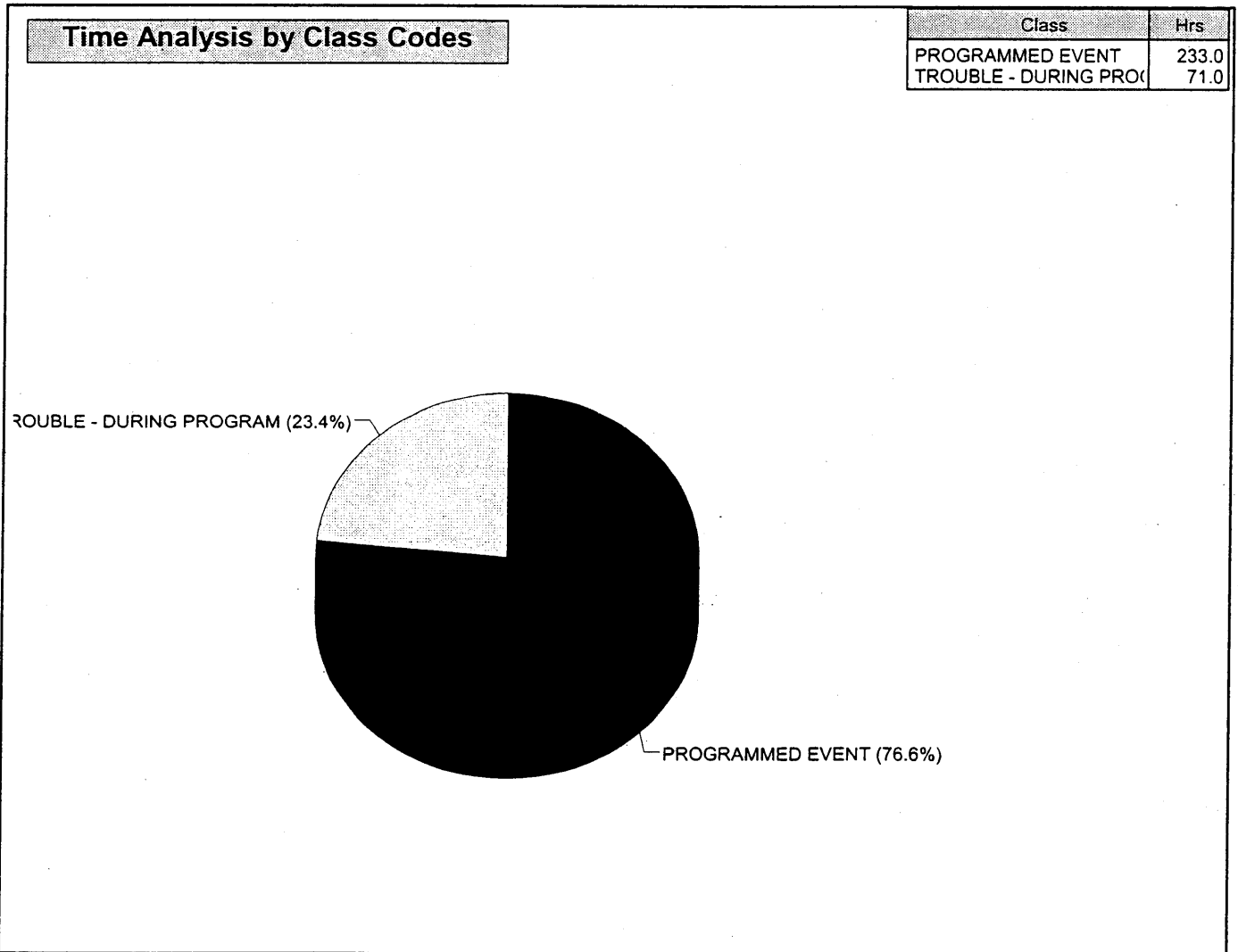
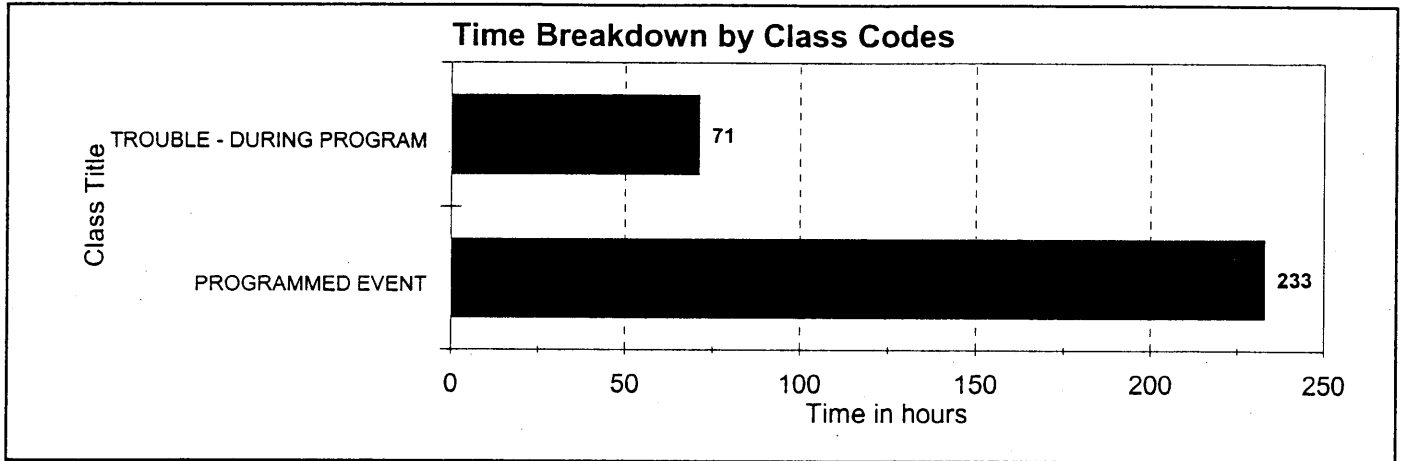
Class	Hrs
PROGRAMMED EVENT	233.0
TROUBLE - DURING PROGRAM	71.0

Operation	Hrs
DRILLING AHEAD	82.0
LOGGING	44.5
TOT. CSG/CMT	40.8
RIG REPAIR	26.0
TOT. TRIPPING	23.5
N/U & TEST BOP's	23.0
WIPER TRIP	18.5
LAY DOWN PIPE	9.5
SURVEY	7.0
WELL-HEAD	6.5
CIRCULATE & CONDITION MUD	5.8
RIG DOWN (THE RIG)	4.0
WORK TIGHT HOLE	4.0
REAM/WASH	3.0
LOT / FIT	1.5
CEMENT PLUGS	1.5
HEAD-UP FOR CMT OPS	1.0
RIG SERVICE	1.0
SLIP/CUT DRILL LINE	1.0

