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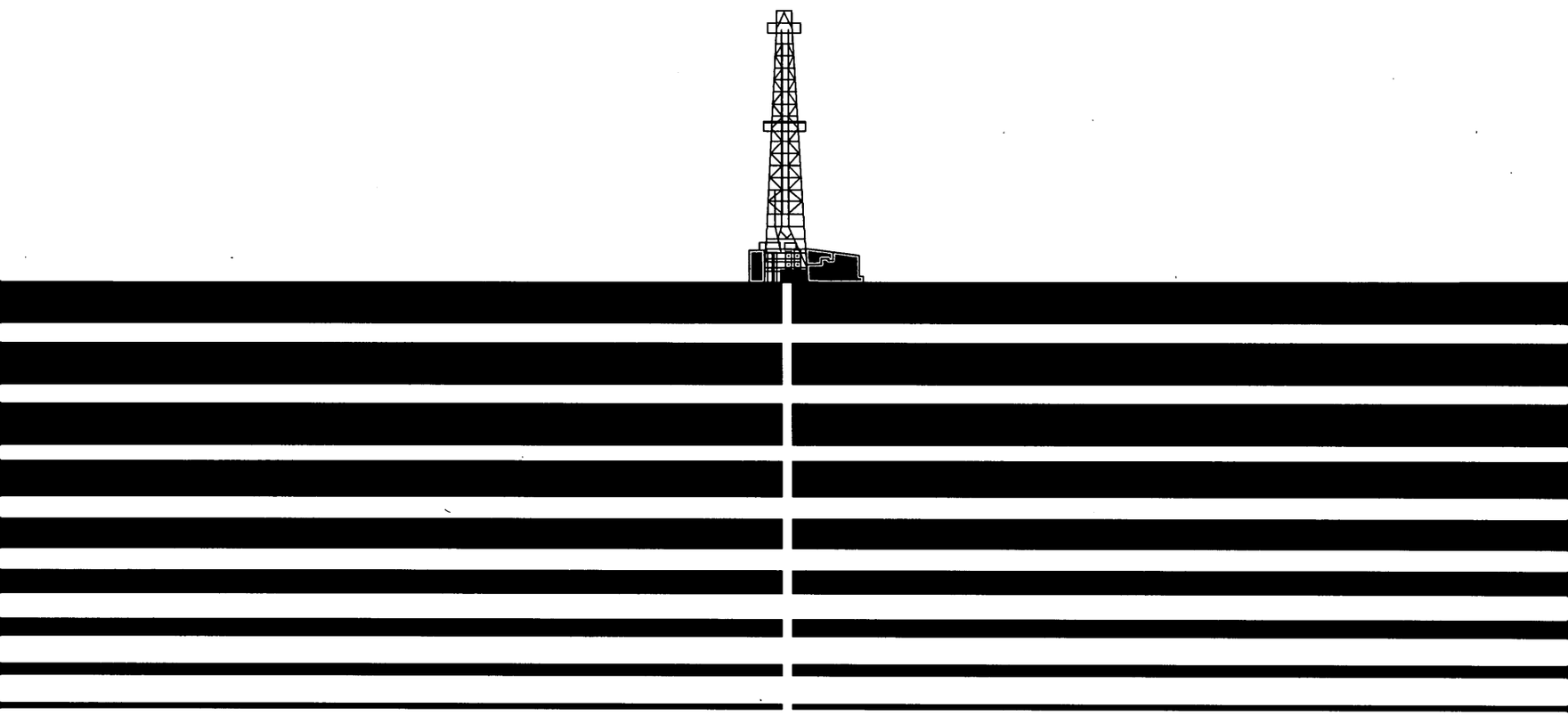
907987 001

PENRYN 1

Well Completion Report



Santos

A.C.N. 007 550 923

P.E.P. 108,
VICTORIA

SANTOS

Petroleum Development

COMPILED FOR

SANTOS (BOL) LTD

(A.C.N. 000 670 575)

PENRYN 1

WELL COMPLETION REPORT

Prepared By:
T. CONROY
July, 2000

PENRYN 1 WCR

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LOCATION MAP

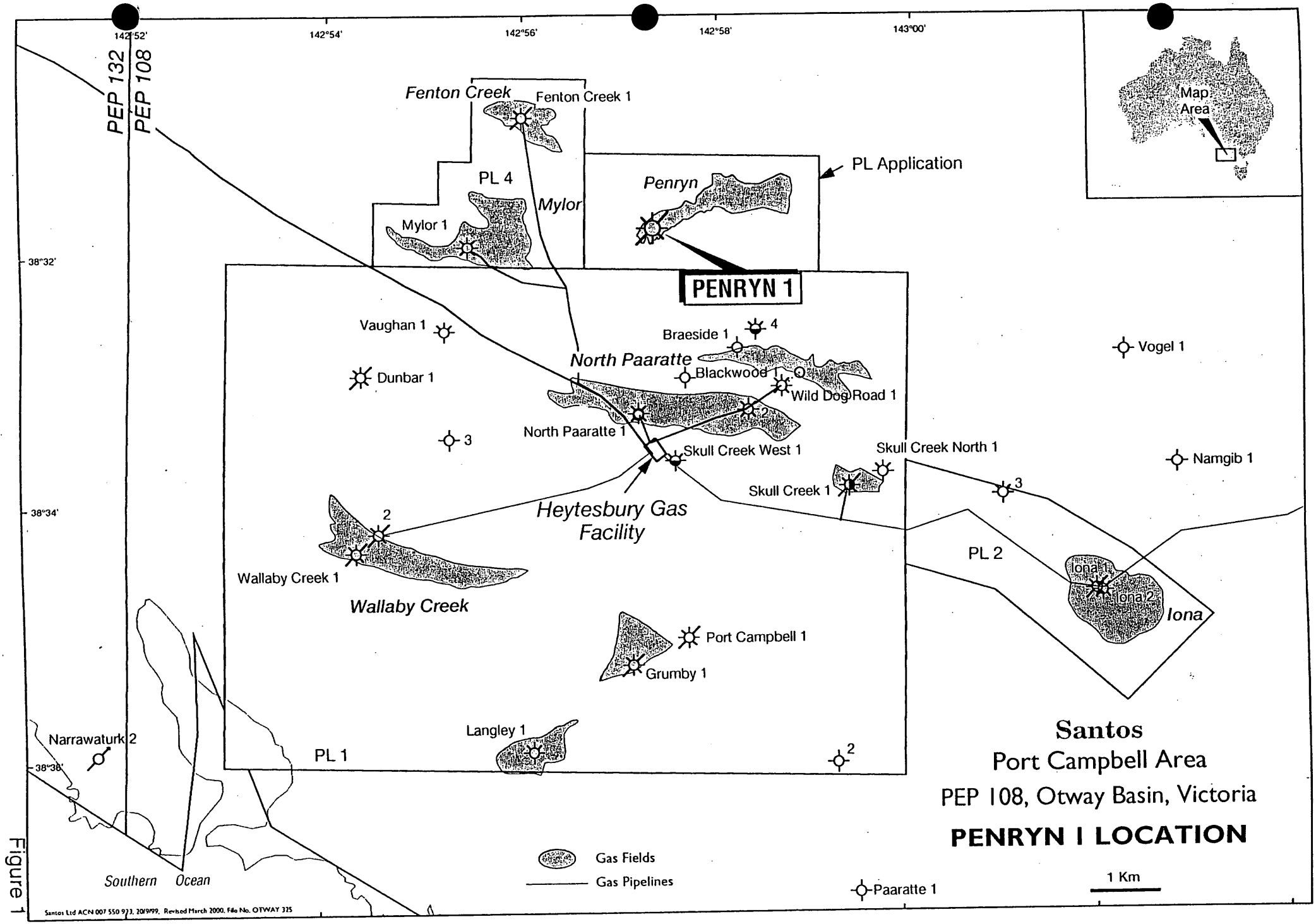

Figure 1

WELL CARD

907987 007

WELL: PENRYN 1	**WELL CATEGORY:** WILDCAT (WCNF) **WELL INTENT:** GAS	**SPUD:** 8/1/00 12:00 hrs **TD REACHED:** 15/1/00 15:30 hrs	
LAT: 38° 31' 40.66" S	**LONG:** 142° 57' 22.51" E	**RIG RELEASED:** 20/1/00, 02:30 hrs **CMPLT:**	
SEISMIC STATION:	WAARRE 3D: LINE 8125, CDP 1470	**RIG:**	OD&E 30
ELEVATION GND:	112.2m amsl **RT:** 116.9m	**STATUS:**	SUSPENDED GAS WELL (SUG)
BLOCK/LICENCE:	PEP 153, ONSHORE OTWAY BASIN, VIC	**REMARKS:** NEW FIELD DISCOVERY FROM WAARRE SANDSTONE	
TD	1822.5m (Logr Ext) 1823m (Drlr)		
TYPE STRUCTURE:	TILTED FAULT BLOCK		
TYPE COMPLETION:	SUSPENDED		
ZONE(S):	WAARRE SANDSTONE "UNIT C"		

CASING SIZE	SHOE DEPTH	TYPE
20"	5.5m	Conductor
9.625"	670.7m	K55 - 36lb-BTC
3.5"	1820m	J55 – 9.3lb-NK35B

AGE	FORMATION OR ZONE TOPS	DEPTH (m)		THICKNESS (m)	HIGH (H) LOW (L)
		LOGGERS	SUBSEA		
MIDDLE TO LATE MIOCENE	PORT CAMPBELL LIMESTONE	Surface	116.9	73	-
EARLY TO MIDDLE MIOCENE	GELLIBRAND MARL	73	43.9	211	-
EARLY OLIGOCENE-EARLY MIOCENE	CLIFTON FORMATION	284	-167.1	37	-
LATE EOCENE -EARLY OLIGOCENE	NARRAWATURK MARL	321	-204.1	68	-
MIDDLE EOCENE-EARLY OLIGOCENE	MEPUNGA FORMATION	389	-272.1	141	20 H
EOCENE	DILWYN FORMATION	530	-413.1	138.5	-
EARLY EOCENE - LATE PALAEOCENE	PEMBER MUDSTONE	668.5	-551.6	74.5	1.5 H
LATE PALAEOCENE	PEBBLE POINT FORMATION	743	-626.1	66.5	8 H
MAASTRICHTIAN TO CAMPANIAN	PAARATTE FORMATION	809.5	-692.6	360	10.5 L
SANTONIAN	SKULL CREEK MUDSTONE	1169.5	-1052.6	169.5	40.5 H
SANTONIAN	NULLAWARRE GREENSAND	1339	-1222.1	142.5	46 H
SANTONIAN TO CONIACIAN	BELFAST MUDSTONE	1481.5	-1364.6	171	37.5 H
TURONIAN	FLAXMANS FORMATION	1652.5	-1535.6	20.5	16.5 H
TURONIAN	WAARRE FORMATION, UNIT "C"	1673	-1556.1	22	16 H
"	UNIT "B"	1695	-1578.1	4	
"	UNIT "A"	1699	-1582.1	55	
LATE ALBIAN	EUMERALLA FORMATION	1754	-1637.1	68.5+	11.0 (H)
	TD	1822.5	-1705.6		

LOG INTERPRETATION (Interval Averages)						PERFORATIONS (4 shots/ft)	
INTERVAL (m)	Ø %	SW %	INTERVAL (m)	Ø %	SW %	FORMATION	INTERVAL
Waarre C						None	
1673-1683 (9.8m)	21.5	20					
1684-1693 (7.9m)	21.2	27					

CORES				
FORM	NO.	INTERVAL	CUT	REC
None				

LOG	SUITE/ RUN	INTERVAL (m)	BHT/TIME/ REMARKS	LOG	SUITE/ RUN	INTERVAL (m)	BHT/TIME/REMARKS
GR	1/1	1822.5-0	63°C/9.45 hrs	LDL	1/1	1822.5-670	63°C/9.45 hrs
SP	1/1	1822.5-670	63°C/9.45 hrs	CNL	1/1	1822.5-670	63°C/9.45 hrs
CAL	1/1	1822.5-670	63°C/9.45 hrs	CAL	1/1	1822.5-670	63°C/9.45 hrs
MSFC	1/1	1822.5-670	63°C/9.45 hrs	MDT	1/2	17 points in Waarre	65°C/16.15 hrs
DLL	1/1	1822.5-670	63°C/9.45 hrs				
AS	1/1	1822.5-670	63°C/9.45 hrs				
WFT	1/1	1822.5-1630	63°C/9.45 hrs				

*Logger Contractor - SCHLUMBERGER

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:

Penryn 1 is situated in Southern Victoria, in the onshore portion of the Otway Basin (Port Campbell. Embayment). The well is located in the PEP 153 licence (formally PEP 108), and sited at CDP 1470, Line 8125, on the Waarre 3D Seismic Survey. It is approximately 5km south of the town of Timboon and 2km ENE of the Mylor gas field.

PEP 153 Licence surrounds the Production Licences 1 and 2, which encompass the North Paaratte, Wallaby Creek, Skull Creek and Iona fields. PPL 4, owned 100% by Santos is immediately adjacent to the west of the proposed Penryn 1 location. The Penryn structure is a tilted fault block closure. It was defined by the Waarre 3D seismic program and has a mapped area of 300 acres (P10).

The primary objective of Penryn 1 was the Waarre Sandstone.

The geological section penetrated was as predicted. All formation tops were intersected high to prognosis except the Paaratte Formation which was intersected 10m low to prognosis. The top of the Flaxmans Formation was close to prognosis, 16.5m high, and the top of the primary objective, the Waarre, was 16m high (at -1556.1m). The top of the Eumeralla Formation (-1637.1m) also came in very close to that predicted, at 11m high.

During drilling, excellent gas shows of up to 5000/40 units were detected in the upper portion of the Waarre, associated with excellent reservoir quality rock. Gas levels decreased markedly below 1696m. No further gas shows were seen in the Waarre Sandstone or Eumeralla Formation.

Wireline logging was carried out by Schlumberger at total depth and consisted of the following: Suite 1/Run 1: PEX; Run 2: MDT.

Log analysis and formation pressure data indicate a gross gas column of 18.3m with 17.7m of net pay in the Waarre 'C' Sandstone.

Penryn 1 reached a total depth of 1823m (D), 1822.5m (L), and has been cased with 3.5" production tubing.

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

AUTHOR: T. Conroy | **DATE**: JULY 2000

WELL HISTORY

1. GENERAL DATA

Well Name:	Penryn 1
Well Classification:	Exploration (Wildcat)
Interest Holders:	Santos (100%)
Participating Interests:	Santos (100%)
Operator	Santos
Block/Licence	PEP 153, Onshore Otway Basin, Victoria
Surface Location	Latitude: 38° 31' 40.66" South Longitude: 142° 57' 22.51" East
Surveyed Elevation	Ground Level: 112.2m Rotary Table: 116.9m
Seismic Survey	Waarre 3D
Seismic Location	CDP 1470, LINE 8125
Total Depth	Driller: 1823m Logger: 1822.5m
Completion	172 joints of 3.5" 9.3 ppft J55 New NK3SB Tubing, set at 1819.5m
Status	Suspended Gas Well.

2. DRILLING DATA

Date Drilling Commenced	1200 hours, 8th January 2000
Date Drilling Completed	1530 hours, 15th January 2000
Date Rig Released	0230 hours, 20th January 2000
Contractor	Oil Drilling & Exploration Pty Ltd (OD&E)
Rig	OD&E 30
Rig Specifications	Refer to Appendix XIII

3. DRILLING SUMMARY

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

Penryn 1 was spudded at 1200 hours on the 8th February 2000. Tables I and II summarise the major drilling operations in this hole. A more comprehensive summary is appended to this report (Appendix XII: (Drilling - Final Well Report).

TABLE I: CASING, HOLE, AND CEMENT DETAILS

BIT SIZE	DEPTH	CSG SIZE	CSG DEPTH	JNTS	CSG TYPE	CEMENT
12.25"	676m	9 5/8"	670m	56	36ppf K55 BT & C	529sx, 186 bbls Class 'G' plus 127sx, 26bbls "G" tail
8.5" 6.75"	680m 1823m	3 1/2"	1819.5m	147	9.3ppf J55 New NK3SB	403sx, 142 bbls Class 'G' Plus 119sx, 25 bbls Class 'G' tail

TABLE II: SUMMARY OF MUD SYSTEMS

MUD TYPE	INTERVAL (m)
Spud Mud (Gel/Water)	Surface - 1618
KCL/Polymer	1618 - 1823

(b) Lost Time

Lost time at Penryn 1 – Please refer to Appendix XII (Drilling - Final Well Report, Section 6: Time Breakdown Data).

(c) Water Supply

Make up water (Cl 200 mg/l , total hardness 40 mg/l, nil carbonates, bicarbonates 86 mg/l, pH 6.5) sourced from local water bore.

(d) Mudlogging

Mudlogging services were provided by Geoservices Ltd. Samples were collected, washed, and described at 15m intervals from the surface to 840m, then at 10m to 990m, and then at 3m intervals to total depth at 1823m. All samples were checked for oil shows using ultraviolet fluorescence. Gas levels were monitored from the surface casing shoe to TD using a total gas detector and other parameters monitored included rate of penetration, weight on hook and mud pit levels.

(e) Testing

No DSTs were conducted in Penryn 1.

(f) Coring

No cores were cut in Penryn 1.

(g) Wireline Logging

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

TABLE IV: ELECTRIC LOG SUMMARY

LOG	SUITE/ RUN	INTERVAL (m)	BHT/TIME/ REMARKS	LOG	SUITE/ RUN	INTERVAL (m)	BHT/TIME/ REMARKS
GR	1/1	1822.5-0	63°C/9.75hrs	LDL	1/1	1822.5-670	63°C/9.75hrs
SP	1/1	1822.5-670	63°C/9.75hrs	CNL	1/1	1822.5-670	63°C/9.75hrs
CAL	1/1	1822.5-670	63°C/9.75hrs	CAL	1/1	1822.5-670	63°C/9.75hrs
MSFC	1/1	1822.5-670	63°C/9.75hrs	MDT	1/2	17 points in Waarre	65°C/16.15hrs
DLL	1/1	1822.5-670	63°C/9.75hrs				
AS	1/1	1822.5-670	63°C/9.75hrs				
WFT	1/1	1822.5-1630	63°C/9.75hrs				

*Logger Contractor - SCHLUMBERGER

(h) Geothermal Gradient

A measured static bottom hole temperature of 68°C at 1841m is calculated. This gives a geothermal gradient of 2.35°C/100m. An ambient temperature of 23°C was employed. Data used for calculations is as follows:

63°C at 1822.5m after 9.75 hours from Run 1, Suite 1 PEX logging run.
65°C at 1822.5m after 16.5 hours from Run 2, Suite 1 MDT logging run.

(i) Hole Deviation

The Penryn 1 well is a vertical hole. Directional surveys indicate a maximum deviation from vertical of 5.5° inclination 112°T at 1813m.

(j) Velocity Survey

No velocity survey was run in Penryn 1.

(k) Completion Summary

Penryn 1 was cased and suspended.

GEOLOGY

1. PRE-DRILLING SUMMARY (after Well Proposal)

Penryn 1 is proposed as an Otway Basin gas exploration well to be located in the PEP 153 licence, (located at CDP 1470, Line 8125, on the Waarre 3D Seismic Survey) approximately 5km south of the town of Timboon and 2km ENE of the Mylor gas field. The Penryn Structure is situated within the Port Campbell Embayment and the productive Waarre Sandstone play fairway immediately north of PEL 1.

The PEP 153 Licence surrounds the Production Licences 1 and 2, which encompass the North Paaratte, Wallaby Creek, Skull Creek and Iona fields. PPL 4, owned 100% by Santos is immediately adjacent to the west of the proposed Penryn 1 location.

The Penryn Structure is a tilted-fault block closure, mostly defined by 3D seismic although for the larger Penryn area only 2D seismic is available. The primary objective of Penryn 1 was clean sandstones, Unit "C", of the Late Cretaceous Waarre Formation. Lithic sandstones of the underlying Early Cretaceous Eumeralla Formation formed a contingent secondary objective. The well was expected to intersect a thick reservoir section in the Waarre with a mean net pay estimated at 21m.

Penryn 1 is an attractive project with a mean prognosed success case of 5.5 BCF sales gas (11.95 BCF OGIP) and a Pc (probability of commercial success) of 65%, resulting in expected mean reserves of 3.58 BCF sales gas. The potential for oil at the Penryn location is a distinct possibility, but has not been included in any economics. Spill from Mylor 1 is likely to be in the direction of Penryn. Mylor 1 has a light oil leg of about 1.8m thick.

2. DRILLING RATIONALE (after Well Proposal)

GEOLOGICAL RISK ASSESSMENT

Play Analysis

The Penryn Prospect is mapped as a tilted-fault block closure with the primary reservoir the Waarre Sandstone; both vertical and cross-fault seal is provided by a thick Belfast Mudstone. Structures are charged from mature source beds located within the underlying Eumeralla and/or Crayfish Group with migration conduit directly into the reservoir or via fault conduits. The play has proven successful in the nearby Mylor, Fenton Creek, North Paaratte, Wallaby Creek and Iona Fields.

Trap

The interpretation and mapping of the Penryn Prospect was essentially based on the Waarre 3D Survey which was recorded in 1993. The closure area of the Penryn Structure however extends beyond the limit of the survey towards east and as a result the eastern limits of the Penryn Structure are defined by a 1x1 km 2D seismic grid.

The Waarre 3D data quality is very good in the central portion of the grid including the Mylor, Fenton Creek and the core of the Penryn area but deteriorates as the fold diminishes towards the edge of the survey. The 2D Seismic grid is also good quality and comprises vintages of data from 1985-1995.

Mapping was carried out at top Waarre Sandstone which is the primary target. The Waarre Sandstone has a distinctive characteristic on both 3D and 2D seismic and therefore a high degree of accuracy was maintained on picking this event. The mapping was extended regionally to cover the Mylor and Fenton Creek gas fields. The top Belfast Mudstone was interpreted on selected grid to adequately evaluate the seal efficiency over the Penryn Structure.

The Penryn structural closure has been formed by a major-tilted fault block which also accommodates the Mylor gas field about 3km west of the Penryn Prospect. Mylor and Penryn structures are separated by a gentle saddle. There is a possibility that the two structures are in communication at depth, however there is insufficient velocity information for an accurate depth conversion.

The extended closure area of the Penryn structure is controlled by a complex faulting system and may include spillage into the downthrown side of the main fault block.

A strong amplitude event is present at the top Waarre reflector over the Penryn. A similar event over Mylor and Fenton Creek gas fields suggest that the amplitude anomaly is likely related to presence of gas in these structures.

The location for the proposed Penryn 1 was selected on inline 8125 at CDP 1470. This location is about 80m away from the bounding fault at the Waarre Sand level and exhibits a strong amplitude.

Depth conversion for the prognosis was performed using Mylor 1 with the results from Iona 1 used for reference.

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 sub-divided into three sub-units – Waarre "A", "B" & "C". The sands within the A & B units are generally shalier and more cemented and consequentially have lower porosity than the overlaying unit C (av 20%). In Mylor 1 however Unit A exhibited good porosity but proved water wet due to juxtaposition of the reservoir against the permeable Unit C. Thickness changes in the lower units imply that syn-depositional subsidence increased basinward to the southwest.

While the Waarre Sandstone thins to the north, the proximity to the Mylor and Fenton Creek wells where excellent reservoir is encountered provides high confidence that similar good reservoir will be found in Penryn 1. Average core permeabilities of 4.1 Darcies are measured in Mylor 1 and production tests confirmed the potential of the reservoir with test rates of 17-25mmcfd.

The top section of the Waarre Formation, defined as "Unit C" by Buffin (1989) is a well-developed quartz arenite unit. The sandstone is typically medium to coarse-grained, well sorted, clean, porous and with good permeability, and displays good to excellent reservoir qualities. It represents the hydrocarbon-bearing sands occurring in the gas fields of the Port Campbell Anticline. The sandstones exhibit a variety of sedimentary features that indicate deposition in a channel sand facies, part of a tidal beach-barrier complex environment, to tidal channels, ebb and flood tidal delta bars, open bays, and subtidal flats (Buffin, 1989). It has been suggested that all of the Waarre units contain marine microplankton thus they were deposited in open marine environments, not fluvial or estuarine (Foster and Hodgson, 1995). "Unit C" is thought to have been deposited in a shallow marine upper shoreface region, due to its medium to coarse grain size and poorly sorted nature. The sandstones make up excellent reservoirs with their lack of matrix (as compared to the Eumeralla), and low cement content.

Average *in situ* porosities are between 20 to 24% and permeabilities generally surpass 1.5 Darcies. The net to gross of the Waarre commonly exceeds 85%. The Penryn 1 well is expected to intersect a good reservoir section, with a mean net pay of 21m.

Seal

All Otway Basin successes In the Port Campbell Embayment area have been in high side, tilted fault and 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 major risk for prospects within the central 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 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 Snake Creek Mudstone

The lack of 3D seismic coverage in the eastern portion of the Penryn prospect adds uncertainty to the cross fault seal viability for the "greater" Penryn structure which may rely on downthrown fault seal against the Eumeralla Formation. Seismic interpretation suggests that leakage will not occur as the fault displacement (30ms) is considerably less than the thickness of the Belfast Mudstone (100ms+).

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. Mature source units underlie the gas fields and most likely charge directly into the overlying structures through source-reservoir juxatposition or via fault conduits. This model is proposed for Penryn 1, which is positioned in a similar situation to the adjacent, existing gas fields.

With many of the structures being present prior to the Belfast deposition, the timing of generation and migration does not appear to be a major issue.

3. RESULTS OF DRILLING

(a) Stratigraphy

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

TABLE VI: STRATIGRAPHY IN THE PENRYN 1 WELL

AGE	FORMATIONS	DEPTH (m)	ELEV (m)	THICK
	HEYTESBURY GRP			
MIDDLE-LATE MIOCENE	PORT CAMPBELL LIMESTONE	Surface	+116.9	73
EARLY-MIDDLE MIOCENE	GELLIBRAND MARL	73	+43.9	211
LATE OLIGOCENE	CLIFTON FM NIRRANDA GRP	284	-167.1	37
LATE EOCENE-EARLY OLIGOCENE	NARRAWATURK MARL	321	-204.1	68
MID EOCENE-EARLY OLIGOCENE	MEPUNGA FM WANGERRIP GRP	389	-272.1	141
EARLY EOCENE	DILWYN FM	530	-413.1	138.5
LATE PALEOCENE-EARLY EOCENE	PEMBER MUDSTONE	668.5	-551.6	74.5
LATE PALAEOCENE	PEBBLE POINT FM SHERBROOK GRP	743	-626.1	66.5
MAASTRICHTIAN-CAMPANIAN	PAARATTE FM	809.5	-692.6	360
SANTONIAN	SKULL CREEK MUDSTONE	1169.5	-1052.6	169.5
"	NULLAWARRE GREENSAND	1339	-1222.1	142.5
SANTONIAN-CONIACIAN	BELFAST MUDSTONE	1481.5	-1364.6	171
TURONIAN	FLAXMANS FM	1652.5	-1535.6	20.5
"	WAARRE FM OTWAY GRP	1673	-1556.1	81
LATE ALBIAN	EUMERALLA FM	1754	-1637.1	68.5+
	TOTAL DEPTH	1822.5	-1705.6	

Cuttings samples were collected, washed, and described at 15m intervals from the surface to 840m, thereafter at 10m intervals from 850m to 990m and at 3m intervals from 993m to the total depth of 1823m.

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

Total depth for Penryn 1 was reached at 1823m (D), 1822.5m (L), in the Early Cretaceous **Eumeralla Formation,** of the **Otway Group**. The well intersected 68.5m of the Eumeralla, the top coming in at 1754m (maximum recorded thickness in the Otway Basin is 2743m, in the Fergusons Hill-1 well). The formation consists of interbedded argillaceous sandstone and silty claystone, with very minor coal. The sandstones are off-white to light and medium greenish-grey, and range in size from very fine to coarse, but are dominantly medium-grained. They are angular to subangular, poorly to moderately sorted, better sorted towards the base, contain weak to moderate silica and calcareous cements and have a common to abundant white argillaceous matrix; in part the sandstone is matrix supported. Characteristically, the Eumeralla contains a high percentage of volcanic rock fragments (38-53%--Abele *et al*, 1995) and in Penryn there are common grey and green, and trace to common dark lithics. There is trace black coaly detritus in part, trace mica flakes in part, common to abundant glauconite grains, and a trace of pyrite (rare pyritized worm burrows. The sandstone varies from friable to occasionally moderately hard but only exhibits a very poor to poor porosity. No oil fluorescence was observed.

The claystone comprises approximately 20% of the section drilled and is off-white to medium brownish-grey, in part light brown, and below 1767m is off-white to light bluish-grey and light to medium greenish-grey. At the top it is moderately to very silty, whereas below 1767m decreases to slighty silty. Coaly detritus is abundant near the top, but appears as a trace throughout the remainder of the formation. The claystone is soft to firm and slightly subfissile to occasionally sub blocky.

The Eumeralla was deposited in a high-energy fluviatile environment, probably in a major braided stream system where there was an abundant supply of sand-sized volcanic detritus. The source of the volcanic material is unknown, but due to results from age dating, it appears that volcanism was contemporaneous with sedimentation (Abele *et al*, 1995). In the eastern portion of the Otway Basin the Eumeralla has been dated to be Aptian to Albian.

The Late Cretaceous **Sherbrook Group** 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", has been renamed the Flaxmans Formation, after Flaxmans-1, by Bain (1961). Of the approximate 35.8m of good 'clean' sand in the Waarre, 17.7m is expressed as net pay (see Appendix III for Log Analysis). The sandstone is off-white to light brownish-grey to light grey, very fine to grit, but dominantly fine to medium in size, though slightly more coarse at the base. The grains are angular to subrounded, very poorly to poorly sorted, contain a weak to moderate silica cement. There is trace to common white argillaceous matrix throughout, clear to opaque quartz grains, and minor black coaly detritus. The sandstone is friable to moderately hard, has a fair visible porosity, commonly excellent reservoir quality was exhibited in the samples, but no fluorescence.

The sandstone packages are from 3 to 10m thick and are generally blocky in shape, although a 5m sands fine upward. 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 Penryn well it was intersected at 1652.5m (-1535.6m ss), thus is 17.5m thick. It consists of a medium brownish-grey to medium grey, moderately silty to very silty claystone, with minor dispersed very fine to pebble size quartz grains in part with orange staining. It contains common fine glauconite grains, with a trace of pyrite nodules and black coaly detritus, common micromica, is soft to firm and slightly subfissile. The Flaxmans is dated as being Turonian (Partridge, 1997) in age, and is defined as the initial marine transgressive unit of the Sherbrook Group (Finlayson, 1994). This formation and the overlying Belfast Mudstone are considered part of the regional seal for the Waarre Formation.

The **Belfast Mudstone** conformably overlies the Flaxmans Formation. Its top came in at 1481.5m (-1364.6m ss), and was 171m thick. The formation is largely made up of a medium to dark grey, medium olive- to medium brownish-grey claystone with only minor stingers of sandstone (very fine to coarse, common to abundant matrix, moderately hard, very poor to poor porosity).

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

The **Nullawarre Greensand** conformably overlies the Belfast with a top intersected at 1339m (-1222.1m ss), and was 142.5m thick. It is predominantly made up of a medium green, in part orangey-brown, very fine to coarse, mainly medium-grained sandstone with very minor medium green, partly orangey-brown. The sandstone is angular to subrounded, moderately sorted, with weak silica cement There are abundant yellow/brown iron oxide stained quartz grains, decreasing with depth, common glauconite especially at the top, and trace mica flakes. The sandstone is friable to moderately hard and has a poor to fair porosity. No shows were registered.

The Nullawarre is regarded as being Santonian to Campanian in age and a marine deposit formed above storm wave base. It may be a sheet sand which accumulated on the upper part of the shelf (Abele *et al*, 1995).

In this locality, the **Skull Creek Mudstone,** (sometimes considered part of the Paaratte Formation), conformably overlies the Nullawarre Greensand. The top of the mudstone was encountered at 1169.5m (-1052.6m ss), and is 169.5m thick. It comprises a medium grey to brownish-grey, moderately silty, claystone with a minor, 2m thick, interbedded sandstone lens, in the middle portion. The claystone has common dispersed very fine quartz, and partially altered feldspar grains, trace:- black coaly detritus, medium brown cryptocrystalline dolomite, and micromica, with common pyrite. It is soft, sticky and slightly subfissile. The sandstone lens formed between 1188-90m has a slightly coarsening upward profile, is light brownish-grey, occasionally pale green-grey, very fine to medium, occasionally coarse, moderately to occasionally poorly sorted, white argillaceous matrix, with very poor to fair porosity. A pro-delta environment of deposition is interpreted for the Skull Creek and an age of Santonian has been attributed to it.

The top of the youngest formation of the Sherbrook Group, the **Paaratte Formation,** was interpreted to lie at 809m, (-692.1m ss). The formation is 360.5m thick and is made up of thin (1-5m) to fairly thick (10-35m), sandstone packages, interbedded with claystone, 1-3m thick, and minor siltstone. The sandstone is very light brownish-grey to very light grey, and towards the base becomes off-white to light brown. Grain size is predominantly coarse to very coarse, though ranges from very fine to pebbly, and decreases in grain size to fine to very fine towards the base. The grains are angular to subrounded, are very poorly sorted, though improve to moderate at the base. There is weak pyrite, silica and calcareous cement throughout the section. A trace of argillaceous and silty matrix occurs at the top, and again at the base where it is common to abundant. Common, decreasing to trace, grey, green and red volcanogenic lithics are found and abundant altered feldspar grains were noted. Trace to common very fine carbonaceous material occurs throughout, in part associated with pyrite. The sandstone is dominantly friable and occasionally moderately hard in part. It has fair to occasionally good porosity, decreasing to very poor, visible porosity at the base. No fluorescence was noted.

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

The Paaratte Formation was deposited in a deltaic environment, in this case, presumably delta plain, and has been dated to be Santonian to Maastrichtian in age in the Otway Basin.

Unconformably overlying the Paaratte Formation is the oldest unit in the **Wangerrip Group**, the **Pebble Point Formation**. At Penryn, the Pebble Point is 66.5 thick, from 743m (-626.1m ss) to 809.5m. The topmost 9m of the formation consists of interbedded silty claystone and argillaceous, silty sandstone; the middle section, 31m, a coarse grained sandstone package; and the lowermost 35m an interbedded section predominantly of claystone/siltstone with argillaceous sandstone).

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

Below 775m claystone predominates, and is brown-grey to medium olive 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 non fissile. The sandstone is brown-grey, very fine to grit, mainly grit, angular to subrounded, very poorly sorted with minor weak iron oxide cement and abundant olive-brown argillaceous and silty matrix (matrix supported). There are common orange iron oxide stained quartz grains, trace:- dark brown iron oxide pellets, black carbonaceous matter, pyrite and no visible porosity.

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

Conformably overlying the Pebble Point is the **Pember Mudstone**, between 668.5m (-551.6m ss) and 743m, thus is 74.5m thick. A light to medium brown to medium olive-grey claystone predominates, with a minor amount of off-white to light brown fine-grained sandstone. The claystone is moderately to very silty with abundant dispersed very fine to fine quartz grains in part, common glauconite especially at the top. There is trace:- black carbonaceous flecks, micromica, pyrite and it is soft, sticky and non fissile. The minor sandstone is laminated, finely interbedded and has gradational contacts with the claystone, and is angular to subangular, moderately sorted with weak silica cement and abundant off-white argillaceous and silty matrix (in part matrix supported). It carries a trace of glauconite and pyrite, is friable and has very poor to poor inferred porosity.

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

The **Dilwyn Formation** conformably overlies the Pember Mudstone at this location, and was encountered between 530m (-413.1m ss) and 668.5m, therefore is 138.5m 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 and is interbedded and in part grades to a medium brown claystone. It is moderately to very silty with abundant, in part, dispersed very fine to grit-sized, quartz sand grains, stained brown, and in part grading to argillaceous sandstone. The claystone is slightly calcareous in part, with trace to common pyrite and is very soft, very dispersive and non fissile.

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 shoreface deposits of a coastal barrier system and the interbedded section possibly back beach lagoonal sediments, with some breaching occurring. Another interpretation is that the Dilwyn could have formed in a lower delta plain area with the sands, distributary channels and mouth bars, and the clays, the interdistributary bay fills (Abele *et al.*, 1995).

The Dilwyn Formation is the youngest unit of the Wangerrip Group, and is disconformably overlain by the **Mepunga Formation**, the oldest formation of the **Nirranda Group**. In the Penryn well the Mepunga was intersected at 389m (-272.1m ss) and is 141m thick. The massive sandstone is medium brown and very light brownish-grey, very fine to medium, in part, common coarse to grit-sized, angular to subrounded (dominantly subangular), moderately sorted, becoming poorer with depth, with in part, strong calcareous cement (in general decreasing with depth, abundant medium brown argillaceous and silty matrix (matrix supported in places), and abundant brown-stained quartz grains, decreasing to common with depth. There is trace glauconite at the top, trace fossil fragments and coarse muscovite flakes, and the sand is unconsolidated to hard in part, 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 non fissile.

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

The **Narrawaturk Marl** overlies the Mepunga Formation with a conformable contact. The marl was encountered at 321m (-204.1m ss), and is 68m thick. (Solely the Gamma Ray wireline log was run over this section, above the 9 5/8' casing). The formation is made up of a medium brown to medium olive grey marl and contains abundant fossil fragments, including bryozoa, forams, shell fragments, echinoid spines and sponge spicules. It has a trace pyrite, trace to common very fine, clear quartz grains, rare glauconite and is very soft, sticky and non fissile.

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

The Narrawaturk represents the youngest formation of the Nirranda Group, and overlying it with a regional disconformity is the **Clifton Formation**, the oldest unit of the **Heytesbury Group.** The Clifton is a 37m thick formation of calcarenite, found from 284m (-167.1m ss) to 321m in the Penryn well. The limestone is white to orange and dark brown, very iron oxide rich with abundant iron oxide pellets and common iron oxide replaced fossil fragments (decreasing with depth). It contains common to abundant very coarse, rounded, brown, iron oxide-stained quartz grains, common fine clear quartz grains, abundant fossil fragments, trace glauconite increasing to abundant with depth, all set in a cryptocrystalline to calcarenitic matrix. The limestone is friable with an inferred poor porosity.

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

The Clifton Formation grades vertically, and in places laterally into the **Gellibrand Marl**. Here, the marl is 211m thick, from 73m (+43.9m ss) to 284m. It is a medium olive grey with common to abundant fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules, has a trace of very fine, to in part, coarse clear quartz grains, and below 137m, rare black carbonaceous detritus. There is a trace of pyrite, appearing as fossil replacement in places, trace of glauconite and it is very soft, sticky and non fissile.

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

The Penryn 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 73m in depth. The calcarenite is light grey, fine-grained with a moderate to strong calcareous cement. It contains trace to common fossil fragments, trace glauconite and is friable to hard with a very poor to poor intergranular porosity. A light to medium grey marl appears as trace to 90%, (increasing with depth) which contains common to abundant very fine to fine calcarenitic fragments, with a trace of glauconite and is soft and sticky.

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

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

(b) Stratigraphic Prognosis (after Well Proposal)

The Penryn 1 well is situated within a tilted fault block, with a simple three way closure, that was defined by the Waarre 3D Seismic Survey. This structure forms a typical type of play found in the Otway Basin, and lies approximately 5 km south of the town of Timboon and 2 km ENE of the Mylor gas field.. The Penryn Structure is situated within the Port Campbell Embayment and the productive Waarre Sandstone play fairway immediately north of PEL 1.

The geological section penetrated was within tolerance to prognosis. With the exception of the Paaratte Formation which was 10.5m low to prognosis, all other prognosed tops were intersected were 1.5 – 40.5m high to prognosis. The primary objective, the Waarre Formation, was close to that predicted, being only 16m high, while the secondary contingent objective, the Eumeralla Formation was also close at 11.0m high. (The top of the Eumeralla Formation tends to be hard to pick on seismic in this region.)

Formations intersected in Penryn 1 were as predicted on prognosis.