TIME BREAKDOWN DATABASE - single well overview

WELL : McINTEE #1

Pacesetter : none selected

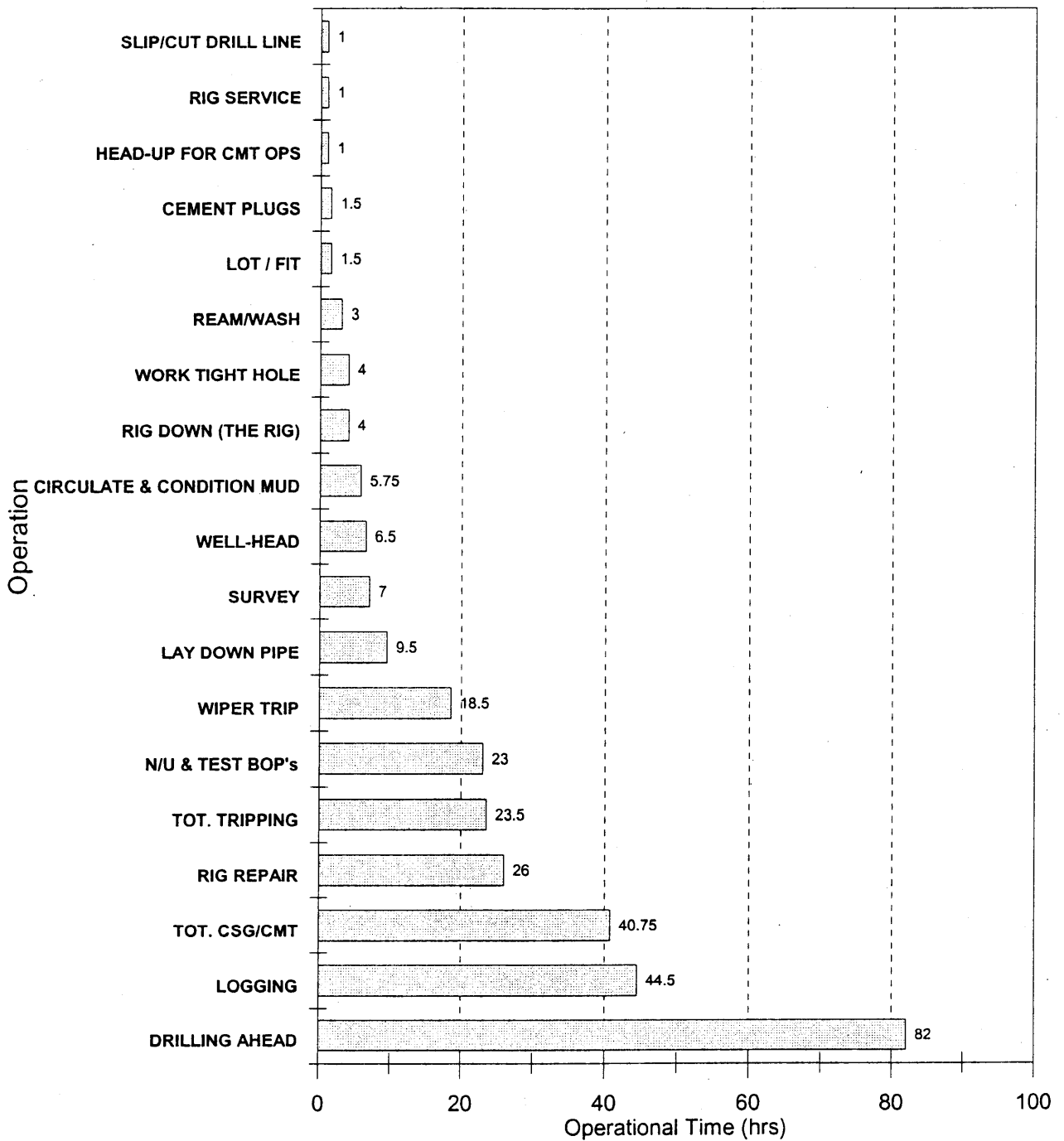


TIME BREAKDOWN DATABASE - single well overview

WELL : McINTEE #1

Pacesetter : none selected

Time Breakdown by Operational Code

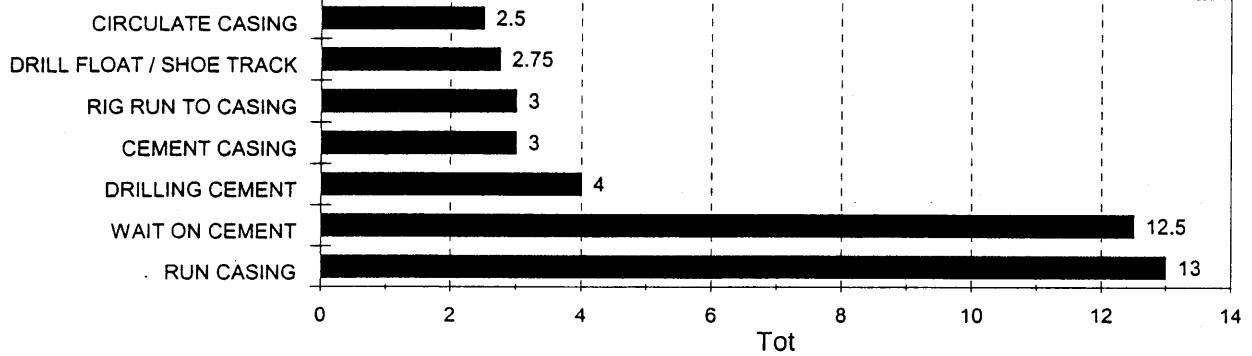


TIME BREAKDOWN DATABASE - single well overview

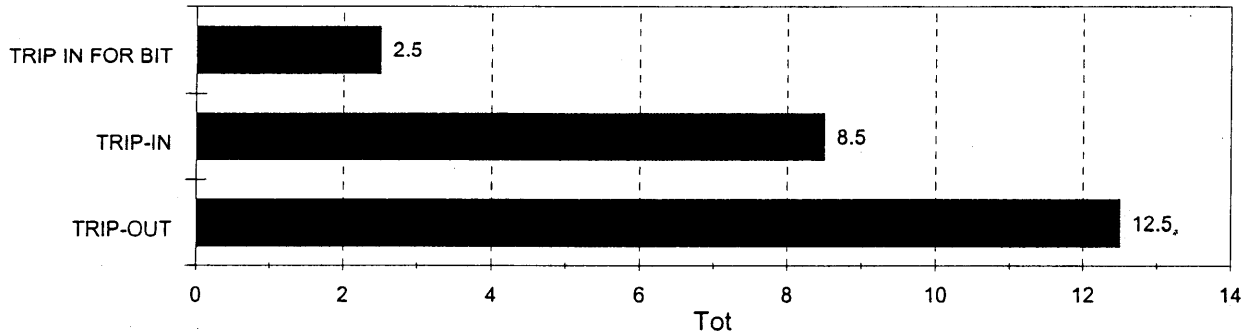
WELL : McINTEE #1

Pacesetter : none selected

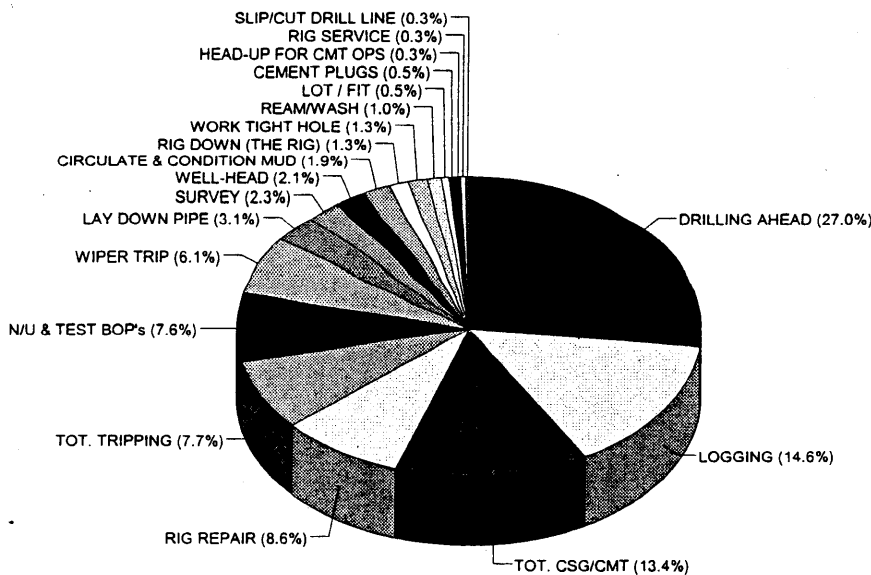
Breakdown of Total Csg & Cmtng Time



Breakdown of Total Tripping Time



Time Analysis by Operational Codes

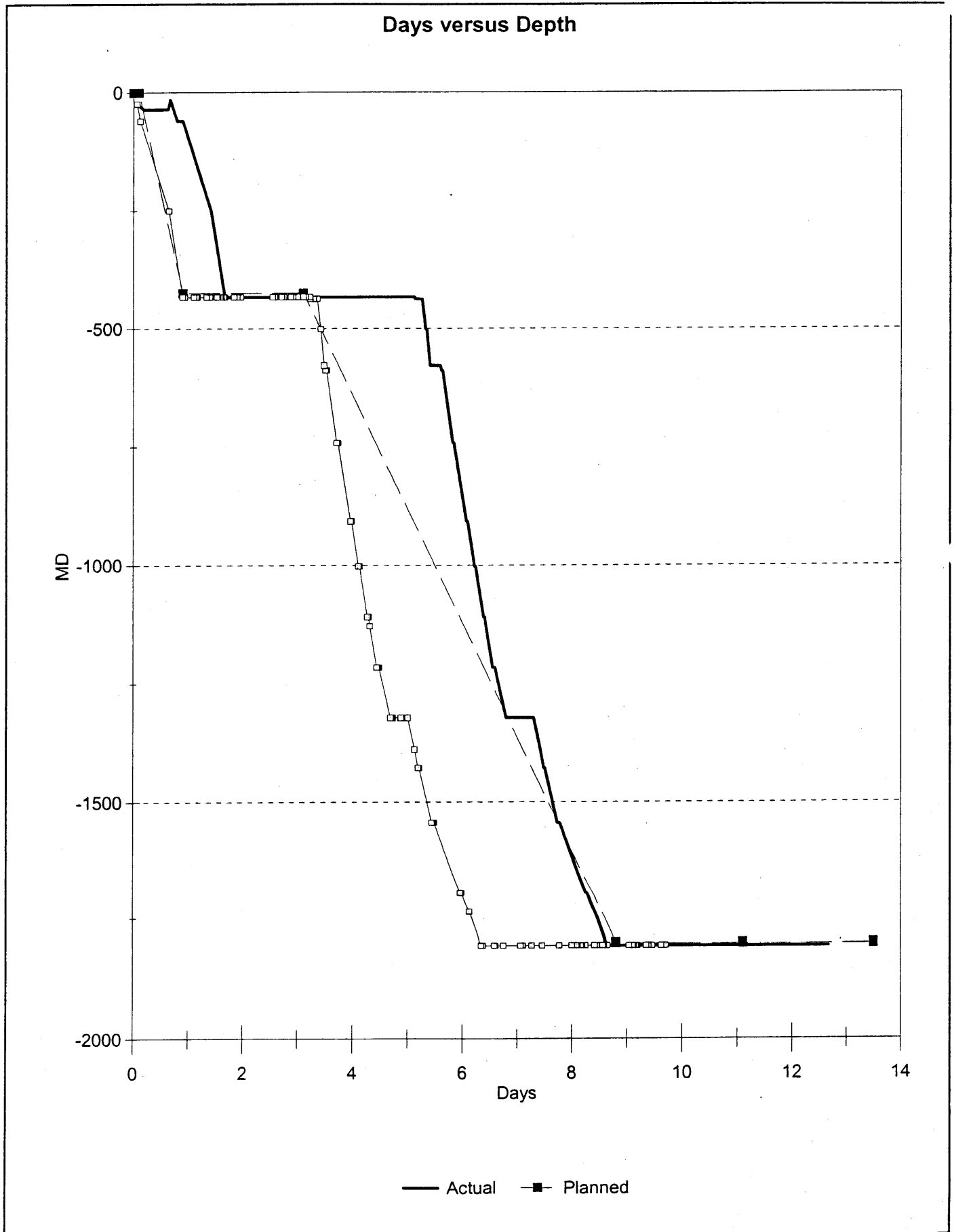


Operation	hrs
DRILLING AHEAD	82.0
LOGGING	44.5
TOT. CSG/CMT	40.8
RIG REPAIR	26.0
TOT. TRIPPING	23.5
N/U & TEST BOP's	23.0
WIPER TRIP	18.5
LAY DOWN PIPE	9.5
SURVEY	7.0
WELL-HEAD	6.5
CIRCULATE & CONDIT	5.8
RIG DOWN (THE RIG)	4.0
WORK TIGHT HOLE	4.0
REAM/WASH	3.0
LOT / FIT	1.5
CEMENT PLUGS	1.5
HEAD-UP FOR CMT O	1.0
RIG SERVICE	1.0
SLIP/CUT DRILL LINE	1.0

# TIME BREAKDOWN DATABASE - single well overview

WELL : McINTEE #1

Pacesetter : none selected



**McINTEE #1**

Drilling Co.: OD&E

Rig : OD&E #30

RT above GL: 4 m Lat : 38 deg 29 min 21.10 sec Spud Date: 10/02/2001 Release Date: 23/02/2001  
GL above MSL: 59 m Long : 142 deg 49 min 21.18 sec Spud Time: 14:00:00 Release Time: 06:00:00

**TIME BREAKDOWN DATABASE Non-Productive Time Analysis (NPT)**  
(Pre-Spud time excluded)

**Total Time on Well (hrs) 304.0 (days) 12.67 Spud Date : 10/02/2001**  
**Total Trouble Time (hrs) 71.0 (days) 2.96 Total Depth : 1,803**  
**Trouble Time (%) 23.36 Final Depth : 1,803**

**Total NPT Hours per Phase**

PHASE	HOURS
SURFACE HOLE	18.5
SURFACE CASING	27.0
PRODUCTION HOLE	9.5
EVALUATION PROD. HOLE	16.0

**NPT during programmed time**

DATE	PHS	OPERATION	NPT hrs	DEPTH m	DESCRIPTION OF PROGRAMMED TROUBLE TIME
10/02/2001	SH	DRILLING AHEAD	3.0	36	Spot HiVis pill in annulus and crow bar pack clay/gel and sacks around cellar and mouse hole, fill annulus -OK. Drill from 24m to 36m - Muid communication to Rat hole and varios spots around cellar.
10/02/2001	SH	TRIP-IN	4.0	36	POOH and rack 9 7/8" assembly. M/U 17 1/2" Bit and drill opening hole to 24m, POOH and L/O 17 1/2" Bit and assembly.
10/02/2001	SH	TRIP-IN	0.5	36	M/U 3 joints of 2 7/8" cement stinger and RIH to 27 meters.
10/02/2001	SH	CEMENT PLUGS	1.0	36	Head up to cement, hold safety meeting and Dowell batch mix and pump cement.
11/02/2001	SH	CEMENT PLUGS	0.5	36	Dowell continue batch mix and pump cement at 27 meters. Total 22 bbls pumped.
11/02/2001	SH	WAIT ON CEMENT	4.5	36	WOC. - POOH and L/O 2 7/8" cement stinger. Work and flush Rat hole and mouse hole with Kelly.