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

TABLE VIII: ACTUAL VERSUS PREDICTED DEPTHS AND THICKNESSES PENRYN 1

FORMATION	PROG SS DEPTH	ACTUAL SS DEPTH	DEPTH DIFF	PROG THICK	ACTUAL THICK	THICK DIFF
Port Campbell Lst	-	+116.9m	-	-	73m	-
Gellibrand Marl	-	+43.9m	-	-	211m	-
Clifton Fm	-	-167.1m	-	-	37m	-
Narrawaturk Marl	-	-204.1m	-	-	68m	-
Mepunga Fm	-292.1m	-272.1m	20.0mH	-	141m	-
Dilwyn Fm	-	-413.1m	-	-	138.5m	-
Pember Mdst	-553.1m	-551.6m	1.5mH	81m	74.5m	-6.5m
Pebble Point Fm	-634.1m	-626.1m	8.0mH	48m	66.5m	+18.5m
Paaratte Fm	-682.1m	-692.6m	10.5mL	411m	360m	-51m
Skull Creek Mdst	-1093.1m	-1052.6m	40.5 mH	175m	169.5m	-5.5m
Nullawarre Greensand	-1268.1m	-1222.1m	46.0mH	134m	142.5m	+8.5m
Belfast Mdst	-1402.1m	-1364.6m	37.5mH	150m	171m	+21m
Flaxmans Fm	-1552.1m	-1535.6m	16.5mH	20m	20.5m	+0.5m
Waarre Fm	-1572.1m	-1556.1m	16.0mH	92m	81m	-11m
Eumeralla Fm	-1664.1m	-1637.1m	11mH	100m	68.5m+	
TD	-1764.1m	-1705.6m				

(c) Hydrocarbon Summary

Total gas was recorded from the surface to total depth (1823 m KB) 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 collected at 15m intervals from the surface to 840m, at 10m intervals to 990m, and then at 3m intervals from 993m there to TD at 1822.5m. All samples were washed, described and checked for fluorescence using ultraviolet light.

Surface to top Dilwyn Formation (spud to 530m)

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

Dilwyn Formation (530-668.5m)

Background total gas within the Dilwyn Formation was essentially 0. A minor 0.4 unit gas peak, C1 100%, was observed around 600m. No significant total gas peaks were recorded within the formation. No hydrocarbon fluorescence was noted. The formation is water saturated.

Pember Mudstone (668.5-743m)

Background total gas within the Pember Mudstone was 0 units. No hydrocarbon fluorescence or total gas peaks were recorded.

Pebble Point Formation (743-809.5m)

Background total gas within the Pebble Point Formation was 0 units. No hydrocarbon fluorescence or total gas peaks were recorded.

Paaratte Formation (809.5-1169.5m)

Background total gas within the Paaratte Formation was effectively 0 units, except for one interval 997m-1051m. This interval had a background gas of 1 unit and maximum of 6 units of total gas, C1 100%. No hydrocarbon fluorescence or significant total gas peaks were recorded.

Skull Creek Mudstone (1169.5-1339m)

Background total gas within the *Skull Creek Mudstone* was 0 units. No hydrocarbon fluorescence or total gas peaks were recorded.

Nullawarre Greensand (1339-1481.5m)

Background total gas within the *Skull Creek Mudstone* was effectively 0 units. No hydrocarbon fluorescence or total gas peaks were recorded.

Belfast Mudstone (1481.5-1652.5m)

The first high readings of gas in the well were within the Belfast Mudstone. The background total gas was 2 units, maximum was 50 units, C1=95% and C2=5%. No hydrocarbon fluorescence was recorded for this interval.

Flaxmans Formation (1652.5-1673m)

Similar gas readings as the Belfast Mudstone were recorded in the Flaxmans, with a maximum total gas of 50 units and background gas of 40 units, C1=88%, C2=7%, C3=4% and iC4=1%. No hydrocarbon fluorescence was recorded for this interval.

Waarre Formation (1673-1754m)

Waarre Unit "C" (1673-1695m)

The primary objective of the Penryn 1 well was the Waarre Unit "C". The formation was intersected close to the depth predicted, at 1689m, 16m high. 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 flow gas at economic recovery rates. Between 1673-1693m maximum total gas was 5000 units, C1=88%, C2=7%, C3=3% and iC4=2%. No oil fluorescence was documented at the wellsite. Log analysis and formation pressure data indicate a gross column of 18m with 18m of net pay.

Average porosity calculated in the interval from 1673-1693m was 21.4% and average water saturation 23.5%. MDT point 17 at 1691.6m, recovered a sample containing 360L of gas, 120 mL of condensate with an API gravity of 58.84 at 60°F. Mudlog gas peaks, log evaluation, combined with MDT tests indicate that the Waarre Unit "C" has good potential at this location.

Waarre Unit "B" (1695-1699m)

Gas readings decrease in the Waarre Unit "B", with a maximum total gas of 95 units and background gas of 35 units, C1=88%, C2=7%, C3=4% and iC4=1%. No hydrocarbon fluorescence was recorded for this interval.

Waarre Unit "A" (1699-1754m)

Gas readings decrease further in the Waarre Unit "A", with a maximum total gas of 40 units and background gas of 20 units, C1=95%, C2=4% and C3=1%. No hydrocarbon fluorescence was recorded for this interval.

Eumeralla Formation (1754-1822.5m TD)

The formation was intersected 11m high to prognosis. Poor sand development was encountered in the Eumeralla Formation as it tended to contain abundant argillaceous matrix with varying degrees of both silica and calcareous cements. No fluorescence was documented in this formation. A maximum total gas of 20 units and background gas of 10 units were recorded, C1=99% and C2=1%. No hydrocarbon fluorescence was recorded for this interval.

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

4. SUMMARY

Penryn 1 was drilled as a Wildcat (WCNF) gas exploration well within PEP 153, at CDP 1470, Inline 8125, located on the Waarre 3D Seismic Survey. The Penryn structure is situated near the northern border of the Port Campbell Embayment of the Otway Basin, in southern Victoria. The structure is a tilted fault block with three way dip closure. It is located close to the gas production area of the Port Campbell region, in close proximity to Petroleum Production Licences 1 and 2, including several fields producing natural gas and carbon dioxide currently.

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

Drilling of Penryn 1 was terminated 68.5m into the Eumeralla Formation. Formation tops were intersected high to prognosis, with the exception of the Paaratte Formation at 10.5m low. From the top of the Paaratte at 809.5m, including the intervening Skull Creek Mudstone and Nullawarre Greensand, to the top of the Belfast Mudstone at 1481.5m, the four formations were all high by 1.5-40.5m to that expected. The Flaxmans, Waarre and Eumeralla Formations were all intersected close to prognosis, at 20.5m, 16m and 11.0m high, respectively.

Wireline logging at total depth of 1822.5m consisted of the following; Run 1 PEX and Run 2: MDT. No full hole cores were cut in Penryn 1.

Analysis of the logs shows a total of 18.3m of net sand within the Waarre "C" (average Ø 21.4% and average Sw 23.5%). Log evaluation and formation pressure data indicates a gross gas column of 18m with a similar amount of net pay. On intersection during drilling, a good gas show with a maximum total gas of 5000 units with a background of 40 units was documented in the Waarre Unit "C" (1673m to 1693m). No oil fluorescence was detected in the samples.

Penryn 1 has established the presence of hydrocarbons reservoired in the Waarre Formation at this location within PEP 153. It is very suitably positioned, just to the north of PPL1 and PPL2 to await possible development in the future, and tie in to existing production facilities.

Penryn 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 15m intervals from the surface to 840m, thereafter at 10m intervals from 850m to 990m, and then at 3m intervals from 993m to total depth at 1822.5m.

HEYTESBURY GROUP

Port Campbell Limestone (Middle to Late Miocene)

73m thick

Spud-73m — CALCARENITE: light grey, fine grained, moderate to strong calcareous cement, trace to common fossil fragments, trace glauconite, friable to hard, very poor to poor intergranular porosity.
With trace to 90% increasing with depth:
MARL: light to medium grey, common to abundant very fine to fine calcarenitic fragments, trace glauconite, soft, sticky.

Gellibrand Marl (Early to Middle Miocene)

211m thick

73-284m — MARL: medium olive grey, common to abundant fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules, trace very fine to occasionally coarse clear quartz grains, trace pyrite, trace glauconite, very soft, sticky, non fissile.

Clifton Formation (Late Oligocene)

37m thick
284-321m

284-321m — CALCARENITE: white to orange to dark brown, very iron oxide rich with abundant iron oxide pellets and common iron oxide replaced fossil fragments - in general decreasing with depth, common to abundant very coarse rounded brown iron oxide stained quartz grains, common fine clear quartz grains, abundant fossil fragments, trace glauconite increasing to abundant with depth, all set in a cryptocrystalline to calcarenitic matrix, friable, poor inferred porosity.

NIRRANDA GROUP

Narrawaturk Marl (Late Eocene to Early Oligocene)

68m thick
321-389m

322-389m — MARL: medium brown, medium olive grey, abundant fossil fragments including bryozoa, forams, shell fragments, echinoid spines and sponge spicules, trace pyrite, trace to common very fine to fine clear quartz sand grains, rare glauconite, very soft, sticky, non fissile.

Mepunga Formation (Middle Eocene to Early Oligocene)
141m thick
389-530m

389-530m SANDSTONE: (90%) medium brown, off white, clear to translucent, very fine to medium, occasional to common coarse to grit sized grains, dominantly fine to medium, angular to subrounded, dominantly subangular, moderately sorted, nil to occasionally strong calcareous cement - in general decreasing with depth, abundant medium brown argillaceous and silt matrix, abundant brown stained quartz grains decreasing to common with depth, trace glauconite at top, trace fossil fragments, trace to common pyrite, trace coarse muscovite flakes, unconsolidated to occasionally hard, very poor to occasionally good inferred porosity, no oil fluorescence.
CLAYSTONE: (10%) medium brown, slightly to often very silty, often abundant dispersed very fine to grit sized brown stained quartz sand grains, slightly calcareous in part, trace glauconite at top, trace to common pyrite, very soft, very dispersive, non fissile.

WANGERRIP GROUP
Dilwyn Formation (Early Eocene)
138.5m thick
530-668.5m

530-668.5m SANDSTONE: (90%) very light brown, off white, clear, translucent, very fine to occasionally grit, dominantly medium, angular to subrounded, poorly sorted, very weak silica and calcareous cements, common to minor medium brown argillaceous and silt matrix, clear to opaque to occasionally orange brown quartz grains, trace to common pyrite, trace black carbonaceous detritus, friable to unconsolidated, very poor to very good dominantly fair inferred porosity, no fluorescence.
SILTSTONE: (10%) medium brown, moderately to very silty, often abundant dispersed very fine to grit sized brown stained quartz sand grains - in part grading to argillaceous SANDSTONE, slightly calcareous in part, trace to common pyrite, very soft, very dispersive, non fissile.

Pember Mudstone (Early Eocene to Late Plaeocene)
74.5m thick
668.5-743m

668.5-743m CLAYSTONE: (80%) medium brown to medium olive-grey, dominantly olive gery, moderate to commonly silty, minor to common very fine brown stained quartz grains, in part grading to argillaceous very fine SANDSTONE< minor to common glauconite, common carbonaceous specks, trace micromicaceous, trace pyrite, soft, sticky.
SANDSTONE: (10%) light brown to translucent quartz, dominantly pale brown, very fine to fine, sub angular to sub rounded, moderately sorted, very weak silica cement, commonly matrix supported, trace glauconite, loose, friable, very poor inferred porosity, no fluorescence.
SILTSONE (10%) olive grey to black, dark brown, commonly argillaceous, trace carbonaceous specks, trace pyrite nodules, trace glauconite, abundant iron stained very fine quartz grains, very soft and dispersive, predominantly soft to occasionally firm.

Pebble Point Formation (Late Palaeocene)
66.5m thick
743-809.5m

743-809.5m SANDSTONE: (70%) pale to medium brown grey, trace pale orange-yellow with depth, very fine to coarse, dominantly medium to coarse grained, subangular to subrounded, commonly rounded, poorly sorted, common to abundant dark brown argillaceous/silty matrix, commonly washing out of the samples, dominantly matrix supported, minor visual grain seats grain to grain contact, trace to very poor inferred porosity when matrix supported, moderate to good inferred porosity when moderately consolidated and grain seats visible with silica cement rimming, no oil fluorescence.
SILTSTONE: (30%) dark brown, olive black, commonly argillaceous, common carbonaceous specks, trace pyrite, trace glauconite in part, abundant dispersed very fine quartz grains, firm to subblocky.

SHERBROOK GROUP
Paaratte Formation (Maastrichtian to Campanian)
360m thick
809.5-1169.5m

809.5-900m SANDSTONE: (100%) very light brown grey, very fine to pebble, dominantly very coarse, angular to subrounded, dominantly subangular, very poorly sorted, weak pyrite and silica cements, trace medium brown argillaceous and silt matrix, common yellow quartz grains, common grey green and red volcanogenic lithics, trace coarse brown and green mica flakes, trace black coaly detritus, friable, very good inferred porosity, no oil fluorescence.
SILTSTONE: (trace) medium to dark brown- grey, olive-brown grey, common very fine carbonaceous specks, common pyrite in part, trace micromicna, amorphous to firm, commonly soft.

900-995m SANDSTONE: (90%) very light grey, very fine to occasionally pebbly, dominantly coarse to very coarse, angular to subrounded, dominantly subangular, very poorly sorted, weak silica cement, no visible matrix, trace yellow quartz grains, trace grey green and red volcanogenic lithics, trace coarse brown and green mica flakes, trace black coaly detritus often with associated pyrite, friable, very good inferred porosity, no oil fluorescence,
With minor interbedded:
SILTSTONE: (10%) medium to dark grey to medium brown grey, very silty, common pyrite, common black coaly detritus often with associated pyrite, trace micromica, very dispersive, non to slightly subfissile, with minor thinly interbedded:

995-1110m SANDSTONE (85%) pale grey, fine to very coarse, dominantly coarse to medium, commonly in the upper section the grain size is coarser, dominantly coarse to very coarse, angular to subrounded, commonly subangular to subrounded, commonly poorly sorted, better sorting with smaller grain size, mnr weak silica cement, commonly angularity of grains is a diagenetic feature caused by compaction, minor medium to dark brown and medium grey matrix, minor milky and iron stained quartz grains, trace mica specks, minor carbonaceous specks, poor to moderate inferred porosity , no oil fluorescence.
SILTSTONE: (15%) medium grey, dark olive grey, commonly argillaceous grading to claystone, pale grey occasionally very fine arenaceous in part, minor to common carbonaceous specks in part, soft/dispersive commonly firm, minor sub-blocky.

1110-1169.5m SANDSTONE: (60%) off white to light brown, very fine to fine, angular to subrounded, moderately sorted, weak to moderate silica and calcareous cements, common to abundant white argillaceous and silt matrix, abundant altered feldspar grains in part, trace black coaly detritus, trace pyrite, friable to moderately hard, nil to very poor occasionally fair visual porosity, no oil fluorescence.
CLAYSTONE: (40%) medium to dark grey to medium brown grey, moderately to very silty, occasionally very finely arenaceous with quartz and partially altered feldspar grains, trace to common black to dark brown carbonaceous flecks and fine detritus, slightly calcareous in part, trace pyrite, trace micromica, soft, slightly subfissile, increasing in percentage with depth.

<u>Skull Creek Mudstone</u> (Santonian)
169.5m thick
1169.5-1339m

1169.5-1275m SANDSTONE: (55%) pale grey, pale green-grey, fine to trace coarse, dominantly very fine, angular to subrounded, dominantly subangular, moderately sorted, weak silica cement, trace to common white argillaceous matrix, common yellow orange quartz grains, trace black coaly detritus, trace brown and green mica flakes, friable, very poor to occasionally fair visual porosity, no oil fluorescence.
SILTSTONE: (45%) medium grey to medium brown grey, moderately silty, occasionally common dispersed very fine quartz and partially altered feldspar sand grains, trace black coaly detritus, trace medium brown cryptocrystalline dolomite, common pyrite, trace micromica, soft, sticky, slightly subfissile.

1275-1339m CLAYSTONE: (70%) pale brown silty, grading to siltstone in part, trace pyrite, trace mica, trace medium brown cryptocrystalline dolomite, occasional carbonaceous specks, minor pyrite, dispersive, soft, amorphous, sub-blocky.
SANDSTONE: (20%) off white, clear, translucent, very fine to coarse, poor sorting, sub angular to subrounded, minor weal siliceous cement, minor pyrite, trace off white/pale grey argillaceous matrix, loose (drilling induced), com friable, poor to very poor inferred and visual porosity, no oil fluorescence.
SILTSTONE (10%) medium grey to medium brown grey, moderately silty, occasionally common dispersed very fine quartz and partially altered feldspar sand grains, trace black coaly detritus, trace medium brown cryptocrystalline dolomite, common pyrite, trace micromica, soft, sticky, slightly subfissile.

<u>Nullawarre Greensand</u> (Santonian)
142.5m thick
1339-1481.5m

1339-1420m SANDSTONE: (80%) medium green, very fine to coarse, dominantly medium, angular to subrounded, dominantly subangular, moderately sorted, weak silica cement, abundant medium green argillaceous matrix - matrix supported, orange to dominantly green stained quartz grains, common glauconite, trace mica flakes, friable, poor inferred porosity, no oil fluorescence,
Grading to:
CLAYSTONE: (20%) medium green to yellow green, abundant dispersed quartz grains, common glauconite, trace pyrite, soft, sticky, dispersive, non fissile.

1420-1481.5m SANDSTONE: (70%) orange brown, opaque, clear to translucent quartz, becoming medium green in part with depth, very fine to coarse, dominantly medium, angular to subangular, moderately sorted, weak to moderate iron oxide cement, common to abundant orange brown iron oxide rich argillaceous matrix becoming medium green with depth, abundant orange brown stained quartz grains, trace to abundant green stained quartz grains increasing with depth, abundant dark brown iron oxide pellets decreasing with depth, friable to moderately hard, poor to fair inferred porosity, no oil fluorescence, In part grading to and with interbedded:
CLAYSTONE: (30%) orange brown, becoming medium greenish grey with depth, iron oxide rich, abundant dispersed very fine to coarse orange to green stained quartz grains, soft, sticky, non fissile.

<u>Belfast Mudstone</u> (Santonian to Coniacian)
171m thick
1481.5-1652.5m

1481.5-1557m CLAYSTONE: (95%) medium to dark grey, medium olive grey to medium brown grey, moderately silty, common glauconite, rare medium brown cryptocrystalline dolomite, trace very fine partially altered feldspar grains in part, trace black carbonaceous detritus, trace to common black carbonaceous flecks, trace pyrite, trace micromica, firm, slightly subfissile.
With in part minor laminated and finely interbedded:
SANDSTONE: (5%) light grey, very fine to coarse, dominantly very fine to occasionally medium, angular to subangular, moderately sorted, weak calcareous and dolomite cements, moderate silica cement, common white argillaceous matrix, clear quartz grains, trace glauconite, trace black carbonaceous matter, moderately hard, very poor to poor visible porosity, no oil fluorescence.

1557-1652.5m CLAYSTONE: (90%) medium to dark grey to medium brown grey, moderately silty, trace very fine sandstone laminae in part, common glauconite, trace medium brown cryptocrystalline dolomite, trace fine black carbonaceous detritus and flecks, trace pyrite, trace to common micromica, firm, subfissile.
SILTSTONE: (10%) medium to dark grey, argillaceous grading to CLAYSTONE in part, trace to common carbonaceous specks and flecks, trace mica, firm to locally moderately hard, sub blocky to occasionally blocky.

<u>Flaxmans Formation</u> (Turonian)
20.5m thick
1652.5-1673m

1652.5-1673m CLAYSTONE: (95%) medium brown to medium olive-brown, moderately silty, abundant dispersed very fine to rare coarse quartz grains often stained green and orange, slightly calcareous in part, common glauconite, trace pyrite, soft, sticky, non fissile.
SILTSTONE: (5%) medium grey brown, common very fine to coarse orange to green stained quartz grains, abundant medium green to orange brown argillaceous matrix, common glauconite, trace pyrite, friable.

Waarre Formation (Turonian)
(81m thick)
1673-1754m

1673-1695m WAARRE 'UNIT C'

SANDSTONE: (80%) clear, translucent, opaque, fine to very coarse, sub-angular to sub-rounded becoming more rounded with depth, poor to moderately sorted, better sorting with depth, weak siliceous cement, minor off white argillaceous matrix which is occasionally preserved within silica cementation of depositional grain seats, predominantly, friable, loose in tray, commonly clean, fair to good inferred porosity, especially where there are moderate to coarse rounded grains with visible grain seats, no oil fluorescence.