11/02/2001	SH	DRILLING CEMENT	1.0	15	Break circulation, tag cement at 6 m and drill cement from 6m to 10.2 m - Communication to mouse hole - drill to 11.0m - flow to mouse hole healed, continue drill cement to 14.5 m.
11/02/2001	SH	DRILLING CEMENT	3.0	60	Continue drill with HWDP thru cement to 28m and formation to 60 m with intermitent communication to mouse hole at 14.5 m, 18m and 26m. ( Control GPM and hole surge ).
11/02/2001	SH	TRIP-OUT	1.0	60	POOH from 60m and L/O 3 1/2 HWDP drilling assembly and 9 7/8" bit.
13/02/2001	SC	RIG REPAIR	1.0	433	Wait On repair of fork truck to continue N/U operations.
13/02/2001	SC	N/U & TEST BOP's	0.5	433	Attempt to circulate and flush BOPs and system to water - NoGo. Investigate and identify flow to Kill V/Vs.
14/02/2001	SC	RIG REPAIR	5.5	433	Trouble shoot & identify damaged Inner Kill V/V. Stip and confirm. (Twisted and broken stem in Closed position ). **Nil spares to repair. Remove Inner Kill V/V and N/U outer V/V to Inner.
14/02/2001	SC	RIG REPAIR	1.0	433	Tongs not biting 4 3/4" DCs, trouble shoot same and rectify.
14/02/2001	SC	RIG REPAIR	0.5	433	Attempt to test Hydril element with HiVis mud at varying Annular pressures -NoGo.
14/02/2001	SC	LAY DOWN PIPE	0.5	433	POOH L/D 9 excess singles 3 1/2" DP.
14/02/2001	SC	RIG REPAIR	1.5	433	POOH with BHA and break Bit.
14/02/2001	SC	RIG REPAIR	1.0	433	Work Hydril on 2 7/8" tubing & test - NoGo. Retry on 3 1/2" D/P - NoGo. Fully close element on empty hole to stroke element fully, retry test on 3 1/2" D/P -NoGo. (**Confirmation of replacement for 24:00 Hrs )
14/02/2001	SC	RIG REPAIR	4.0	433	Hold Prejob safety meeting, L/O mouse hole, N/D flow line & Bell Nipple, R/U Kelly and flange plates and break Hydril cap. L/O same and remove element (No obvious damage).
14/02/2001	SC	RIG REPAIR	3.0	433	Wait on load in of new Hydril element, - Service Survey unit and derrick sheave, general house keeping.
15/02/2001	SC	RIG REPAIR	4.5	433	Wait on load in of new Hydril element, -General house keeping, Rig Service & Sort subs in Junk box, Rack drill pipe- strap & clean same.
15/02/2001	SC	RIG REPAIR	3.0	433	New Hydril Element in at 04:30 Hrs. Install new Hydril element and M/U Hydril cap.
15/02/2001	SC	RIG REPAIR	1.0	433	Electricians change out Power Limit card and test same.
15/02/2001	PH	SURVEY	0.5	501	Circ and Survey at 484m -Misrun.
15/02/2001	PH	SURVEY	0.5	578	Circ and Survey at 560m -Misrun. Tool not picturing- Appears to be not reaching MDC.
16/02/2001	PH	TRIP-OUT	4.0	578	POOH to inspect BHA. L/O No Drift String Stb #3 with ID 1 7/8". RIH to 578m.
17/02/2001	PH	WORK TIGHT HOLE	4.0	1,321	L/O top singles and P/U Kelly. Attempt to break circ, string pack-off and stuck with nil circ at 1294m, Work and jar to movement, regain rotation, regain circulation, work and ream to full free.
17/02/2001	PH	REAM/WASH	0.5	1,321	Ream from 1294m to 1321m. Hole clean.