CLAYSTONE: (10%) medium brown to medium olive-brown, moderately silty, abundant dispersed very fine to rare coarse quartz grains often stained green and orange, slightly calcareous in part, common glauconite, trace pyrite, soft, sticky, non fissile.

SILTSTONE: (10%) medium grey brown, common very fine to coarse orange to green stained quartz grains, abundant medium green to orange brown argillaceous matrix, common glauconite, trace pyrite, friable.

1695-1699m WAARRE 'UNIT B'

SANDSTONE: (70%) off white, clear, translucent, very fine to coarse, commonly poor sorting, sub-angular to sub-rounded, predominantly sub-rounded, occasional weak siliceous cement, occasional off white argillaceous matrix, occasional pyrite nodules, fair to good inferred porosity, no oil fluorescence.

CLAYSTONE: (20%) medium grey to medium brown/grey, commonly silty locally, com f glauconite grains, common carbonaceous flecks and specks, trace pyrite, common mica specks, dispersive, soft-firm.

SILTSTONE: (10%) pale to medium grey, medium grey/olive, dark grey, commonly argillaceous, occasional to common glauconite grains, trace to common locally carbonaceous specks, occasional pyrite nodules, firm-moderately hard, sub-blocky.

1699-1754m WAARRE 'UNIT A'

SANDSTONE: (80%) off white, clear, translucent, fine to coarse, commonly fine upper to medium lower, sub-angular to sub-rounded, predominantly sub-rounded becoming more rounded with depth and finer grained, commonly matrix supported fine quartz grains, occasional weak siliceous cement, occasional to common off argillaceous matrix, common lithics, trace calcitic cement, loose-friable, poor to fair inferred porosity, no oil fluorescence.

SILTSTONE: (20%) medium grey to medium grey/brown, commonly grading to claystone, slightly calcareous, occasional mica specks, trace to common carbonaceous specks, trace pyritised worm burrows, firm to moderately hard.

Eumeralla Formation (Late Albian)
(68.5+m)
1754-1822.5m TD

1754-1822.5m SANDSTONE: (85%) off white, very fine to coarse, dominantly fine at top, dominantly medium at base, subangular, poor to moderately sorted, weak to moderate silica and calcareous cements, common to abundant white argillaceous matrix in general decreasing with depth, common grey green and trace red lithics, trace black coaly detritus, trace pyrite, very poor visible porosity at top increasing to poor at base, friable to moderately. Interbedded and in part laminated with:
CLAYSTONE: (10%) off white to medium brown grey, occasionally very light brown and rare pale blue-grey, slightly silty in part, trace black coal detritus, abundant dispersed very fine to medium quartz and lithic sand grains in part, trace pyrite, trace to common micromica, firm, subfissile.
SILTSTONE: (5%) medium to dark brown, pale grey to grey-brown in part, commonly grading to claystone, common fine carbonaceous fragments, trace very fine carbonaceous specks, firm to moderately hard, sub fissile to sub blocky.

APPENDIX II: HYDROCARBON SHOW REPORTS

No oil shows were seen in Penryn 1

APPENDIX III: WIRELINE LOGGING REPORTS

APPENDIX III (a): LOGGING ORDER FORM

Santos

A.C.N. 007 550 923

LOGGING ORDER FORM

COMPANY:	Santos		
WELL:	Penryn 1	**FIELD:**	Wildcat Exploration
RIG:	OD&E 30	**STATE:**	Victoria
LOCATION:	Line 8125 Waarre 3D CDP 1470	**BLOCK:**	PEP 153
LATITUDE:	38° 31' 40.66" S	**LONGITUDE:**	142° 57' 22.51" E

ELEVATIONS:

GL:	112.2 m	**RT: .**	116.9 m

12 ¼" HOLE:	676m	**9 5/8" CSG:**	670m	**WT:**	36 lb/ft (K55)
6 ¾" HOLE:	1823m	**3 ½" CSG :**	-	**WT:**	-

TD (DRILLER): 1823m

MUD SYSTEM: KCL/PHPA/Polymer **CIRCULATION STOPPED:** 14:30 hrs, 16/1/00

WT = 9.5 VISC = 62 pH = 8.5 K^+ = 2.8 Cl^- = 15000 W.L. = 5.5 PV = 24 YP = 25

GEOLOGIST: T. Conroy

INFORMATION GIVEN ABOVE IS TO BE USED ON LOG HEADER SHEETS

HOLE CONDITIONS (TIGHT SPOTS, DEVIATION, COALS, BARITE IN MUD, ETC.)

Hole condition expected to be reasonably good for logging run.
Four tight spots on trips out of hole 886m, 844m, 1464m and 1667m. Suspected filter cake build up around stabilisers.
Maximum deviation is 4.50° AT 1726m azimuth 100°; 5.5° azimuth 110° at TD
Barite in mud = 16.2 lbs/bbl. (1.1% volume)

DRILL STEM TESTS/CORED INTERVALS:

No DST planned. No cores were cut.

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

Additional relevant mud properties (chlorides, K+) to be noted in remarks section of header.

Santos

A.C.N. 007 550 923

LOGGING ORDER FORM

LOGGING PROGRAM:

LOG	INTERVAL	REPEAT SECTION
Suite 1, Run 1: PEX-AS		
LLD-LLS	TD to CSG	No repeat section
MSFC	TD to CSG	
CAL	TD to CSG	
GR	TD to surface	
SP	TD to CSG	
SDT	TD to CSG	
LDL-CNL	TD to 100m above Waarre	
WFT	To be acquired from 30m above Waarre to TD when running in the hole	
Suite 1, Run 2 MDT-GR		
20 points (programmed)	TBA	

GENERAL REMARKS:

1. TENSION CURVES TO BE DISPLAYED ON LOG FROM TD TO SURFACE CASING SHOE.
2. ALL CALIBRATIONS IN CASING TO BE VERSUS DEPTH.
3. ALL ZONES OF CYCLE SKIPPING/POOR QUALITY TO BE DISCUSSED. REPEAT SECTIONS TO BE AVOIDED UNLESS ABSOLUTELY NECESSARY. ANY REPEAT SECTIONS TO BE NOTED AS REMARKS.
4. ALL THERMOMETER READINGS (PLUS ASSOCIATED DEPTHS) TO BE RECORDED IN HEADER
5. ALL SCALES TO BE STANDARD SANTOS SCALES UNLESS OTHERWISE ADVISED.
6. NO DATA TRANSMISSION REQUIRED AT WELLSITE. ASCII DATA REQUIRED IMMEDIATELY AFTER THE LOGGING RUN. MENTION RMF, RM, RMC, BHT IN THE ASCII FILE.
7. ANY CHANGES FROM STANDARD PROCEDURES PLUS ALL COMMENTS TO BE NOTED IN HEADER REMARKS
8. 200' SAND PASS REQUIRED FOR XY-DENSITY LOG. (IF RUN)
9. MAXIMUM 15 MINUTES PER MDT POINT. FOLLOW NEW PROCEDURES BASED ON DRAWDOWN SIGNATURES

APPENDIX III (b): FIELD ELECTRIC LOG REPORT

SANTOS LIMITED

FIELD ELECTRIC LOG REPORT

WELL:	PENRYN 1	**GEOLOGIST:**	TIM CONROY
LOGGING ENGINEER:			
RUN NO.:	1 & 2	**DATE LOGGED:**	16-17/1/00
DRILLERS DEPTH:	1823m	**LOGGERS DEPTH:**	1822.3m
ARRIVED ON SITE:	13:00 14/1/00		
ACTUAL LOG TIME:	14 HRS	**LOST TIME LOGGER:**	-
TOTAL TIME:	STANDBY	**LOST TIME OTHER:**	-

TYPE OF LOG	PEX (Run 1)	MDT (Run 2)				
TIME CIRC. STOPPED	14:30hrs 16/1/00	14:30hrs 16/1/00				
TIME TOOL RIG UP	.5hr	1hr				
TIME TOOL RIH	1.25hrs	1.5hrs				
TIME TOOL RIG DOWN	0.75hrs	0.5hrs				
TOTAL TIME	7.5hrs	6.75hrs				

TYPE OF LOG	FROM	TO	REPEAT SECTION	TIME SINCE LAST CIRCULATION	BHT
GR	1823m	0m	No	9hrs 45mins	63°C
MSFC-LLS-LLD-SP	1823m	670m	No	9hrs 45mins	63 C
AS	1823m	670m	No	9hrs 45mins	63 C
WFT	1630m	1823m	No	9hrs 45mins	63 C
LDL-CNL-CAL (PEX)	1823m	670m	No	9hrs 45mins	63 C
MDT	17 points	-		16hrs15mins	65 C

MUD SYSTEM: WEIGHT:

HOLE CONDITIONS:
Good hole conditions. Four potential tight spots were highlighted from tripping in the hole. These points did not cause any concern with sticking. Caliper shows a relatively in gauge hole was drilled. Maximum hole deviation to 5.5° at 1813m, azimuth 112°. Displacement 47 m 94.7° azimuth

REMARKS / RECOMMENDATIONS
Very professional logging crew. Good experience and used their own initiative. Good quality logging products and timely. Minor sections in PEX logs where LQC exceeds error range.

WELLSITE LOG QUALITY CONTROL CHECKS

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

LOG TYPE	SDT	GR	CAL	DLL	MSFL	LDL	CNL	MDT	REMARKS
CASING CHECK	Y		Y						
SCALE CHECK	Y	Y	Y	Y	Y	Y	Y	Y	
DEPTH Casing Total	Y	Y	Y	Y		Y			
CALIBRATIONS OK	Y	Y	Y	Y	Y	Y	Y	Y	
REPEATABILITY	Y	Y	Y	Y	Y	Y	Y	Y	
LOGGING SPEED	Y	Y	Y	Y	Y	Y	Y		Waveform taping affected by speed of 2500'/hr, skipping.
OFFSET WELL Repeatability	Y	Y	Y	Y	Y	Y	Y	Y	
NOISY / MISSING DATA	Y	X	X	X	X	X	X	X	
CURVES/LOGS Depth Matched	Y	Y	Y	Y	Y	Y	Y		
Rm MEASUREMENT				Y	Y				
LLS / LLD / CHECK				Y	Y				
PERF / RHOB CHECK						Y	Y		Large HDRA with rugose hole. PEF unreliable due to 2.8% KCl
LOG HEADER / TAIL	Y	Y	Y	Y	Y	Y	Y	X	
PRINT/FILM QUALITY	Y	Y	Y	Y	Y	Y	Y	X	

COMMENTS: Minor cycle skipping on the array sonic due primarily to logging speed and minor sections of log exceed their LQC limits, generally in the rugose hole. MDT 2.75 gallon chamber had a faulty o-ring and leaked the sample out. In general a very successful logging run with the PEX. MDT was run with no sticking and pretests built up and stabilised quickly.

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

APPENDIX IV: LOG EVALUATION

PENRYN 1

LOG ANALYSIS

PENRYN 1 - LOG ANALYSIS

Penryn 1 wireline logs were analysed over the Waarre Sandstone, covering the interval from 1652.5m (L) to a Total Depth of 1825m (L). A total of 17.7m of gas pay was identified in the Waarre Sandstone. The well was cased and suspended as a potential future gas producer.

A 12 ¼" surface hole was drilled to 676m (D) and 9 5/8" casing set. An 8 ½" hole was drilled to 680m (D). A 6 ¾" production hole was drilled to a Total Depth of 1823m (D). Sixteen MDT pressure points were taken over the Waarre Sandstone, with a gas-condensate sample taken at 1691.6m.

Pay Summary

- Waarre C Sandstone (upper) 9.8 m Gas Pay (Ave POR 21.5%, Ave SW 20%)
- Waarre C Sandstone (lower) 7.9 m Gas Pay (Ave POR 21.2%, Ave SW 27%)

Logs Acquired

PEX-AS

- GR - TD to surface
- Resistivity-AS; TD to 670 m
- Nuclear; TD to 1665 m
- MDT (16 points + 1 sample)

Mud Parameters

Mud Type	KCl/Polymer
Mud Density	9.5 lb/gal
Rm	0.282 ohmm @ 24.1°C
Rmf	0.238 ohmm @ 24.3°C
Rmc	0.348 ohmm @ 23.5°C
KCl content	2.8%
MRT (1727m (L))	65°C (from MDT point 16)

Log Processing

- Hole conditions were good.
- The GR was corrected (GR_cor) for hole size, and the weight and KCl content of the mud.
- The HLLD was corrected for shoulder bed effects (HLLD_cor) and borehole effects. An invasion corrected Rt curve was derived using the following relationship:

  (HLLD_cor * 1.59) - (HLLS* 0.59)
- No other environmental corrections, other than those applied real-time in the field, were considered necessary.

Interpretation Procedures and Parameters

An interpretation was made using a gamma ray derived Vshale. A total porosity from density was calculated, along with a total porosity from density-neutron. Water saturation was calculated using the Archie equation. Parameters used for the interpretation are detailed in Table 1.

- A total porosity was calculated from density:
  DPHI = (ρg - RHOZ) / (ρg - ρf)

  where: RHOZ = bulk density (log value)
  ρg = matrix or grain density (taken as 2.65gm/cc, ie quartz density)
  ρf = fluid density (taken as 1gm/cc, ie. water or filtrate density)

- A total porosity was calculated from density-neutron to correct the porosity calculation for gas effect on the logs:

$$PHIX = \sqrt{(0.4 \times (TNPH + 0.03)) + (0.6 \times DPHI))^2}$$

If any shale is present in the formation, this causes the neutron to overestimate porosity. Subsequently, a total porosity from density-neutron was taken as the minimum of PHIX and DHPI:

PHIDN = min(DPHI, PHIX)

- PHIE Porosity (a shale corrected total porosity) was calculated as follows:

if Vsh < VshSt	PHIE = a proportional percentile correction from PHIDN to (PHIDN – (Vsh * PHIsh))
elseif VshSt < Vsh < VshCO…	PHIE = PHIDN - (Vsh * PHIsh)
elseif Vsh > VshCO	PHIE = PHIDN

where: VshSt = the start of the sliding scale Vsh correction
VshCO = shale volume cut-off
Vsh = shale volume
PHIDN = total porosity
PHIsh = apparent shale porosity

- In calculating water saturation, Sw, industry standards for ***a*** and ***n*** of 1 & 2 respectively were used for the Archie equation. SCAL data from the near offset well of Mylor 1 suggested a lower value for the saturation exponent, ***m***, was more appropriate, subsequently a value of 1.8 was used.

Formation Water

There is little regional formation water salinity data from either produced water or DSTs. A log derived Rwa of 0.2 ohmm at 75°F was determined from the near offsets of Mylor 1 and Fenton Creek 1. This was checked against a log derived Rwa in the water leg of the Waarre A Sandstone of Penryn 1, and subsequently used for the analysis.

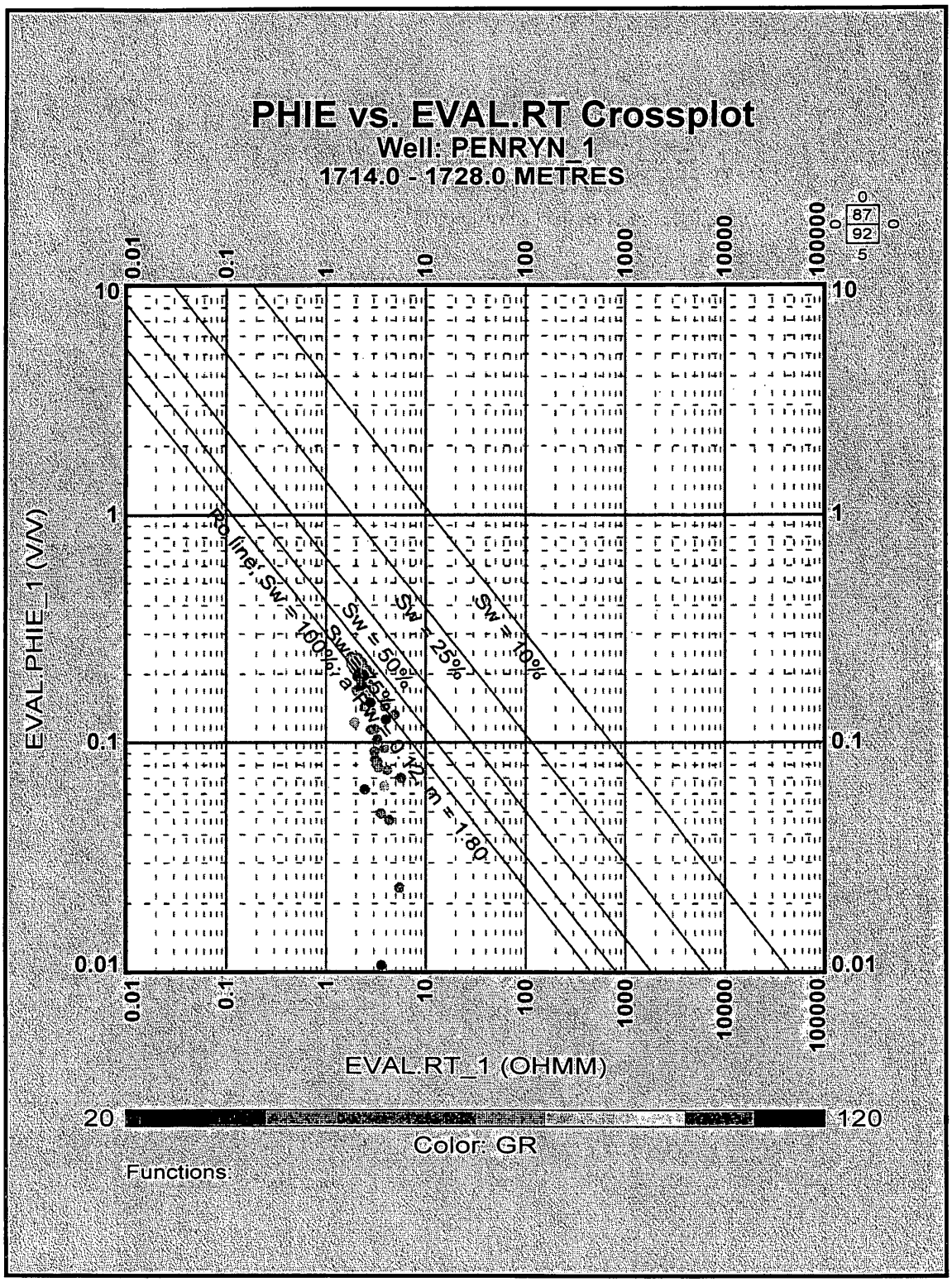

Figure 1: A Pickett Plot of the Waarre A Sandstone from Penryn 1, indicating a log derived Rwa of 0.2 ohmm at 25°C (which gives an insitu Rwa of 0.115 ohmm).

Interpretations & Conclusions

1) A total of 17.7m of gas pay was identified in the Waarre Sandstone (unit C) of Penryn 1. The well was cased and suspended as a future gas producer.

2) Interpretation of the MDT points (as seen in Figure 2) indicates a *free water level* close to the base of the Waarre Sandstone (unit C), at a depth of around 1695m (L) (-1580 mSS). The lower MDT points taken in the Waarre Sandstone (unit A) plot on a separate water gradient, which would indicate they are in a different hydraulic system. A sample was taken at a depth of 1692.6m (L), which recovered 360L gas, 120mL condensate and 250mL filtrate. There was no associated fluorescence from the mudlog over this zone to indicate the presence of an oil leg.

3) The cutoffs used for net pay in this analysis are those which are traditionally applied to the Cooper Basin and may therefore need to be review for future work.