McINTEE #1

Drilling Co.: OD&E

Rig : OD&E #30

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**TIME BREAKDOWN DATABASE Non-Productive Time Analysis (NPT)**  
 (Pre-Spud time excluded)

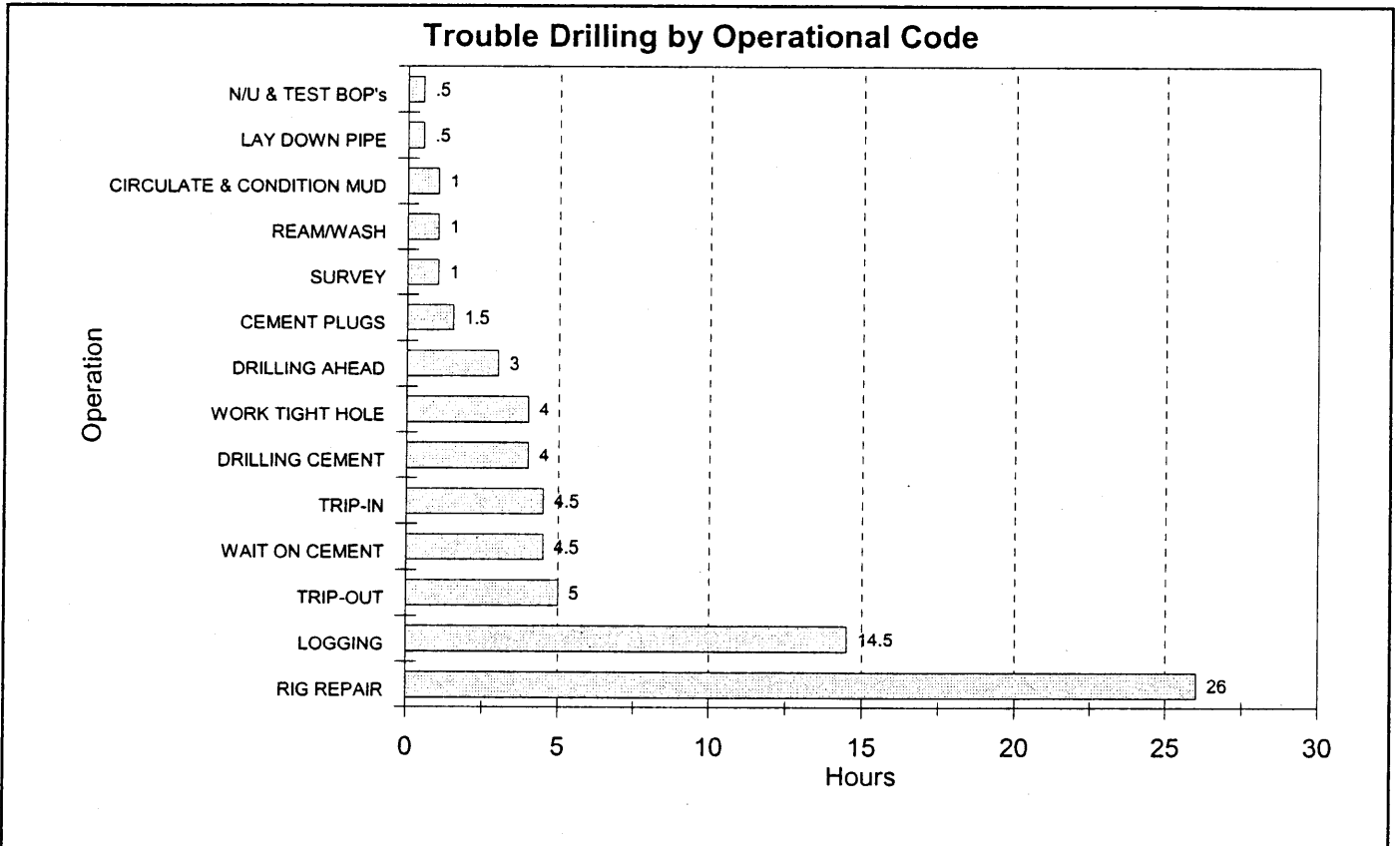
DATE	PHS	OPERATION	NPT hrs	DEPTH m	DESCRIPTION OF PROGRAMMED TROUBLE TIME
19/02/2001	EP	REAM/WASH	0.5	1,803	Attempt to break circulation -NoGo but hole working slick. Rotate at 140 RPM and lock 1000psi on string - Slowly gain circulation ( Same symptom as earlier wiper when string stuck) Ream from 1781 - 1803m.
19/02/2001	EP	CIRCULATE & CONDITION MUD	1.0	1,803	Circulate hole clean and low gas - Peak 240 units. Flow check - static.
20/02/2001	EP	LOGGING	3.0	1,803	Reeves Wireline Logging,Prepare and M/U Log Run #3 Tools- Sidewall Cores. GR failure with nil back-up. L/O tool string.
20/02/2001	EP	LOGGING	2.5	1,803	Reeves Wireline Logging- Rerun Run #1(b), RIH - Failure at truck with depth counter, POOH and rectify same.
20/02/2001	EP	LOGGING	2.0	1,803	Reeves Wireline Logging- Rerun Run #1(c), RIH and log interval 1543 - 1490m. POOH and L/O tool string.
20/02/2001	EP	LOGGING	7.0	1,803	Wait on technician and Sampling Kit for RFS tool string Run #3.( Attempt repair GR from sidewall core riun -NoGo) Tech arrive 13:00 Hrs - RFS Tools arrive 16:45 Hrs. Dress and service RFS tool string.