WES PLOT FILES: /guiness/disk10/petro/wes/wessa/penryn1_00019.wes

TABLE 1

Log Analysis Parameters

PARAMETERS	Flaxmans Formation	Waarre Sandstone	Eumerella Formation
Geothermal Gradient (°C/100 m)	2.22	2.22	2.22
Vsh GRmin (GAPI)	30	30	30
Vsh GRmax (GAPI)	130	100	100
Vsh Start (%)	0.2	0.2	0.2
Vsh Cut-Off (%)	0	0.5	0.2
Phi Shale (%)	0.4	0.13	0.1
LLD Shoulder Bed Correction	1.0	0.95	1.0
LLS Borehole Correction	0.95	0.95	0.95
LLD Borehole Correction	0.97	0.97	0.97
LLS Invasion Factor	0.59	0.59	0.59
LLD Invasion Factor	1.59	1.59	1.59
Rw (ohmm) @ 25°C	0.2	0.2	0.2
a	1	1	1
m	1.8	1.8	1.8
n	2	2	2

TABLE 2

FORMATION	SAND	SAND INTERVAL	NET PAY	GROSS SAND	NET SAND	AVG POR	WT AVG SW
WAARRE SANDSTONE	WAARRE C	1673 -1683	9.8	9.9	9.9	21.5	20
WAARRE SANDSTONE	WAARRE C	1684 -1693	7.9	8.5	8.4	21.2	27
WAARRE SANDSTONE	WAARRE B	1699 -1704	0	5.3	5.3	21.7	-
WAARRE SANDSTONE	WAARRE A	1714 -1728	0	13.7	12.2	18.9	-

Cutoffs:
Gross Sand > 2% PHIE
Net Sand > 8% PHIE
Net Pay > 8% PHIE & <65% Sw

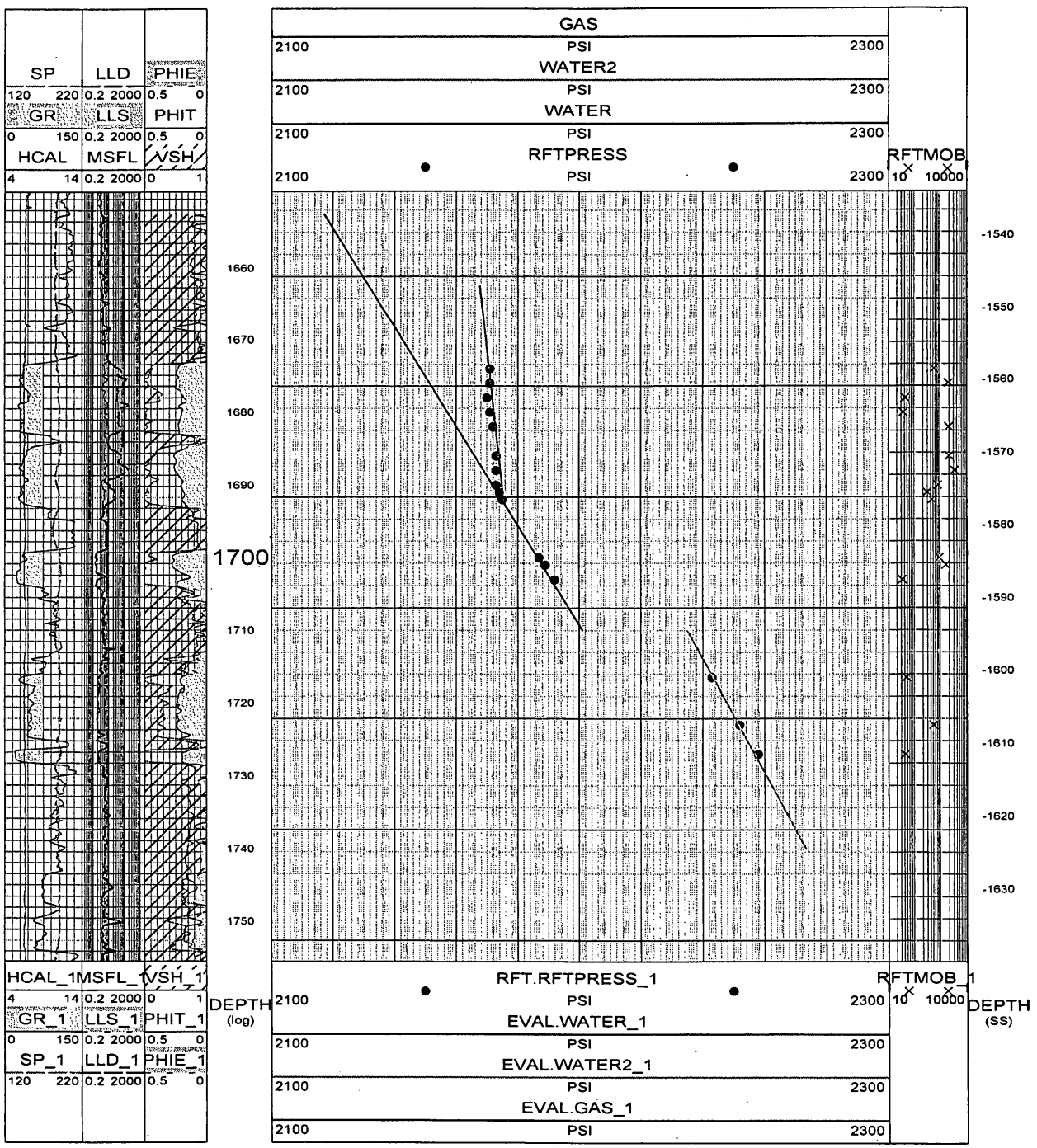

Figure 2: MDT pressure points from Penryn 1, with suggested water and gas gradient lines for the plotted points.

907987_051

PE603026

This is an enclosure indicator page.
The enclosure PE603026 is enclosed within the container PE907987 at this location in this document.

The enclosure PE603026 has the following characteristics:

ITEM_BARCODE	PE603026
CONTAINER_BARCODE	PE907987
NAME	Appendix 4. Penryn-1 Well Evaluation Log
BASIN	OTWAY
ONSHORE?	Y
DATA_TYPE	WELL
DATA_SUB_TYPE	WELL_LOG
DESCRIPTION	Appendix 4. Penryn-1 Well Evaluation Summary Log, Scale 1:500, W1299, PEP108. Appendix 4 contained within "Penryn-1 Well Completion Report" [PE907987]. By Santos Limited
REMARKS	
DATE_WRITTEN	17-JAN-2000
DATE_PROCESSED	
DATE_RECEIVED	07-AUG-2000
RECEIVED_FROM	Santos (BOL) Pty Ltd
WELL_NAME	Penryn-1
CONTRACTOR	
AUTHOR	
ORIGINATOR	Santos (BOL) Pty 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:	PENRYN 1	K.B.:	116.9m	TOOL AND GAUGE TYPE:	Quartz	PAGE:	1
WITNESS:	TIM CONROY	TIME SINCE LAST CIRC.:	16.25hrs	PROBE / PACKER TYPE:	Standard	DATE:	17/01/2000

TEST	FORMATION UNIT SANDS	DEPTH K.B.	DEPTH S.S.	EXPECT. FORM PRESS.	EXPECT. TEMP.	FILE NO.	TEST RESULTS					INTERPRETATION			COMMENTS (FLUID TYPE)
							HYDR. BEFORE	FORM. PRESS	HYDR. AFTER	TEMP.	DRAW D. MOBILITY	TYPE D/D	TYPE BUILDUP	DEPL -S/C	
		FT/M	FT/M	PSIG	°F/P°C		PSI__	PSI__	PSI__	°F/°C	MD/CP				
1	Waarre Sandstone	1674	-1557.1	2500	140°F	26	2745.6	2170.58	2738.6	130.51°F	539	N	R	-	20cc normal
2	Waarre Sandstone	1676	-1559.1	2500	140°F	27	2778.4	2170.78	2748	135.04°F	1864.2	N	R	-	20cc normal
3	Waarre Sandstone	1678	-1561.1	2500	140°F	29	2751.65	2170.78	2751.36	139.51°F	41.5	N	R	-	20cc normal
4	Waarre Sandstone	1680	-1563.1	2500	140°F	30	2754.76	2170.18	2754.67	141.07°F	35.1	N	R	-	20cc normal
5	Waarre Sandstone	1682	-1565.1	2500	140°F	31	2758	2171.22	2758	142.74°F	1999.6	N	R	-	20cc normal
6	Waarre Sandstone	1686	-1569.1	2500	140°F	32	2764.54	2171.61	2764.64	143.53°F	2050.7	N	R	-	20cc normal
7	Waarre Sandstone	1688	-1571.1	2500	140°F	33	2767.85	2172.59	2767.83	144.0°F	3308.2	N	R	-	20cc normal
8	Waarre Sandstone	1690	-1573.1	2500	140°F	34	2771.02	2172.9	2771.05	144.92°F	763.5	N	R	-	20cc normal
9	Waarre Sandstone	1691	-1574.1	2500	140°F	35	2772.63	2173.0	2772.83	145.2°F	302.3	N	R	-	20cc normal
10	Waarre Sandstone	1692	-1575.1	2500	140°F	36	2774.32	2174.03	24.4677	146.04°F	439.7	N	R	-	20cc normal

ANTICIPATED GEOTHERMAL GRADIENT: 1.5 °C/100ft

ANTICIPATED WATER GRADIENT: 0.43 psi/ft

MUD WEIGHT / GRADIENT: 0.489 psi/ft

DRAWDOWN NORMAL : PRESSURE DOES NOT DROP TO ZERO
LIMITED : PRESSURE DROPS TO ZERO

BUILD UP TYPES : IMMEDIATE - RAPID - GOOD - SLOW

SANTOS LIMITED

PRESSURE SURVEY

WELL: PENRYN 1 K.B.: 116.9m TOOL AND GAUGE TYPE: Quartz PAGE: 2

WITNESS: TIM CONROY TIME SINCE LAST CIRC.: 16.25hrs PROBE / PACKER TYPE: Standard DATE: 17/01/2000

TEST	FORMATION UNIT SANDS	DEPTH K.B.	DEPTH S.S.	EXPECT. FORM PRESS.	EXPECT. TEMP.	FILE NO.	TEST RESULTS					INTERPRETATION			COMMENTS (FLUID TYPE)
							HYDR. BEFORE	FORM. PRESS	HYDR. AFTER	TEMP.	DRAW D. MOBILITY	TYPE D/D	TYPE BUILDUP	DEPL -S/C	
		FT/M	FT/M	PSIG	°F/P°C		PSI_	PSI_	PSI_	°F/°C	MD/CP				
11	Waarre Sandstone	1700	-1583.1	2500	140°F	37	2787.36	2187.48	2787.56	146.53°F	848.5	N	R	-	20cc normal
12	Waarre Sandstone	1701	-1584.1	2500	140°F	38	2789.04	2188.88	2789.01	146.86°F	1523.7	N	R	-	20cc normal
13	Waarre Sandstone	17032	-1586.1	2500	140°F	39	2797.32	2191.74	2792.26	147.21°F	32.9	N	R	-	20cc normal
14	Waarre Sandstone	1716.5	-1599.6	2500	140°F	40	2814.28	2242.8	2814.45	147.66°F	46.8	N	R	-	20cc normal
15	Waarre Sandstone	1723	-1606.1	2500	140°F	41	2824.94	2251.97	2824.9	148.16°F	510.8	N	R	-	20cc normal
16	Waarre Sandstone	1727	-1610.1	2500	140°F	42	2831.45	2257.71	2831.56	148.45°F	41.4	N	R	-	20cc normal
17	Waarre Sandstone	1691.6	-1574.7	2500	140°F	43	2773.27	2173.21	2773.41	148°F	1075.39	N	R	-	2.75 & 6 gallon sample

ANTICIPATED GEOTHERMAL GRADIENT: 1.5 °C/100ft

ANTICIPATED WATER GRADIENT: 0.43 psi/ft

MUD WEIGHT / GRADIENT: 0.489 psi/ft

DRAWDOWN NORMAL : PRESSURE DOES NOT DROP TO ZERO
LIMITED : PRESSURE DROPS TO ZERO

BUILD UP TYPES : IMMEDIATE - RAPID - GOOD - SLOW

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APPENDIX VI: DRILL STEM TEST DATA

No Drill Stem Tests were conducted in Penryn 1.

APPENDIX VII: HYDROCARBON ANALYSIS

amdel

907987 057

Amdel Limited
A.C.N. 008 127 802

Petroleum Services
PO Box 338
Torrensville Plaza SA 5031

Telephone: (08) 8416 5240

10 February 2000

Santos Limited
GPO Box 2319
ADELAIDE SA 5001

Attention: Andy Pietsch

REPORT LQ8665

CLIENT REFERENCE:	SC983002-83
WELL NAME/RE:	Penryn-1
MATERIAL:	Downhole Tool
WORK REQUIRED:	Composition

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out. This report relates specifically to the sample or samples submitted for testing.

Brian L Watson
Manager
Petroleum Services

OPENING PRESSURE

WELL	PENRYN-1, 1691.62m
SEPARATOR	2173psi @ 140°F
DATE	January 2000
CYLINDER NUMBER	Downhole Tool
OPENING PRESSURE	1655psig @ 77°F
CONTENTS	360 L of Gas 120 mL Condensate 250 mL Mud/Water

AMDEL PETROLEUM SERVICES

Method GL-02-03

Client: SANTOS Ltd Report # LQ8665

Sample: PENRYN-1
Down Hole Tool, 1691.62 m
Received: 18/01/00

COMPOSITIONAL ANALYSIS OF RECOMBINED SEPARATOR FLUID

Component	Flashed Stock Tank Liquid Mol %	Flashed Stock Tank Gas Mol %	Recomb. Sep. Liquid Mol %
Nitrogen	-------	2.13	2.01
Carbon Dioxide	-------	0.15	0.14
Methane	-------	86.16	81.50
Ethane	0.09	6.00	5.68
Propane	0.29	3.02	2.87
I-Butane	0.52	0.74	0.73
N-Butane	1.34	0.82	0.85
I-Pentane	2.97	0.25	0.40
N-Pentane	3.97	0.19	0.39
Hexanes	14.70	0.31	1.09
Heptanes	25.61	0.16	1.53
Octanes plus	50.51	0.08	2.81
TOTAL	100.00	100.00	100.00

RATIOS

Molar ratio	0.0542	0.9458	1.0000
Mass Ratio	0.2372	0.7628	1.0000
Gas Liquid Ratio	1.00 bbl @ SC	16420.5 SCF	-------

STREAM PROPERTIES

Molecular Weight	105.1	19.4	24.0
Density obs(g/cc)	0.7431 @ 15°C	-------	-------
API-Gas Density	58.84 API @60°F	0.668 (air=1)	-------
GHV (BTU/scf)	-------	1151	-------

OCTANE PLUS PROPERTIES

Mol %	50.51	0.08	2.81
Molecular Weight	119.8	114.2	119.7
Density (g/cc)	0.8086 @ 15°C	-------	-------
API @ 60°F	43.42	-------	-------

LABORATORY FLASH SEPARATION DETAILS

Separation Temperature	25	°C
Flash Gas Volume	358.00	litres
Stabilised Liquid Volume	120	ml
Liquid Density	0.7342	g/ml

Approved Signatory Dicae Cass

Accreditation No: 2013

Date 28-Jan-00

AMDEL PETROLEUM SERVICES Flash Liquid Analysis
Method GL-02-03
Client: SANTOS Ltd Report # LQ8665

Sample: PENRYN-1
Down Hole Tool, 1691.62 m
Received: 18/01/00

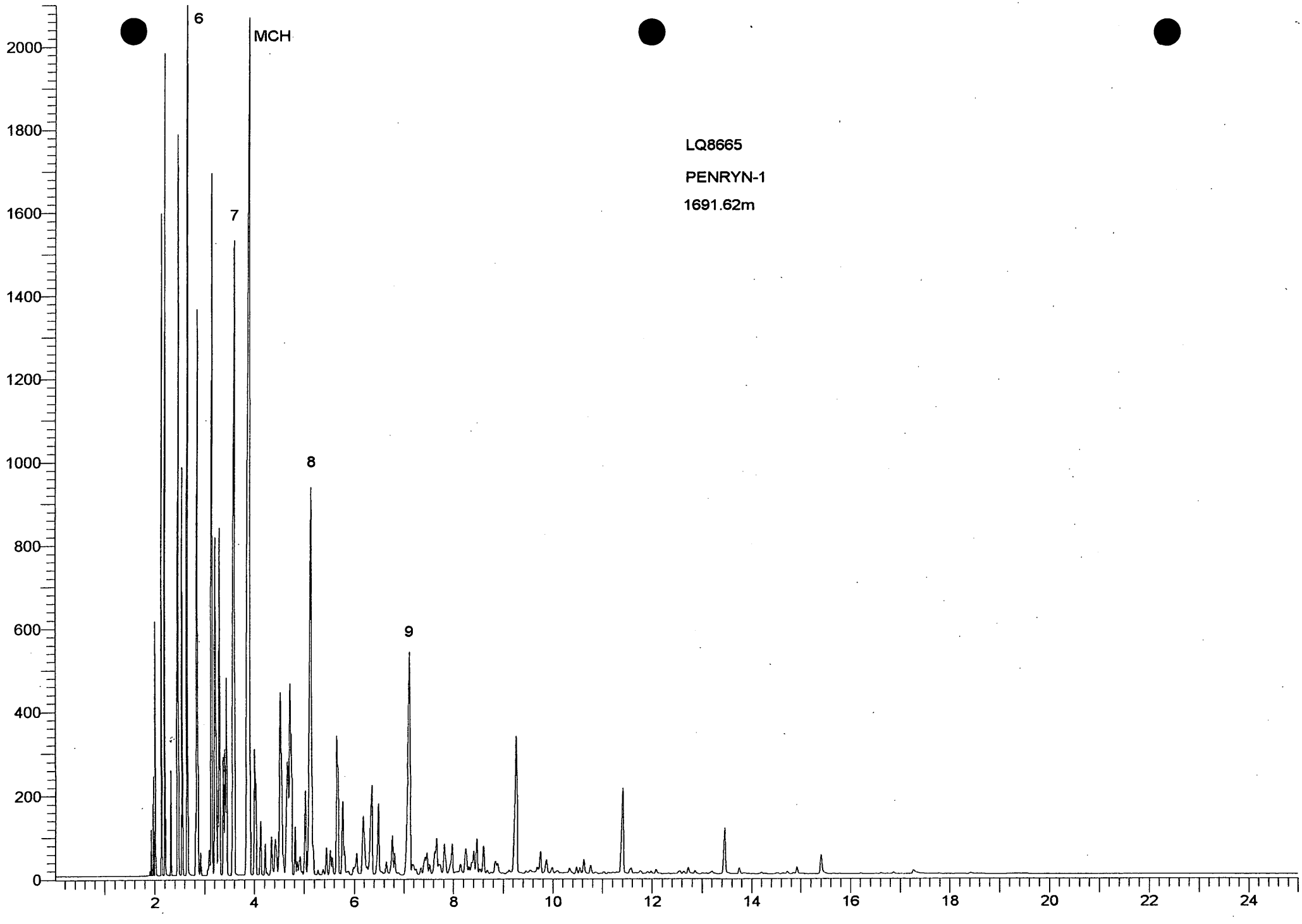
Boiling Point Range (Deg.C)	Component	Weight%	Mol%
-88.6	Ethane	0.03	0.09
-42.1	Propane	0.12	0.29
-11.7	I-Butane	0.29	0.52
-0.5	N-Butane	0.74	1.34
27.9	I-Pentane	2.04	2.97
36.1	N-Pentane	2.73	3.97
36.1-68.9	C-6	12.06	14.70
80.0	Benzene	0.03	0.04
68.9-98.3	C-7	24.37	25.56
100.9	Methylcyclohexane	12.36	13.23
110.6	Toluene	0.38	0.44
98.3-125.6	C-8	17.61	16.20
136.1-144.4	Ethylbenz+Xylenes	1.37	1.35
125.6-150.6	C-9	10.93	8.96
150.6-173.9	C-10	8.15	6.02
173.9-196.1	C-11	3.53	2.37
196.1-215.0	C-12	1.94	1.19
215.0-235.0	C-13	1.04	0.59
235.0-252.2	C-14	0.23	0.12
252.2-270.6	C-15	0.07	0.03
270.6-287.8	C-16	0.00	0.00
287.8-302.8	C-17	0.00	0.00
302.8-317.2	C-18	0.00	0.00
317.2-330.0	C-19	0.00	0.00
330.0-344.4	C-20	0.00	0.00
344.4-357.2	C-21	0.00	0.00
357.2-369.4	C-22	0.00	0.00
369.4-380.0	C-23	0.00	0.00
380.0-391.1	C-24	0.00	0.00
391.1-401.7	C-25	0.00	0.00
401.7-412.2	C-26	0.00	0.00
412.2-422.2	C-27	0.00	0.00
>422.2	C-28+	0.00	0.00
	Total	100.00	100.00

(0.00 = LESS THAN 0.01%)

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

Oil Parameters:

Density of Oil @ 25.0 °C	0.7342	
Specific Gravity @ 15.6 °C	0.7434	
API Gravity	58.84	
Specific Gravity of C8+ fraction	0.8089	(calc)
Average molecular weight of C8+ fraction	120	


6
MCH
7
8
9
LQ8665
PENRYN-1
1691.62m
2000
1800
1600
1400
1200
1000
800
600
400
200
0
2
4
6
8
10
12
14
16
18
20
22
24

APPENDIX VIII: WATER ANALYSIS

No Water Analysis was conducted on Penryn 1.