**NPT during unprogrammed time**

DATE	PHS	OPERATION	NPT hrs	DEPTH m	DESCRIPTION OF UNPROGRAMMED TROUBLE TIME
			0.0		No Trouble Time Present

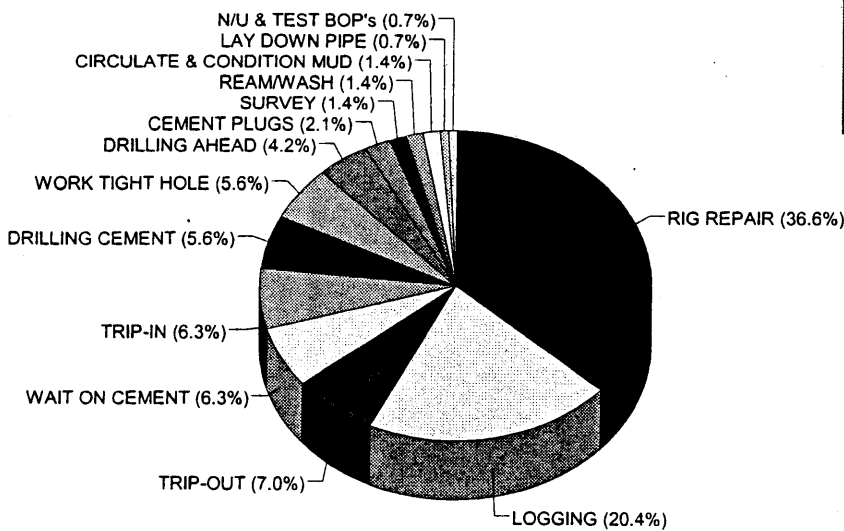
RT above GL: 4 m Lat : 38 deg 29 min 21.10 sec Spud Date: 10/02/2001 Release Date: 23/02/2001  
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**TIME BREAKDOWN DATABASE Non-Productive Time Analysis (NPT)**  
 (Pre-Spud time excluded)



**Trouble Drilling by Operational Code**

OPERATION	HRS
RIG REPAIR	26.0
LOGGING	14.5
TRIP-OUT	5.0
WAIT ON CEMENT	4.5
TRIP-IN	4.5
DRILLING CEMENT	4.0
WORK TIGHT HOLE	4.0
DRILLING AHEAD	3.0
CEMENT PLUGS	1.5
SURVEY	1.0
REAM/WASH	1.0
CIRCULATE & CONDITION MUD	1.0
LAY DOWN PIPE	0.5
N/U & TEST BOP's	0.5





**Section 6.0**

**Survey Data**

**- IDS Survey Report**

**McINTEE #1**

Drilling Co.: OD&E

Rig: OD&E #30

RT above GL: 4 m    Lat : 38 deg 29 min 21.10 sec    Spud Date: 10/02/2001    Release Date: 23/02/2001  
 GL above MSL : 59 m    Long : 142 deg 49 min 21.18 sec    Spud Time: 14:00:00    Release Time: 06:00:00  
 Magnetic Declination (degs): 12.00

Projection:

**DEVIATION SURVEY**

MD (m)	TVD (m)	INCL (deg)	AZIMUTH (deg)	CORRECT. AZ (deg)	DOGLEG (deg/30m)	'V' SECT (m)	N/S (m)	E/W (m)	CLOSURE (m)
64	64	0.50	307	319	0.2	0	0	-0	0
82	82	1.25	325	337	1.4	0	0	-0	1
100	100	1.40	350	2	1.0	1	1	-0	1
137	137	2.50	338	350	1.0	2	2	-1	2
174	174	2.80	339	351	0.2	3	4	-1	4
212	212	2.25	333	345	0.5	4	5	-1	6
319	319	1.40	336	348	0.2	7	9	-2	9
415	415	1.63	312	324	0.2	9	11	-3	11
570	570	1.30	330	342	0.1	11	14	-5	15
720	720	1.50	327	339	0.0	14	18	-6	19
886	886	1.60	320	332	0.0	17	22	-8	23
990	990	1.60	321	333	0.0	19	25	-9	26
1,090	1,090	1.80	303	315	0.2	20	27	-11	29
1,193	1,193	1.75	319	331	0.1	21	29	-13	32
1,299	1,298	1.20	320	332	0.2	23	32	-14	35
1,405	1,404	1.30	320	332	0.0	25	34	-15	37
1,525	1,524	1.30	0	12	0.2	27	36	-16	40
1,685	1,684	1.20	326	338	0.1	30	40	-16	43
1,790	1,789	1.20	330	342	0.0	31	42	-17	45

McINTEE #1

Drilling Co.: OD&E

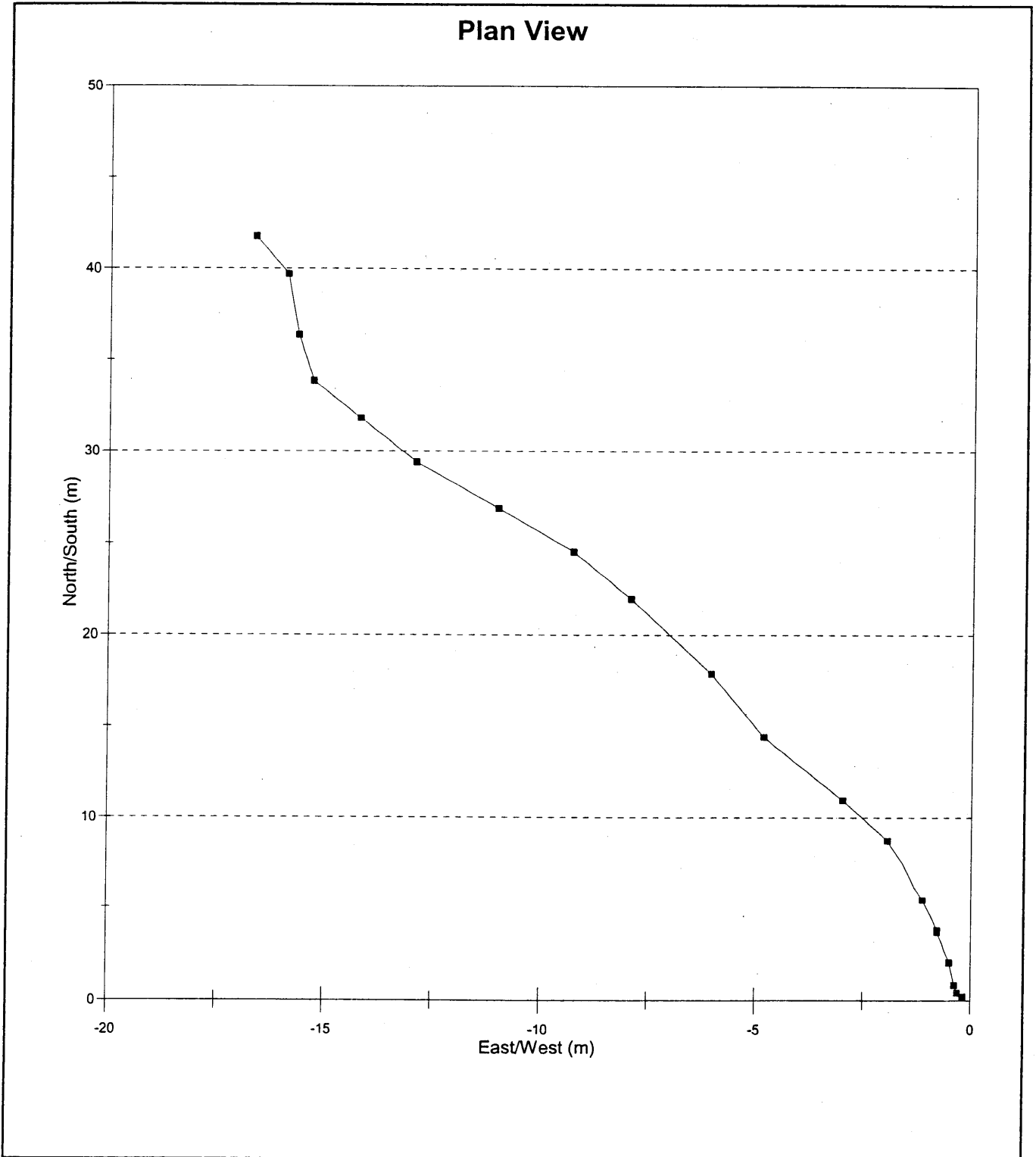
Rig: OD&E #30

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GL above MSL : 59 m Long : 142 deg 49 min 21.18 sec Spud Time: 14:00:00 Release Time: 06:00:00

Magnetic Declination (degs): 12.00

Projection:

DEVIATION SURVEY



McINTEE #1

Drilling Co.: OD&E

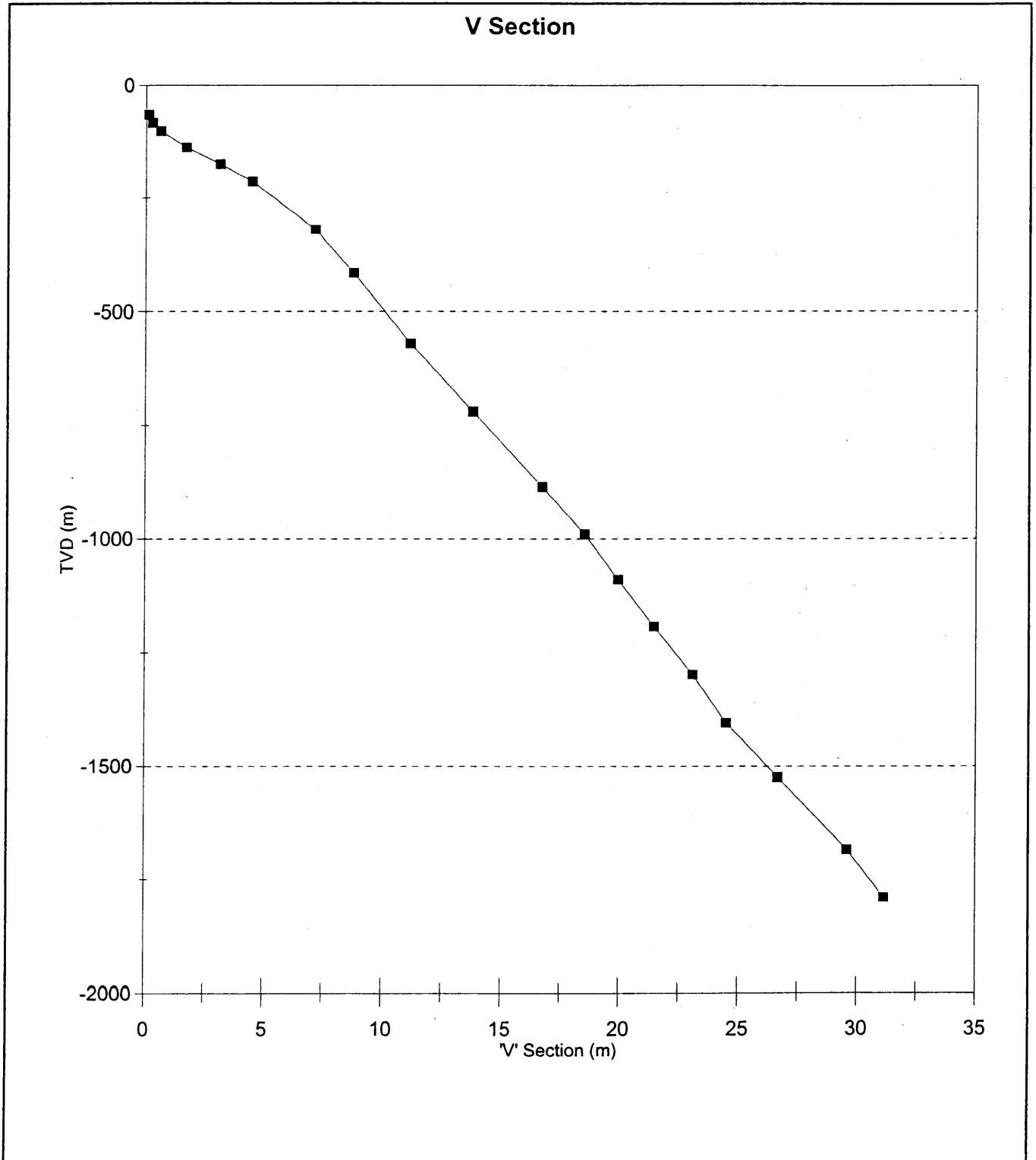
Rig: OD&E #30

RT above GL: 4 m Lat : 38 deg 29 min 21.10 sec Spud Date: 10/02/2001 Release Date: 23/02/2001  
GL above MSL : 59 m Long : 142 deg 49 min 21.18 sec Spud Time: 14:00:00 Release Time: 06:00:00

Magnetic Declination (degs): 12.00

Projection:

**DEVIATION SURVEY**



**APPENDIX XIII: RIG SPECIFICATIONS**

**Rig Inventory for RIG # 30**

- DRAWWORKS** : Ideco Hydrair H-725-D double drum with V-80 Parmac hydromatic brake, Martin Decker satellite automatic drilling control.  
Max. single line pull - 50,000 lbs.  
Main drum grooved for 1-1/8" drilling line.
- 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
- ENGINES** : Four (4) Caterpillar Model 3412 PCTA diesel engines.
- BRAKE** : V-80 Parmac hydromatic brake,
- MAST** : Dresco 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  
Clear 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.
- TRAVELLING BLOCK/HOOK** : One (1) 667 Crosby McKissick 250 ton combination block hook Web Wilson. 250 ton Hydra hook Unit 5 - 36" sheaves.
- WINCHES** : One (1) Ingersol Rand HU-40 with 5/8" wireline.  
Capacity 2,000 lb.  
One (1) ANSI B30.7 with 3/8" wire capacity 4000lbs @ 70 fpm
- SWIVEL** : One (1) Oilwell PC-300 ton swivel
- RIG LIGHTING** : Explosive proof fluorescent. As per approved State Specifications.
- KELLY DRIVE** : One (1) 27 HDP Varco kelly drive bushing.

- MUD PUMPS : Two (2) Gardner Denver mud pumps Model PZH-8 each driven by 750 HP EMD D-79 motors.  
8" stroke with liner size 6" through to 5".  
6" liner maximum pressure 2387 psi  
5.1/2" liner maximum pressure 2841 psi  
5" liner maximum pressure 3437 psi  
6" liner maximum volume 412 gpm  
5.1/2" liner maximum volume 345 gpm  
5" liner maximum volume 280 gpm
- MIXING PUMP : Two (2) Mission Magnum 5" x 6" x 14" centrifugal pump complete with 50 HP, 600 Volt, 60 Hz, 3 phase explosion proof electric motors.
- MUD AGITATORS : Five (5) Geograph/Pioneer 40TD - 15" 'Pitbull' mud agitators with 15 HP, 60 Volt, 60 HZ, 3 phase electric motors.
- LINEAR MOTION SHALE SHAKERS : Two (2) DFE SCR-01 Linear motion shale shakers.
- DEGASSER : 48" Dia Poor Boy Degasser
- DESILTER : One (1) DFE - Harrisburg style 12 cone desilter 12 x 5" cones. Approximate output of 960 gpm. Driven by Mission Magnum 5" x 6" x 11" centrifugal pump complete with 50 hp 600 volt 60 Hz 3 phase explosion proof motor.
- GENERATORS : Four (4) Brown Boveri 600 volt, 600 Kw, 750 kva , 3 phase, 60 HZ AC generators. Powered by four (4) Cat 3412 PCTA diesel engines.
- BOP's & ACCUMULATOR : One (1) Wagner Model 20-160 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.

- BOP's & ACCUMULATOR  
(Cont'd) : 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) Stewart & Stevenson 5 station remote drillers control with air cable umbilical with three pressure gauges, increase and decrease control for annular pressure.  
One (1) Shaffer 13.5/8" x 3,000 psi spherical annular BOP,  
One (1) Shaffer 13.5/8" x 5,000 psi LWS studded, double gate autolock B.O.P.
- KELLY COCK (UPPER) : Two (2) Upper Kelly Cock 7.3/4"OD with 6.5/8" API connections ( 1 x M&M, 1 x Hydril ).
- KELLY COCK (LOWER) : Three (3) M&M Lower Kelly Cocks 6.1/2" OD with 4" IF connections
- DRILL PIPE SAFETY VALVE : One (1) Hydril 6.1/2" stabbing valve (4" IF).  
One (1) Gray inside BOP with 4.3/4" OD and 2.1/4" ID with 3.1/2" IF connections c/w releasing tool and thread protectors.
- AIR COMPRESSORS  
AND 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.
- 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) Foster hydraulic kelly spinner with 6.5/8" LH connection.
- TORQUE WRENCH : Yutani c/w drive sockets 1 1/8" through to 2 3/8"
- SPOOLS : One (1) set double studded adaptor flanges to mate 13.5/8" 5,000 psi. API BOP flange to following wellhead flange.  
13.5/8" x 3,000 series,  
11" x 3,000 series,  
11" x 5,000 series  
7.1/16" x 3,000 series,  
7.1/16" x 5,000 series  
4 1/16" 5000 x 3 1/16" 5000  
3 1/16" 5000 x 2 1/16" 5000



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113

- SPOOLS (Cont'd) : 1 double studed adaptor flange 4 1/16" 5K x 3 1/16" 5K  
1 double studed adaptor flange  
3 1/16" 5K x 2 1/16" 5K  
1 only 14" - BOP mud cross (drilling spool) 13.5/8" 5,000  
x 13.5/8" 5,000 BX160. with 2 x 3 1/16" 5K outlets.  
1 only BOP spacer spool 13 5/8" 3,000 x 13 5/8" 3,000  
1 only BOP spacer .spool 11" 3,000 x 13.5/8" 5,000 .
- ROTARY TABLE : One (1) Oilwell A 20.1/2" rotary table torque tube driven  
from drawworks complete with Varco MASTER  
bushings and Insert Bowls.
- MUD TANKS : SHAKER
- |              |                |
|--------------|----------------|
| Active No 1. | 277 BBL        |
| Desilter     | 73 BBL         |
| Sand Trap    | 50 BBL         |
| Trip Tank    | 29 BBL         |
| Total        | <u>429 BBL</u> |
- SUCTION
- |             |                |
|-------------|----------------|
| Active No 2 | 174 BBL        |
| Pre-Mix     | 146 BBL        |
| Pill Tank   | 63 BBL         |
| Total       | <u>383 BBL</u> |
- TRIP TANK : Trip Tank 29 BBL  
One (1) Mission Magnum 2" x 3" centrifugal pump  
complete with 20 HP, 600 Volts, 60 HZ, 3 phase  
explosion proof motors
- KILL LINE VALVE : 2 x 3 1/8" Cameron FL 5K gate valves
- CHOKE LINE VALVES : 1 x 4 1/16 Cameron FC 5K hydraulic operated gate valve  
1 x 4 1/16 5K manual gate valve
- CHOKE MANIFOLD : One (1) McEvoy choke and kill manifold 3" 5,000 psi  
with hydraulic Swaco "super" choke.
- DRILL PIPE : 240 joints ( 2270 m) - 3.1/2" 13.30lb/ft drill pipe Grade 'G'  
105 with 3 1/2" IF conn
- PUP JOINTS : One (1) - 10' ( 3.65 m) 3.1/2" OD Grade 'G' with 3.1/2" IF  
conn
- HEVI-WATE DRILL PIPE : 6 joints of 3.1/2" H.W.D.P. with 3.1/2" IF conn
- DRILL COLLARS : 12 x 6.1/2" OD drill collars (113 m) with 4" IF conn  
24 x 4 3/4" O.D. drill collars ( 227 m) with 3.1/2" IF conn  
1 x 4.3/4" OD Pony Drill Collar
- KELLIES : Two (2) Square Kelly drive 4.1/4" x 40' complete with  
Scabbard and 55 ft x 3 1/2" kelly hose

- FISHING TOOLS :
- One (1) only 8.1/8" Bowen series 150 FS overshot
  - One (1) 5.3/4" SH Bowen 150 Overshot c/w grapples and packoffs to fish contractors downhole equipment.
  - One (1) only Reverse circulating junk basket 4" IF box
  - One (1) only 6.1/2" OD Griffith Fishing Jars
  - One (1) only 4 3/4" O.D. Bowen Type "Z" Fishing Jar
  - One (1) only Bumper Sub 6.1/2" OD 4" IF pin & box.
  - One (1) 5" R.C.J.B.
  - One (1) 5" Junk Sub with 4.3/4" OD x 1.1/2" ID.
- WIRELINE SURVEY UNIT :
- Gearmatic hydraulic drive Model 5 c/w .092" line
- SUBSTITUTES :
- Two (2) Bit Sub - 7.5/8" reg x 6.5/8" reg double box.
  - Two (2) Bit Subs - 6.5/8" reg double box.
  - Two (2) Bit Sub - 6.5/8" reg box. x 4 1/2" IF box
  - Two (2) Bit Subs - 4.1/2" reg x 4" IF double box.
  - Two (2) 4.3/4" bit subs (36" long) with 3.1/2" IF box x 3.1/2" reg box bored for float.
  - One (1) Float Sub 6.5/8" reg box (FC) x 6.5/8" reg pin
  - Two (2) XO Sub - 4" IF box x 4.1/2" IF pin.
  - Two (2) XO Sub - 4.1/2" IF box x 4" IF pin.
  - One (1) XO Sub - 4.1/2" reg x 4" IF double 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
  - One (1) Junk Sub - 4.1/2" reg box x 4.1/2" reg pin.
  - One (1) XO Sub - 4.1/2" IF box x 4" IF box.
  - Two (2) Kelly Saver Subs c/w rubber 4" IF pin & box.
  - Two (2) Kelly Saver Subs 4" IF pin & box
  - One (1) Kelly Saver Subs 4 1/2" IF pin & box.
  - Two (2) 4 IF box x 3.1/2" IF pin Saver Subs.
  - One (1) Circulating Subs - 4" IF x 2" 1502 hammer union.
  - One (1) Circulating Subs - 4" IF x 2" 602 hammer union.
  - Eleven (11) Lifting Subs - 18" Taper 4.1/2" pick up neck and 4" IF pin.
  - Eight (8) Lift Subs with 3.1/2" OD D.P. neck and 3.1/2" IF pin connections.
- HANDLING TOOLS :
- 2 only 4.1/2" BJ 250 ton 18 degree taper D/P elevators.
  - 1 only 3.1/2" BJ 200 ton 18 degree taper D/P elevators.
  - 1 only 3.1/2" BJ type MGG 18° centre latch Elevators.
  - 1 only 4.1/2" Varco SDXL D/P slips.
  - 1 only 4.1/2" Varco SDML D/P slips
  - 2 only 8" - 6.1/2" DCS-R drill collar slips.
  - 1 only 3.1/2" Varco SDML Slips
  - 1 only 4.3/4" Varco DCS-S Drill Collar Slips

CASING RUNNING TOOLS	:	1 only 13.3/8" Webb Wilson 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 150 ton side door elevators. 1 only 7" single joint P.U. elevators. 1 only 5.½" BJ 200 ton S11 1 only 2.7/8" BJ 100 ton tubing elevator. 1 only 2.3/8" BJ 100 ton tubing elevator. (all P.U. elevators c/w slings & swivel) 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 3.1/2" Varco SDML tubing slips.
CASING / TUBING DRIFTS	:	9 5/8, 7", 5 ½", 3 ½"
THREAD PROTECTORS	:	9 5/8, 7".
KELLY SPINNER	:	One (1) Foster hydraulic kelly spinner with 6.5/8" LH connection.
PIPE SPINNER	:	One (1) International 850H hydraulic pipe spinner
WELDING EQUIPMENT	:	1 - Miller 400 amp welding machine. 1 - oxy acetylene set.
DOGHOUSE	:	1 Doghouse 5m x 2.4m x 2.3m
GENERATOR HOUSE	:	Ross Hill SCR
UTILITY HOUSE	:	1 Utility and Mechanics House
CATWALKS	:	2 catwalks total 18.6m long x 1.6m wide x 1.08m high
PIPE RACKS	:	8 - 9m tumble racks.
DAY FUEL TANK	:	1 only 19,000 ltrs
WATER/FUEL TANK	:	WATER 1 only 320 bbls. 1 only brake cooling tank 80 bbl FUEL 1 only 27,500 litres
OIL STORAGE	:	drums
DRILLING RATE RECORDER	:	1 only 6 pen Pioneer Geograph 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)



TRANSPORT EQUIPMENT AND MOTOR VEHICLES

- One (1) International 530 Forklift
- One (1) Tray Top Utility
- One (1) Crew Bus

CAMP EQUIPMENT

- Four (4) x 8-Man Bunkhouses (12 man emergency)
- One (1) x Recreation/Canteen unit
- One (1) x Ablution/Laundry/Freezer unit
- One (1) x Kitchen/Cooler/Diner unit
- One (1) x Toolpushers unit
- One (1) x Meeting / Smoko unit
- One (1) x Combined Water/Fuel Tank unit
- Two (2) x 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.