APPENDIX IX: PALYNOLOGICAL ANALYSIS

No Palynological Analysis was undertaken on Penryn 1.

APPENDIX X: GEOTHERMAL GRADIENT

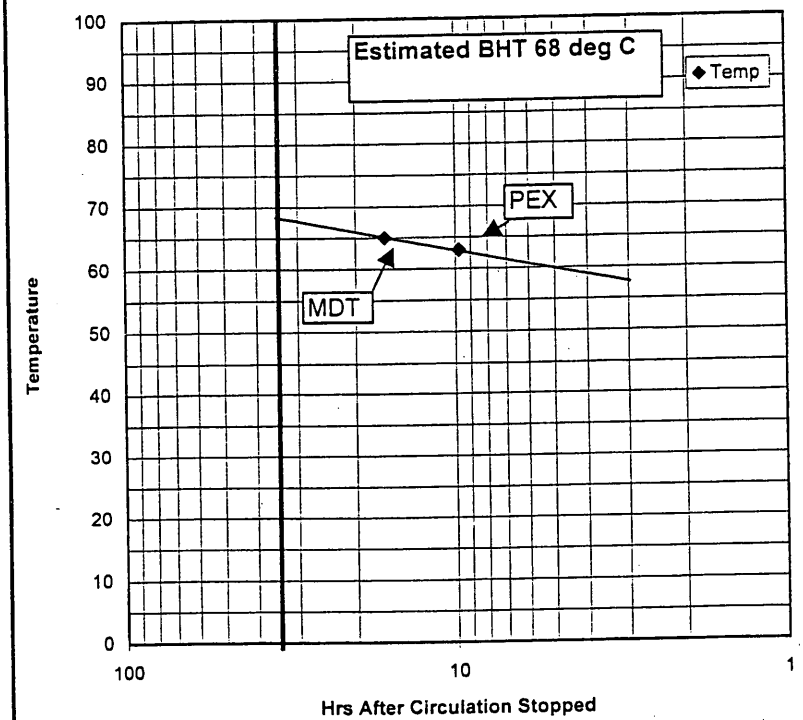
A measured static bottom hole temperature of 68°C at 1823m is calculated. This gives a geothermal gradient of 2.35°C/100m (23.5°C/km). An ambient temperature of 23°C was utilised. Data used for the calculations is as follows:-

63°C at 1823m after 9.75 hours from Run 1, Suite 1.
65°C at 1823m after 16.25 hours from Run 2, Suite 1.

Santos

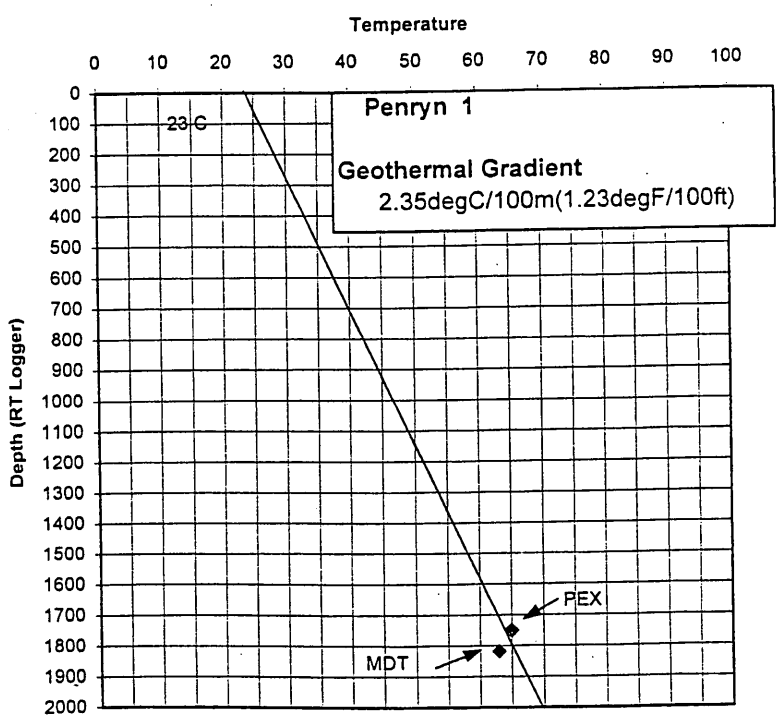
Well Name: Penryn 1

Extrapolation to Determine Static BHT



Santos

Geothermal Gradient



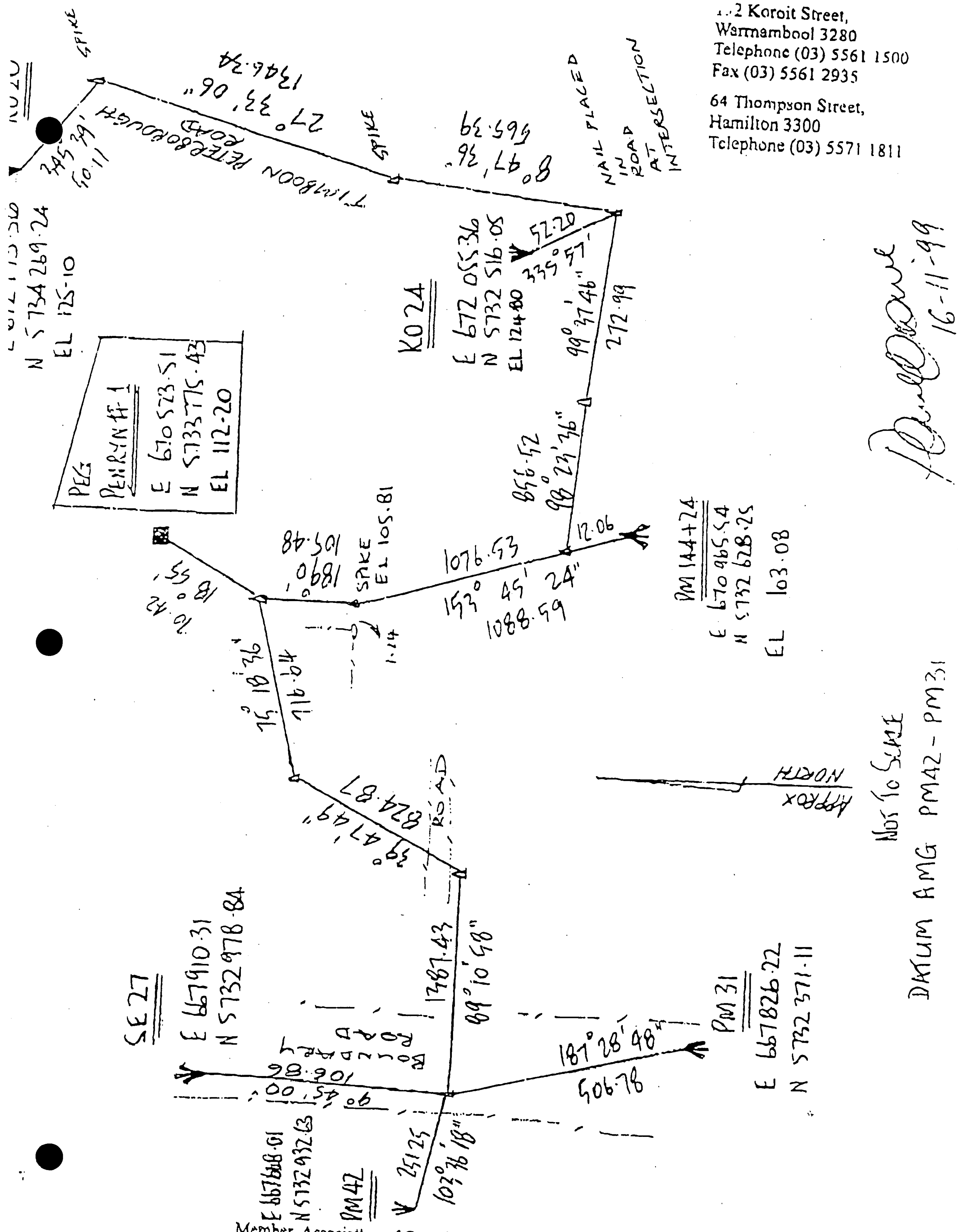
APPENDIX XI: WELL LOCATION SURVEY

Paul D. Crowe, B.App. Sci. (Surv.), L.S., M.I.S.

907987 ~~066~~ 067

Paul Crowe Surveyor
"Ambleside"
..2 Koroit Street,
Warrnambool 3280
Telephone (03) 5561 1500
Fax (03) 5561 2935

64 Thompson Street,
Hamilton 3300
Telephone (03) 5571 1811



Member, Association of Consulting Surveyors, Victoria

APPENDIX XII: DRILLING - FINAL WELL REPORT

SANTOS

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069

FINAL WELL REPORT

PENRYN #1

Drilling Supervisor(s)	: Norman Gamache
Drilling Engineer(s)	: Geoff Coker
Report Author	: Geoff Coker / Prue Forgie
Report Supervisor	: Peter Archer
Date of Issue	: 18th February 2000

Section 1.0

Basic Well Data

- Basic Well Data Table

BASIC WELL DATA

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Well Name	Penryn #1
Well Type	Gas Exploration
Well Intent	Gas
Block	PEP 108
Licence	PEP 108
Operator	Santos Ltd
Drilling Contractor	OD&E
Drilling Rig	ODE #30

Seismic Station	CDP 1470 INLINE 8125			
Latitude	38°	31'	40.66"	South
Longtitude	142°	57'	22.52"	East
Ground Elevation	112.2 m (368 ft)			
Rotary Table Elevation	116.5 m (382 ft)			

Spud Date	12:00 hrs on the 8th January 2000
TD Reached	15:30 hrs on the 15th January 2000
Rig Released	02:30 hrs on the 20th January 2000
Status	Cased and Suspended

Planned Depth	1882 m (6174 ft)	
Actual Depth	1823 m (5981 ft)	
Planned Days	12.3 (spud to rig release)	
Actual Days	11.6 (spud to rig release)	
AFE $	$1,431,480 (C&S)	
Actual Cost $	$1,384,000 (C&S)	(Final Forecast Cost)

	Bit Size	Casing Size
Hole Summary	12 1/4" to 676m (2218 ft)	9 5/8" to 670m (2198 ft)
	8.5" to 680m (2231 ft)	
	6 3/4" to 1823m (5981 ft)	3 1/2" to 1819.5m (5969 ft)

Section 2.0

Well Summary
- Well Summary Card
- Time vs Depth Curve
- Lessons Learnt and Non Conformance Reports

Santos

DRILLING RECORD - PENRYN #1

WELL INFORMATION

LATITUDE:	38° 31' 40.66" S	CONTRACTOR:	OD&E
LONGITUDE:	142° 57' 22.52" E	RIG NO:	30
		DATE SPUDDED:	08/01/2000 12:00
RT. ELEVATION:	116.5m (382 ft)	DATE REACHED TOTAL DEPTH:	15/01/2000 15:30
G.L. ELEVATION:	112.2m (368 ft)	DATE RELEASED:	20/01/2000 02:30
TOTAL DEPTH :	1823m (5981 ft)		

RIG EQUIPMENT

Draworks:	Ideco Hydrair H-725-D	Pump No.1: PZH-8	Pump No.2: PZH-8
		Pump No.3: n/a	
DP Size:	4 1/2" OD w/ 4" IF connection, 3 1/2" OD w/ 3 1/2" IF connection		
DC Size:	6 1/2" OD w/ 4" IF connection, 4 3/4" OD w/ 3 1/2" IF connection 8" OD w/ 6 5/8" Reg connection		

CASING AND CEMENTING

Depth (m RT)	Size (in.)	Weight (lb/ft)	Grade	Coupling	Cement Top (ft K.B.)
670	9 5/8	36	K55	BTC Casing	Surface (39 bbls cement returns, some 16 bbls lost to formation)
1819.5	3 1/2	9.3	J55	New NK3SB	518 m (approx) - Full returns noted during displacement.

FORMATION DATA

Formation	Depth (m)
Dilwyn	437
Pember	656
Pebble Point	736
Paaratte	823
Skull Creek	1197
Nullawarre	1344
Belfast	1505
Flaxman	1656
Waare	1673
Eumeralla	1767
Total Depth	1823

MUD COMPANY: BARIOD

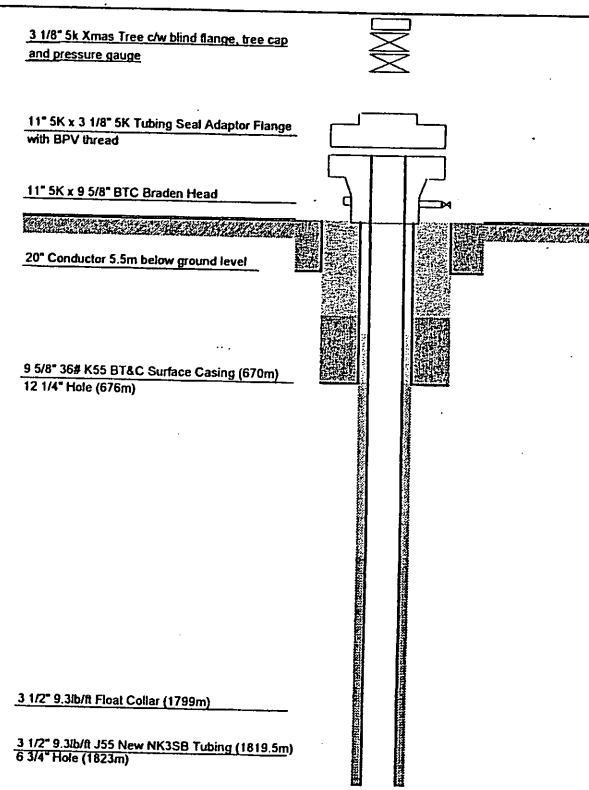
DRILLING FLUID TYPE	INTERVAL (m)	
SPUD MUD	0	676
2% KCL/POLYMER/PHPA	676	1823

MUD PROPERTIES

Depth (m RT)	Density (ppg)	Viscosity (secs/qt)	API W.L. (cc/30m)	pH	Cl (ppm)	P.V. (cps)	Y.P. (lbs/100ft2)	Gels (1/10) (100ft2)	% Solids
220	8.9	38		9.0		10	12	6/18	
600	8.9	37		8.6		6	12	11/21	
676	8.9	36		8.5		6	12	12/19	
676	8.9	36		8.5		6	12	12/19	
679	8.5	60	10.0	9.5	10,000	15	23	4/5	0.9
1265	8.7	47	8.2	8.9	10,000	15	20	3/6	2.4
1620	9.2	51	6.5	8.8	10,500	19	21	3/7	4.0
1823	9.3	52	5.5	8.7	11,000	19	19	3/5	4.2
1823	9.5	62	5.5	8.5	15,000	24	25	3/8	5.5
1823	9.5	65	5.5	8.8	17,000	25	25	4/9	5.4
1823	9.5	60				1			
1823	9.5	28				1			

Survey Data

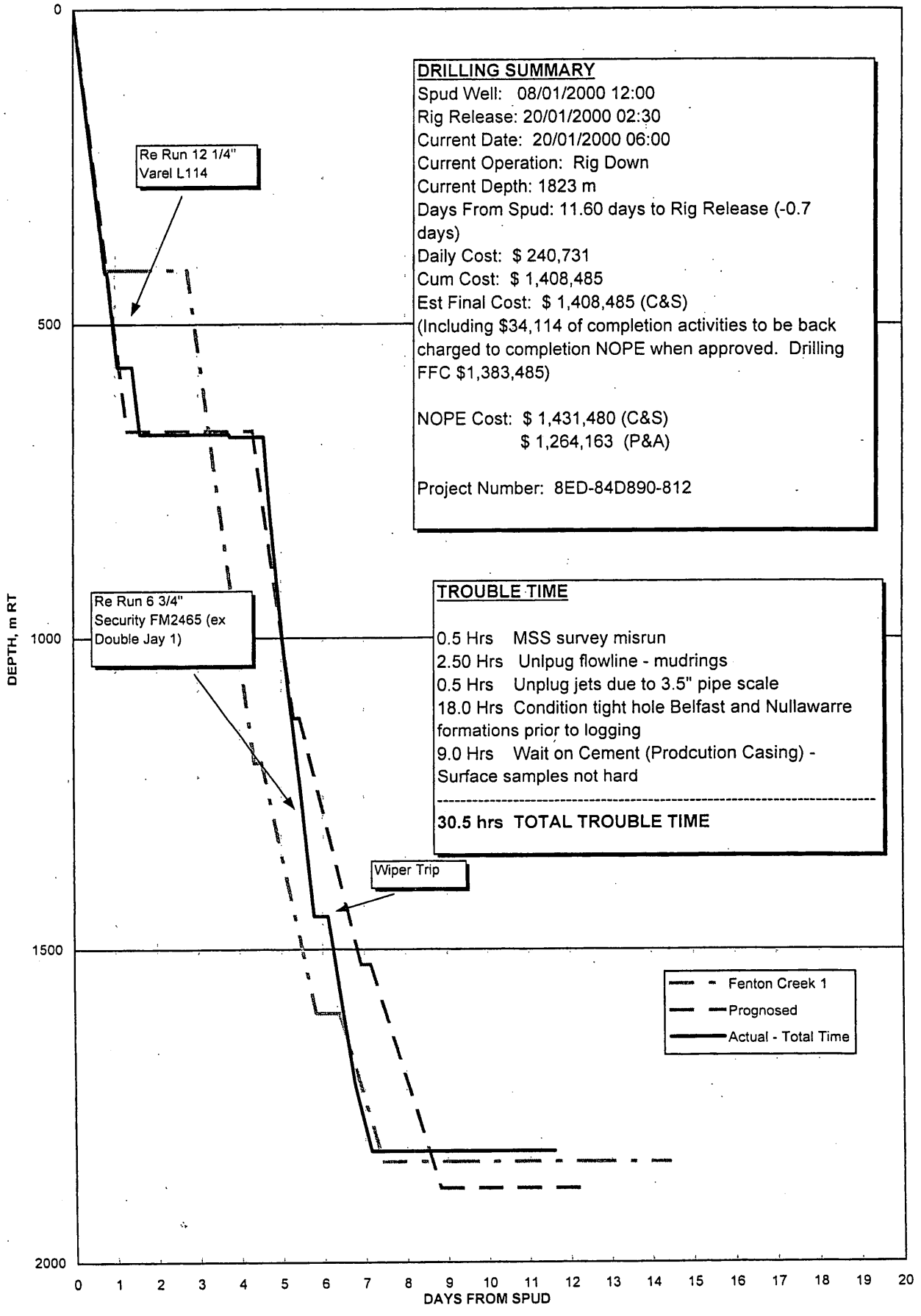
Depth MD (m)	Incl. (deg)	Azimuth (deg)
0	0.00	0
30	0.75	62
205	0.25	62
402	1.00	62
432	1.75	57
633	0.50	162
830	0.50	72
976	1.50	312
1120	1.50	106
1274	2.00	97
1428	3.50	97
1580	4.00	92
1726	4.50	107
1813	5.50	110



BIT RECORD

Bit (No.)	Size (in.)	Type	Manuf.	Jets	IADC	Depth Out (m)	Melrage Drilled	IADC Hours	ROP (m/hr)	Cumulative Hours	WOB (x1000 lb)	RPM	SPP (psi)	Flow (gpm)	Condition	Comments
1RR	12 1/4	L114	Varel	3x18	114	676	666	29.5	22.6	29.5	10/20	140/120	1620	720	I O D L B G O R 4 5 FC A E I ER TD	
2	8 1/2	HP11	Reed	3x11	116	680	4	1.0	20.0	30.5	8.0	60	1245	350	Not Reported. Cleanout trip to drill shoe track	
3RR	6 3/4	FM2465	Security	4 x 12	PDC	1823	1143	49.0	23.3	79.5	10/15	110/85	2100	310	0 2 CT N X IN HC TD	

PENRYN #1
TIME v DEPTH CURVE



DRILLING SUMMARY

Spud Well: 08/01/2000 12:00
Rig Release: 20/01/2000 02:30
Current Date: 20/01/2000 06:00
Current Operation: Rig Down
Current Depth: 1823 m
Days From Spud: 11.60 days to Rig Release (-0.7 days)
Daily Cost: $ 240,731
Cum Cost: $ 1,408,485
Est Final Cost: $ 1,408,485 (C&S)
(Including $34,114 of completion activities to be back charged to completion NOPE when approved. Drilling FFC $1,383,485)

NOPE Cost: $ 1,431,480 (C&S)
$ 1,264,163 (P&A)

Project Number: 8ED-84D890-812

TROUBLE TIME

0.5 Hrs MSS survey misrun
2.50 Hrs Unlpug flowline - mudrings
0.5 Hrs Unplug jets due to 3.5" pipe scale
18.0 Hrs Condition tight hole Belfast and Nullawarre formations prior to logging
9.0 Hrs Wait on Cement (Prodcution Casing) - Surface samples not hard

---

30.5 hrs TOTAL TROUBLE TIME

Santos	CATALOGUE OF EXPERIENCE 907987 075	FORM DMS F-301

FIELD	Penryn	**ACTIVITY**	Drilling Surface Hole
WELL	Penryn #1	**INCIDENT**	
DRILLING PHASE	Surface Hole	**REFERENCE**	conductor surface hole mud bits target tolerance

SUBJECT: Observations and recommendations from drilling surface hole (12 ¼" to 670m) at Penryn #1

SUMMARY:
(1) Surface hole was drilled with spud mud with no inhibition. The surface sticky marl formations proved troublesome (Gellibrand and Mepunga). On three occasions at 210m, 410 – 420 m and at 568 m, blockage of the possum belly and flowline occurred. These blockages caused 2.5 hours of trouble time (value approx. $4k), plus reduced the rate of penetration. Dumping and diluting was used as the clay became saturated. Fresh water make-up water was used. Inhibition could be increased by adding salt or KCl to 2%, although the added cost would most probably break-even with the trouble time unless a large increase in ROP was seen. PHPA is not recommended due to high pump rate and potential for shaker screen plugging.