**ENCLOSURE I: 1 : 200 COMPOSITE LOG**

PE605267

This is an enclosure indicator page.  
The enclosure PE605267 is enclosed within the  
container PE908035 at this location in this  
document.

The enclosure PE605267 has the following characteristics:

ITEM\_BARCODE = PE605267  
CONTAINER\_BARCODE = PE908035  
NAME = Encl.1 McIntee-1 Composite Well Log  
BASIN = OTWAY  
ONSHORE? = Y  
DATA\_TYPE = WELL  
DATA\_SUB\_TYPE = COMPOSITE\_LOG  
DESCRIPTION = Encl.1 McIntee-1 Composite Well Log,  
Scale 1:200, by Santos Limited, W1316,  
PEP154. Enclosure 1 contained within  
"Well Completion Report" [PE605267].  
REMARKS =  
DATE\_WRITTEN = 31-MAY-2001  
DATE\_PROCESSED =  
DATE\_RECEIVED = 20-AUG-2001  
RECEIVED\_FROM = Santos Ltd  
WELL\_NAME = McIntee-1  
CONTRACTOR =  
AUTHOR =  
ORIGINATOR = Santos Ltd  
TOP\_DEPTH = 0  
BOTTOM\_DEPTH = 1803  
ROW\_CREATED\_BY = DN07\_SW

(Inserted by DNRE - Vic Govt Mines Dept)

908035 ~~120~~  
120

**ENCLOSURE II: 1 : 500 MUDLOG**



PE908037

This is an enclosure indicator page.  
The enclosure PE908037 is enclosed within the  
container PE908035 at this location in this  
document.

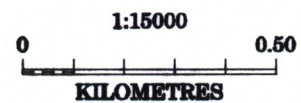
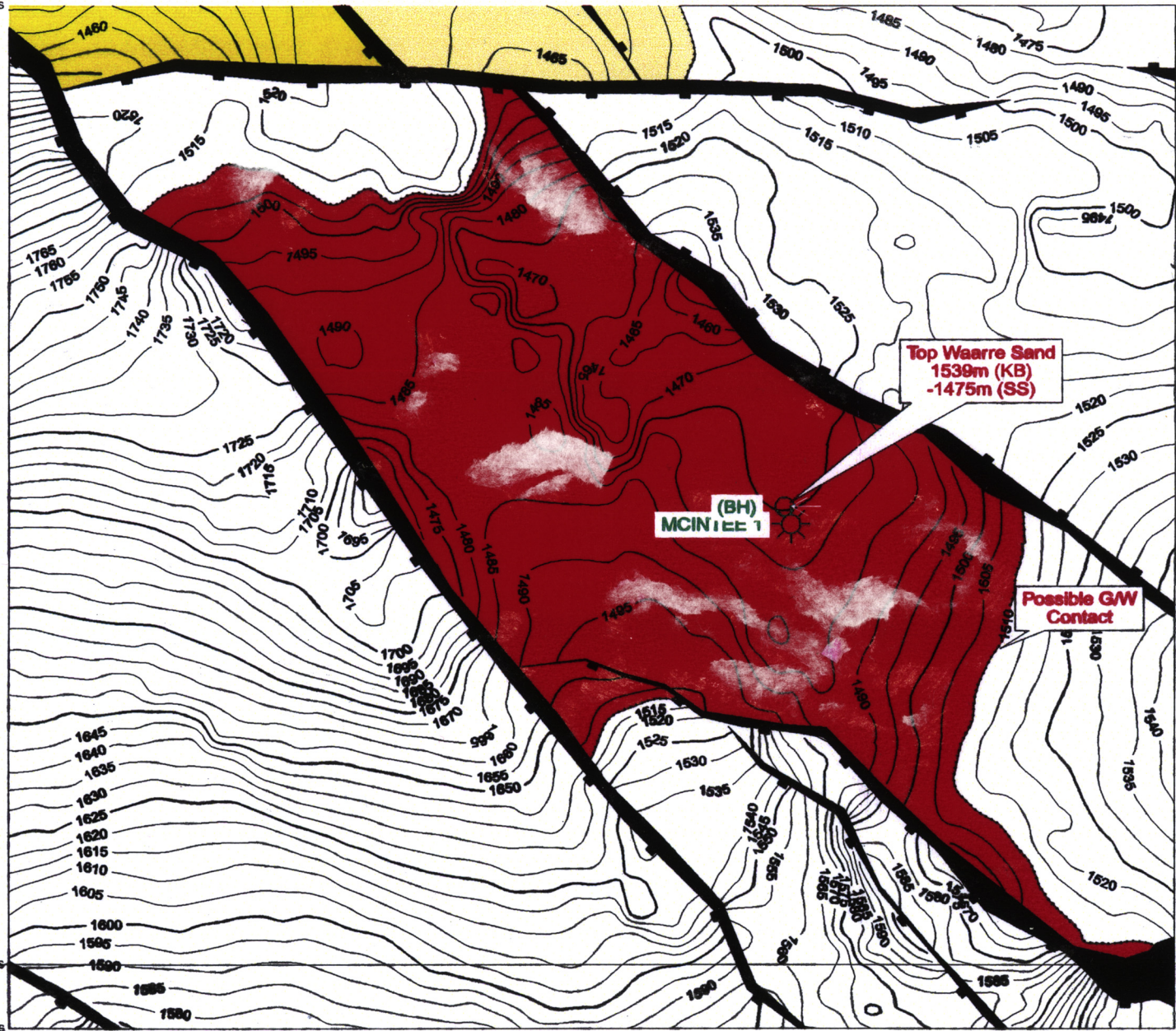
The enclosure PE908037 has the following characteristics:

ITEM\_BARCODE = PE908037  
CONTAINER\_BARCODE = PE908035  
NAME = Encl.2 McIntee-1 Mud Log  
BASIN = OTWAY  
ONSHORE? = Y  
DATA\_TYPE = WELL  
DATA\_SUB\_TYPE = MUD\_LOG  
DESCRIPTION = Encl.2 McIntee-1 Mud Log, Scale 1:500,  
by Santos Limited, W1316, PEP154.  
Enclosure 2 contained within "Well  
Completion Report" [PE908035]  
REMARKS =  
DATE\_WRITTEN =  
DATE\_PROCESSED =  
DATE\_RECEIVED = 20-AUG-2001  
RECEIVED\_FROM = Santos Ltd  
WELL\_NAME = McIntee-1  
CONTRACTOR = Santos Ltd  
AUTHOR =  
ORIGINATOR = Santos Ltd  
TOP\_DEPTH = 0  
BOTTOM\_DEPTH = 1803  
ROW\_CREATED\_BY = DN07\_SW

(Inserted by DNRE - Vic Govt Mines Dept)

**ENCLOSURE III: STRUCTURE MAPS**

# MCINTEE PROSPECT



UNIVERSAL TRANSVERSE MERCATOR PROJECTION  
AUSTRALIAN NATIONAL SPHEROID  
CENTRAL MERIDIAN 141 00 00 E  
Mapsheet datum: "AGD84"

## Santos

DEPTH  
Near Top Waarre Sand  
FEB. 2001  
M.Majedi

Based on Ave Velocity of 2493 m/s at McIntee 1

Date: April 19, 2001	Author:	SECL
Checked/Issued: Bm	Drawn:	
Revised: AUSTRALIAN PATENTING	File No.:	

908035 123

OTWAY BASIN STRATIGRAPHIC COLUMN