The same surface hole mud system could be used again with the use of SAPP to thin the mud, the flowline dump valve to the sump could be cranked out more regularly, and the shaker bypass to sand trap opened more regularly, and the sand trap cleaned more regularly. Also, ensure drillers work each connection at least twice to allow good hole cleaning and time to circulate up cuttings. On Penryn #1, the drillers were working every other connection, and the hole eventually became plugged with clay and cuttings.

(2) A used 12 ¼" bit was used to drill surface hole. This should continue as there are no troublesome hard zones to worry about.

(3) If target tolerance can be relaxed to greater than 50m, then Totco surveys can be run in surface hole instead of MSS surveys. This would eliminate monel rental. There is a history of devaitation in this area (3 – 5.5 degrees) from 1200 m that is worse in 6.75" hole than 8.5" hole.

(4) A 20" conductor was used here instead of the usual 16" used in the Cooper Basin. This was to allow the contingency of opening the 12 ¼" hole up to 17 ½", to allow running 13 3/8" casing in case huge losses were seen drilling surface hole. The nearby offset well Wild Dog Road 1 drilled by Boral / OCA saw huge losses at just out of the conductor shoe. This did not happen on Penryn #1, but the contingency should continue of taking a few joints of 13 3/8" casing to wellsite, and using a pre-installed 20" conductor.

Santos	CATALOGUE OF EXPERIENCE 907987 076	FORM DMS F-301

BACKGROUND:

(1) Offset Iona wells were drilled with spud mud with no problems

(3) A target of 50 m was applied to this well due to it's proximity to a fault

(4) Total losses were experienced just out of the (16") conductor shoe on Wild Dog Road, causing a few days lost time to open the hole up enough with a poor boy hole opener to allow running 13 3/8" casing to seal off the loss zones and regain circulation.

RISK:

(1) As long as sufficient water is available to dilute, and use is made of thinning chemicals such as SAPP, the risk is believed to be low to continue with spud mud in surface hole due to the success of such systems in the area

(2) The calculated closure at 1813 m was 47 m. MSS in surface hole should continue unless the target tolerance is relaxed

(4) Additional cost of the contingency is small

LEASONS LEARNT:

INITIATION		APPROVAL		ASSOCIATED DOCUMENTS
DATE SUBMITTED	4/7/2000	DATE CLOSED		
ORIGINATOR	Geoff Coker	REF. No		
FEEDBACK		CUSTODIAN		Brian Bottroff

Santos	907987 077 CATALOGUE OF EXPERIENCE	FORM DMS F-301

FIELD	Penryn	**ACTIVITY**	Cementing
WELL	Penryn #1	**INCIDENT**	
DRILLING PHASE	Surface Casing	**REFERENCE**	landing joint cement recipie

SUBJECT: Observations and recommendations from surface casing phase (9 5/8" to 670m) at Penryn #1

SUMMARY:

(1) No landing joint was taken to location. The casing was landed and cemented with a full casing joint rather than a landing joint. It is the operator's responsibility to supply the landing joint. Although it did not cause great operational problems, the casing was cemented with the cement head 7m above the rotary table, and a landing joint would increase the safety of the surface casing cementing operation.

(2) Surface casing lead cement used was 12.8 ppg with a laboratory test compressive strength of 1200 psi after 12 hours. Approx 45 bbls of good cement returns were seen to surface, hence the top up job should be optional, or could be a small hand mixed job of quick setting cement to avoid any movement of the surface casing during nipple up. Slack off time was 8 hours from plug bump, even with the 2% CaCl2 accelerated cement top up job, due to low ambient temperatures. Discretion should be used, rather than a compulsory top up job.

(3) A lighter weight lead cement 11.8 or 11 ppg could be considered for surface casing as some lost returns (16 bbls) were noted in this cement job. Offset wells used similar cement recipies, but these wells did not have so deep surface casing.

BACKGROUND:

(1) A landing joint was not on the equipment and materials list. For orphan wells in a remote location, the landing joint must not be forgotten.

(2) In the Cooper Basin, a 11 ppg lead is used. For these wells, a compulsory top up job is necessary, but potentially not Penryn area.

RISK:

Santos	907987 078 CATALOGUE OF EXPERIENCE	FORM DMS F-301

LEASONS LEARNT:

INITIATION	APPROVAL	ASSOCIATED DOCUMENTS

DATE SUBMITTED	4/7/2000	DATE CLOSED		
ORIGINATOR	Geoff Coker	REF. No		
FEEDBACK		CUSTODIAN		Brian Bottroff

Santos	CATALOGUE OF EXPERIENCE 907987 079	FORM DMS F-301

FIELD	Penryn	**ACTIVITY**	drilling surveying
WELL	Penryn #1	**INCIDENT**	
DRILLING PHASE	Production Hole	**REFERENCE**	bits makeup water float valves pipe spinner rental pipe

SUBJECT: Observations and recommendations from production hole phase (6 3/4" to 1823m) at Penryn #1

SUMMARY:

(1) 6 ¾" FM2465 drilled entire well with no wear discernable on bit. Used or rebuilt matrix or steel bodied bits with good gauge protection should be considered for future wells. Steel bodied more aggressive (than an FM2465) bits should be considered for future wells to increase the rate of penetration. There is the occasional very hard stringer, but nothing that premium cutters from the major bit suppliers can't handle.

(2) Have a used 6 ¾" tricone bit for cleanout trips or if reaming is required to prevent excessive wear to the PDC bit. A used 4-1-7 IADC grade bit would be ideal.

(3) Considerably more water was used for making mud than was anticipated. A lot more water was used for making spud mud than anticipated, and more dilution was required in main hole than expected. The quantity of water required is very much dependent on the size and depth of the surface hole. Take the quantity you think you need and add 50%. Consider testing (for mud and cement) other water sources in the area in the event supply runs short.

(4) Deviation built to 5.5 deg due to the drift of the formations in the area. The drift is worse in 6.75" hole than 8.5" hole. Control drilling has to be introduced to correct the deviation. As the PDC bit becomes more worn, the deviation appeared to increase.

(5) Ensure drillers use the pipe spinner to rotate pipe out of the hole prior to logging to minimise hole damage.

(6) Have drillers break circulation ½ way into the hole to reduce the risk of plugged jets, especially when rental 3 ½" drill pipe is used.

(7) The use of a ported flapper type float could have eliminated some of the problems experienced with plugging jets. A ported flapper type float was in the drilling program to be used, but OD&E were not able to supply in time. Consider giving the contractor more than one month lead time to source, or have Santos source itself.

(8)The 3 ½" drill pipe should be stored with corrosion inhibitor to avoid scaling of pipe interior. A half hour of rig time was lost unplugging the jets due to pipe scale. This will

always be a problem with rental pipe. Attempt to find out the history of the rental pipe and if it is not to be inspected, make sure is its rabbitted and hammered when picked up to remove scale.

BACKGROUND:

(1) Bit recommendation for next well in the area would be a used (1-1 condition or better) FS2463, DS40 or S80 or S98, or a rebuild or any of the above.

(2) 4-1-7 6.75" bits are not used routinely in the Cooper Basin. As soon as one is used and if rerunable, set it aside. Any TCI bit would be acceptable, but 4-1-7 is ideal. It is not worth running a new TCI bit however, is no used are available.

(3) Any anticipated water usage calculations need to be made with the intended mud system in use, and include reference to offset well's makeup water volume.

RISK:

LEASONS LEARNT:

INITIATION		APPROVAL		ASSOCIATED DOCUMENTS
DATE SUBMITTED	4/7/2000	DATE CLOSED		
ORIGINATOR	Geoff Coker	REF. No		
FEEDBACK		CUSTODIAN		Brian Bottroff

Santos	CATALOGUE OF EXPERIENCE 907987 081	FORM DMS F-301

FIELD	Penryn	ACTIVITY	wiper trip condition hole
WELL	Penryn #1	INCIDENT	
DRILLING PHASE	Evaluation	REFERENCE	

SUBJECT: Observations and recommendations from evaluation phase (6 3/4" to 1823m) at Penryn #1

SUMMARY:
Approximately 18 hours were lost conditioning the production hole in the Belfast and Nullawarre formations prior to logging. The value of this trouble time is approx $27,000. Incidations were that this was due to clay swelling and filter cake over the Nullawarre greensand. The KCl content was rasied from 2 to 3%, and mud weight raised from 9.3+ to 9.5 ppg. This remedied the Nullawarre problem.

BACKGROUND:
Offset wells have required more inhibition and mud weight. OCA use 4% KCl on the 8.5" production hole section of their wells. On the nearby Iona OBS 2 well, the production hole interval was 6.5". 3 – 5% KCl was used and a mud weight of 9.3 only was required.

RISK:

LEASONS LEARNT:
A KCl content of 3% is recommended on the next well in the area, at least until the Nullawarre is drilled. PHPA would remain at up to 1 ppb, and remain until the Waare is penetrated. 2% KCl is required for the Eumeralla.

Santos	907987 032 CATALOGUE OF EXPERIENCE	FORM DMS F-301

INITIATION		APPROVAL		ASSOCIATED DOCUMENTS
DATE SUBMITTED	4/7/2000	DATE CLOSED		
ORIGINATOR	Geoff Coker	REF. No		
FEEDBACK		CUSTODIAN		Brian Bottroff

Santos	907987 083 CATALOGUE OF EXPERIENCE	FORM DMS F-301

FIELD	Penryn	**ACTIVITY**	cementing well control WOC tubing running
WELL	Penryn #1	**INCIDENT**	
DRILLING PHASE	Production Casing	**REFERENCE**	cross over Halad 322 stabbing board

SUBJECT: Observations and recommendations from production casing phase (3 1/2" to 1819.5m) at Penryn #1

SUMMARY:

(1) A cross over from 3 ½" New NK3SB (or what ever tubing thread that is to be used) to 3 ½" IF should be provided by Santos, to cross back to the drilling contractor's stabbing well control valve. One was not taken to Penryn #1 and the only way to circulate during a kick situation would be to use the cementing contractor's cement head or circulating swedge.

(2) Some 9 hours were spent over and above what is normally acceptable before pulling tension (total WOC time 14 hours). This is due to the low ambient temperature in the area and the "heat activation" nature of the Halad 322 tail additive. The tail samples started "going off" much faster than placed in a water bath.

(3) The tubing run was range 2. The rig was only used to running range 3. The stabbing board could not be modified to accommodate range 2 in the short term. The tubing was run with no stabbing board, but if there was high winds, this could have become a safety issue, and lead to poor operational performance.

BACKGROUND:

(1) All ways consider the well control and fishing aspects of everything run in the hole.

(2) Place tail samples in a water bath with hot water in order to mimic downhole temperatures, immediately after the cement job has finished if there is a requirement to pull tension, especially if Halad 322 is used.

(3) The range of any tubulars to be run should be discussed with the drilling contractor prior to spud, and plans put in place to accommodate handling requirements.

Santos	907387 084 CATALOGUE OF EXPERIENCE	FORM DMS F-301

RISK:

LEASONS LEARNT:

INITIATION		APPROVAL		ASSOCIATED DOCUMENTS
DATE SUBMITTED	4/7/2000	DATE CLOSED		
ORIGINATOR	Geoff Coker	REF. No		
FEEDBACK		CUSTODIAN		Brian Bottroff

PENRYN #1

Drilling Co.: OD&E

Rig: OD&E #30

RT above GL: 4 ft
GL above MSL : 119 ft

Lat : 38 deg 31 min 40.66 sec
Long : 142 deg 57 min 22.52 sec

Spud Date: 08/01/2000
Spud Time: 12:00:00

Release Date: 20/01/2000
Release Time: 02:30:00

ACTIVITY ANNOTATIONS

DATE : 05 January, 2000 — **REPORT NUMBER :3**

Comment	Solution
Haliburton cementers arrived on location with pumping unit and bulk takns. Rigged up & tied into rig water system. Bulk cement to arrive 06/01/00. Load of 9-5/8" & 13-3/8" casing arrived on location today. Also received 4-3/4" and 6-1/2" NMDCs	

DATE : 06 January, 2000 — **REPORT NUMBER :4**

Comment	Solution
Final mud order arrived on location from Bariod. Also received 60 jnts 9-5/8" csg and 6 jnts 13-3/8" csg. along with pre-spud equipment. Missing landing joint for 9-5/8" casing.	

DATE : 08 January, 2000 — **REPORT NUMBER :6**

Comment	Solution
Encountered problems with clay building up in flow line and plugging shaker box. 9-5/8" BTC Landing joint obtained from Boral Energy.	Encrease water addition at shakers and work connections to increase hole cleaning. Increase dump & dilution frequency.

DATE : 09 January, 2000 — **REPORT NUMBER :7**

Comment	Solution
Hole in good condition throughout wiper trip. Mud ring encountered after breaking circulation. David McDonald (lead floorman) sustained dislocated shoulder while wiper triping.	

DATE : 10 January, 2000 — **REPORT NUMBER :8**

Comment	Solution
Casing run went well with no hole problems. Losses encountered while pumping lead cement. 16 bbls estimated losses to formation. Displacement went well with full returns throughout. Approx. 45 bbls of good cement to surface. Top job conducted regardless.	

DATE : 11 January, 2000 — **REPORT NUMBER :9**

Comment	Solution
Drill out top & bottom plugs. Drill out cement in shoe track. No problems encountered.	

PENRYN #1

Drilling Co.: OD&E **Rig:** OD&E #30

RT above GL: 4 ft	Lat : 38 deg 31 min 40.66 sec	Spud Date: 08/01/2000	Release Date: 20/01/2000
GL above MSL : 119 ft	Long : 142 deg 57 min 22.52 sec	Spud Time: 12:00:00	Release Time: 02:30:00

ACTIVITY ANNOTATIONS

DATE : 12 January, 2000 **REPORT NUMBER :10**

Comment	Solution
Drifted and descalled 3.5" DP prior to running in the hole. Plugged jets encountered during initial circulation due to scale from DP internal walls. Approx. 1/2 Hr. non-productive time.	Drill pipe to be coated prior to storage to avoid excessive internal scaling.

DATE : 13 January, 2000 **REPORT NUMBER :11**

Comment	Solution
Schlumberger ETA on location 14th via Roma. MDT truck ETA on location 15th via Moomba / Adelaide. Fire permit received on location and valid until 1st June, 2000.	

DATE : 14 January, 2000 **REPORT NUMBER :12**

Comment	Solution
Schlumberger engineer & 2 operators arrived on location with logging unit from Roma. Cement bulker arrived on location with cement for production hole. MDT truck due to arrive on location Saturday from Adelaide. Premium casing running gear and 2 x technicians due on location Saturday PM.	

DATE : 15 January, 2000 **REPORT NUMBER :13**

Comment	Solution
MDT truck arrived on location from Adelaide via Moomba @ 10:00 Hrs. Tight hole encountered from 1823m to 1464m while wiper tripping. Picked up kelly and pumped out singles from 1464m to 1387m. Suspected filter cake build up around stabilisers (packing off).	

DATE : 16 January, 2000 **REPORT NUMBER :14**

Comment	Solution
Hole problems encountered on second wiper trip. Worked tight hole @ 1667m, 1464m, 886m and 844m. Hole came good after working through tight areas. Premium casing technicians arrived on location.	

DATE : 17 January, 2000 **REPORT NUMBER :15**

Comment	Solution
Logging program went well throughout. No problems running MDT to bottom. Hole in good condition.	

PENRYN #1

Drilling Co.: OD&E

Rig: OD&E #30

RT above GL: 4 ft	Lat : 38 deg 31 min 40.66 sec	Spud Date: 08/01/2000	Release Date: 20/01/2000
GL above MSL : 119 ft	Long : 142 deg 57 min 22.52 sec	Spud Time: 12:00:00	Release Time: 02:30:00

ACTIVITY ANNOTATIONS

DATE : 18 January, 2000 — **REPORT NUMBER :16**

Comment	Solution
3.5" tubing run and cementing went well with no associated problems. Tearing out rig while waiting on cement. Clean tanks and solids control equipment. Load out expected for Thursday and Friday 20-21st.	

DATE : 19 January, 2000 — **REPORT NUMBER :17**

Comment	Solution
Waited on cement an extra 8 Hrs for surface samples to set before setting casing slips. Samples still soft when slips were set. Achieved 40,000 lbs over-pull on tubing.	

DATE : 20 January, 2000 — **REPORT NUMBER :18**

Comment	Solution
Crew had problems removing X-tree cap after pressure testing. Chain tong and cheater bar was used to remove cap in order to retrieve BPV. As a result, threads were gauled on both cap and nut. Preveious to pressure test, cap & nut were removed to check "O" ring seal and made up by hand with no problems.	Ensure cap nut is well greased and hand tightend only. Locate the problem before applying excessive force.

DATE : 21 January, 2000 — **REPORT NUMBER :19**

Comment	Solution
All wellsite shacks are off location. Rig is 98% loaded out. Wellhead cage has been installed over X-Tree. All rubbish picked up. 6 jnts of 3.5" tubing remains on location for use by Expertest for flowline to flare pit.	

DATE : 22 January, 2000 — **REPORT NUMBER :20**

Comment	Solution
First rig crew released @ 0700 Hrs 22/01/200 and transported back to Adelaide via charter bus. Second crew held back to tear down camp and have ready for crane and trucks, ETA @ 1400 Hrs. T.P. & second crew departed location @ 1200 Hrs. 22/01/200. Truckies arrived on location @ 1400 Hrs and loaded out camp. Rig generators, SCR and 1 pipe bin remaining on location. Expect 100% load out by 12 noon 23/01/2000.	

Section 3.0

Well History

- IDS Well History Report

PENRYN #1

Drilling Co.: OD&E

907087 089

Rig: OD&E #30

RT above GL: 4 ft
GL above MSL : 119 ft

Lat : 38 deg 31 min 40.66 sec
Long : 142 deg 57 min 22.52 sec

Spud Date: 08/01/2000
Spud Time: 12:00:00

Release Date: 20/01/2000
Release Time: 02:30:00

Well History

#	DATE	DEPTH	WELL HISTORY (24 Hr Summary)
1	03/01/2000	10	Delete this line and enter a brief summary of the last 24 hrs here
2	04/01/2000	10	Finalise load out on Wild Dog #1 and move rig to Penryn #1. Spot loads and rig up.
3	05/01/2000	10	Finalise load out on Wild Dog #1 and rig up on Penryn #1.
4	06/01/2000	10	WOD, Continue with general rigging up and prepare for spud. Release crews for the night & WOD.
5	07/01/2000	10	W.O.D, Continue with general rigging up and shut down for Santos Introduction and ODE OH&S meeting. Wait On Daylight.
6	08/01/2000	220	WOD,Rig up to drill Rat & Mouse hole, Spud @ 1200Hrs. Drill 12-1/4' hole to 220m.
7	09/01/2000	600	Drill, Circ. hole clean, clean mud rings from flowline and shaker box, Wiper trip, Circ. out mud rings, Drill ahead.
8	10/01/2000	676	Drill to 676' (Csg Pnt), Circ sample, Wiper, Circ., POH, L/Out 8" DCs & 12-1/4' Assy. Run Csg & Cmt. W.O.C.
9	11/01/2000	676	WOC, Back-off landing jnt & L/out, Install Csg bowl, N/Up BOPs, Pressure test,L/out NMDC, M/up 8-1/2" Assy & RIH to drill out shoe track.
10	12/01/2000	679	RIH with 8.5" bit and slick assy. from 301m to 634m. P/Test rams & annular preventer. Cont. RIH & Tag cement, drill out shoe track. Drill 3m of 8.5" pilot hole to 680 m., Circ, L.O.T., L/Dwn DP & P/up 6-3/4" assy & RIH.
11	13/01/2000	1,265	Drill 6-3/4" hole from 679m to 1265m (Total 586m). Circulate & run SSM surveys @ 830m, 976m & 1120m.
12	14/01/2000	1,620	Drill from 1265m to 1447m, Pump high vis sweep & circ to cond. hole, Wiper trip to shoe, Break circ & drill from 1447m to 1591m (pump sweep). Circulate & run SSM survey @ 1580m. Continue to drill from 1591m to 1620m.
13	15/01/2000	1,823	Drill to 1823m (TD), Circ Btm Sample, Clean hole, Wiper Trip, Trip tight hole from 1464m to 1387m.
14	16/01/2000	1,823	RIH, Ream & wash to bottom, Circ. High Vis sweeps, Wiper 15 stands (tight), Work pipe & circ., Run SSM survey, POH to log, Lay out 6-3/4" stabs & monel, Hold Safety meeting & R/up loggers, Log with PEX-AS.
15	17/01/2000	1,823	Run Pex-As and MDT, L/Out tools, R.I.H., Slip line, Cont. R.I.H., Circ, POH laying down DP.
16	18/01/2000	1,823	P.O.H. laying out DP and BHA. R/up to run 3.5" tubing & run same. Circ tubing, Rig up cementers & cement casing. Displace cement and press test casing. W.O.C.
17	19/01/2000	1,823	W.O.C., Set slip & seal assy., Make up X-Tree & pressure test.
18	20/01/2000	1,823	Press. test X-Tree, Release rig and commence tearing down rig for stacking. Lay down derreck @ 1000 Hrs, General rigging out, W.O.D.
19	21/01/2000	1,823	W.O.D., Load out rig and associated equipment, clean up location, Shut down crews and equipment and W.O.D.
20	22/01/2000	1,823	WOD & trucks, Rig down camp facilities, Release crews and camp staff, Load out camp 100% (truckies only for load out), WOD & trucks.

Section 4.0

Drilling Data

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

EN[illegible]N # D[illegible]g C[illegible]OD&L [illegible]g. OD[illegible]30 [illegible]ud C[illegible] BAR[illegible]

RT above G[illegible]: 4 m Lat : 38 deg 31 min 40.66 sec [illegible]d Date: 08/01/2000 Release Date: 20/01/2000 **Total [illegible]st:** $ 17,635

GL above MSL :116.5 m Long : 142 deg 57 min 22.52 sec Spud Time: 12:00 Release Time: 2:30

MUD RECAP

R#	DATE	TYPE	DEPTH	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 $
6	08/01/2000	Aquagel/Fresh water	220	34	8.9	38	10	12	6	18			0			9.0				836
7	09/01/2000	Aquagel/Fresh water	567	43	8.9	37	6	12	11	21			0			8.6	200	40		203
8	10/01/2000	Aquagel/Fresh water	676	43	8.9	36	6	12	11	21			0			8.5	5	40		838
9	11/01/2000	Aquagel/Fresh water	676	25	8.9	36	6	12	12	19	2.0		0			8.5	5	40		0
10	12/01/2000	Aquagel/Fresh water	680	31	8.5	60	15	23	4	5	1.0		0		1.5	9.5	10,000	20	2	4,832
11	13/01/2000	Aquagel/Fresh water	1,242	38	8.7	47	15	20	3	6	8.2		2.4	.2	2.0	8.9	10,000	40	2	2,527
12	14/01/2000	Aquagel/Fresh water	1,618	44	9.2	51	19	21	3	7	6.5		4.9	.5	4.0	8.8	10,500	60	2	2,817
13	15/01/2000	KCL/Ploymer	1,823	48	9.3	52	19	19	3	5	5.5		5.5	.7	5.5	8.7	11,000	60	2	1,476
14	16/01/2000	KCL/Ploymer	1,823	44	9.5	62	24	25	3	8	5.5		5	.7	5.5	8.7	15,000	80	3	1,425
15	17/01/2000	KCL/Ploymer	1,823	43	9.5	65	25	25	4	9	5.5		5	.75	5.5	8.8	17,000	80	3	684
16	18/01/2000	KCL/Ploymer	1,823	28	9.5	60	1	0	0	0	0.0		0	0	0.0	0.0	0	0	0	1,998

PENRYN #1

Drilling Co.: OD&E **Rig:** OD&E #30

RT above GL 4 m
GL above MSL 116.5 m

Lat : 38 deg 31 min 40.66 sec
Long : 142 deg 57 min 22.52 sec

Spud Date: 08/01/2000
Spud Time: 12:00

Release Date: 20/01/2000
Release Time: 2:30

BHA SUMMARY

#	Length (ft)	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
0	0	0	0	0	0	0				
1	198	54	40	75	75	55	1,850	1,733	1,680	Bit,Bit Sub,2x8" DC,12-1/4" Stab,1x8" DC, x/o,x/o,1x6.5" NMDC,x/o,8x6.5" DC, Jars, 3x6.5" DC, 5x4.5" Hvy WT DP.
2	159	72	60	72	72	72				Bit, Bit Sub, 8x 6-1/2" DCs, 1x 6-1/4" Jars, 3x 6-1/2" DCs,3x Hvy Wt.DP
3	291	42	38	103	105	95				Bit, 1x NB RMR, Monel, 1x Pony DC, 1x String Stab, 1x NMDC, 1x String Stab, 26x 4-3/4" DCs, 1x Jars, 2 x 4-3/4" DCs, 6x Hvy Wt.
4	273	32	34	50	50	50				Bit, Bit Sub, 26x 4-3/4" DCs, 1x Jars, 2 x 4-3/4" DCs, 6x Hvy Wt.

PENRYN #1

Drilling Co.: OD&E Rig: OD&E #30

RT above GL : 4 m
GL above MSL 1165 m

Lat : 38 deg 31 min 40.66 sec
Long : 142 deg 57 min 22.52 sec

Spud Date: 08/01/2000
Spud Time: 12:00

Release Date: 20/01/2000
Release Time: 2:30

BIT SUMMARY BY FORMATION

DATE	BIT#	SIZE in	MFR	TYPE	IADC	JETS	SER #	IN m	OUT m	~~FTGE~~ METRGE	On Bott HRS	FORMATION	TOP@ m	ROP min/m	WOB k-lbs	RPM	TRQ 1000 ft-lb	SPP psi	FLW gpm	MW ppg	I	O1	D	L	B	G	O2	R
10-01-00	1RR	12.25	Varel	L114	114	3x18	131976	0	676	676	13.5	Undifferentiated	0	53.2	10.1	111		1243	720	8.9	4	5	FC	A	E	IN	ER	TD
												Dilwyn	437	51.6	13.1	137		1656										
												Pember Mudstone	656	25.7	17.2	129		1727										
11-01-00	2	8.50	REED	HP11	116	3x11	MA3248	676	680	4	0.5	Pember Mudstone	656	9.9	6.6	84		1412	360	8.9	0	0	WT	A	X	E	I	TD
15-01-00	3RR	6.75	SEC	FM2465		4x12	5985194	680	1,823	1,143	33.8	Pember Mudstone	656	67.9	4.2	137		1303	344	9.0	0	2	CT	N	X	IN	HC	TD
												Pebble Point	736	61.9	4.0	139		1380										
												Paaratte	823	46.4	4.1	113		1497										
												Skull Creek	1,197	44.1	9.7	73		1836										
												Nullawarre	1,344	49.7	8.3	80		1918										
												Belfast	1,505	30.8	15.5	85		2026										
												Flaxman	1,656	15.9	7.2	105		1933										
												Waarre "C"	1,673	25.1	8.6	105		1926										
												Waarre "B"	1,714	13.5	7.8	98		1909										
												Waarre "A"	1,767	34.2	12.5	76		2022										

PENRYN #1

Drilling Co.: OD&E **Rig:** OD&E #30

RT above GL : 4 m
GL above MSL : 16.5m

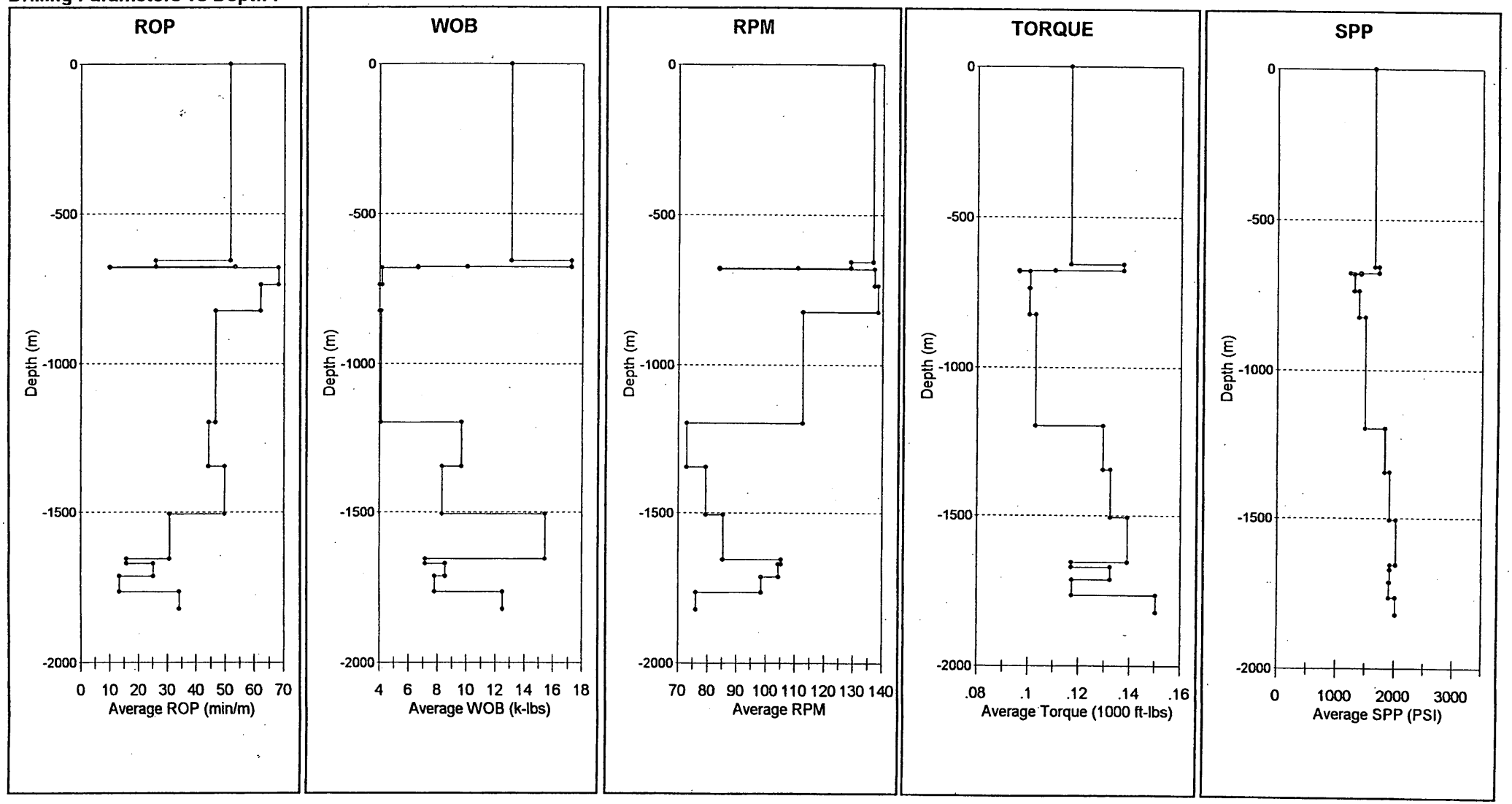
Lat : 38 deg 31 min 40.66 sec
Long : 142 deg 57 min 22.52 sec

Spud Date: 08/01/2000
Spud Time: 12:00

Release Date: 20/01/2000
Release Time: 2:30

BIT SUMMARY BY FORMATION

Drilling Parameters vs Depth :



12:14:51, 04[illegible]2000

907987 095

Santos

Santos Ltd
A.C.N. 007 550 923

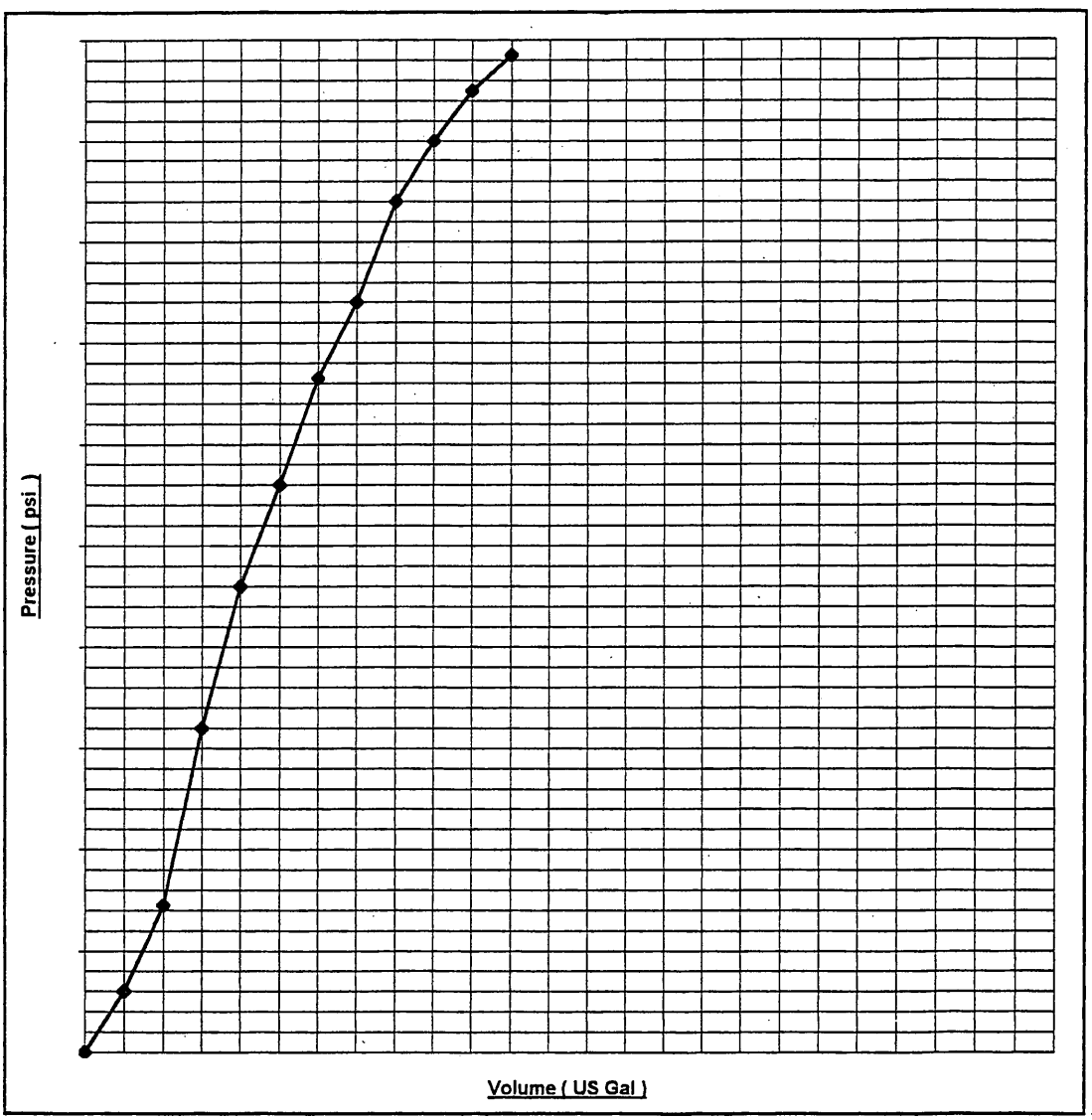
LEAK OFF TEST / FORMATION INTEGRITY TEST

WELL: Penryn #1 RIG: Rig #30 DATE: 12/01/00

CASING SIZE: 9.625 (inch) SANTOS SUPERVISOR: Norman Gamache

A. MUD DENSITY IN USE:	8.6	(ppg)
B. HOLE DEPTH:	2218	(ft)
C. SHOE DEPTH:	2199	(ft)
D. F.F.P. PRESSURE (GRAPH):	600	(psi)
E. EQUIVALENT DENSITY: PRESSURE. (D) (psi) / SHOE DEPTH (C) (ft) x 0.052 + MUD DENSITY IN USE (A) (ppg)	13.8	(ppg) (EMW)
F. STABILIZED PRESSURE RECORDED:	440	(psi)
G. VOLUME PUMPED:	46.2	(gallons)
H. VOLUME REGAINED:	12.6	(gallons)

Vol. (bbls)	Press. (psi)
0	0
0.1	60
0.200	145
0.3	320
0.4	460
0.5	560
0.6	665
0.7	740
0.8	840
0.9	900
1	950
1.1	985



Section 5.0

Casing and Cementing

- **Casing and Cementing Reports**
- **Wellhead Installation Report or**

Santos

Santos Ltd

A.C.N. 007 550 923

CASING AND CEMENTING FORM

907987

DQMS F-220

Well Name: Penryn #1

Hole Size:	12 1/4	T.D.:	676m	By:	Gamache	Date:	1/10/00	Contractor	Haliburton

PRE-FLUSH 15 bbls. @ 8.33 ppg. **SPACER** 25 bbls @ 8.33 ppg.

Additives:

CEMENT

LEAD SLURRY:	529	sacks class	'G'
Slurry Yield:	1.97	cu.ft./sack	
Mixwater Req't:	11.13	gal./sack	
Actual Slurry Pumped:	186	bbls @	12.8 ppg
TAIL SLURRY:	127	sacks class	'G'
Slurry Yield:	1.16	cu.ft./sack	
Mixwater Req't:	5.11	gal./sack	
Actual Slurry Pumped:	26	bbls @	15.8 ppg

ADDITIVES

Product	Concentration	Amount
Bentonite	2.50%	1242 lbs
NF-5	0.004 Gal/Sk	2.11 gal
CFR-3	0.20%	99 lbs
NF-5	0.004 Gal/Sk	0.5 gal

DISPLACEMENT Fluid: Mud @ 8.8 ppg

Theoretical Displ.:	164 bbl.	Bumped plug with	850 psi
Actual Displ.	164 bbl @ 5.45 bpm	Pressure Tested to:	2300 psi
Displaced via	HOWCO	Bleed back:	1.5 bbls

ACTIVITY	Time
Start Running csg.	11:00
Casing on Bottom	17:30
Start Circulation	17:45
Start Pressure Test	20:00
Pump Preflush	19:55
Start Mixing	20:10
Finish Mixing	20:58
Start Displacing	21:00
Stop Displ./Bump	21:28
Press. test	21:28

Returns to Surface: ____ bbls mud ____ bbls cmt.

Reciprocate / Rotate Casing: No. Casing differentially stuck prior to cementing.

Top Up Job run: Yes / No Yes 50 sx class 'G' with 1% CaCl

Plug Set Make / Typ Non Rotating

Centralisers, type/depth: Center on 1st & 2nd joints. Coupling on 4th, 5th, 6th, 7th, 5

Cement basket not run.

Remarks: No hole problem during casing run. Full Circulation while reciprocating with r
good throughout. Lost circulation at 130 bbls while pumping lead cement and regained afte
Lost approx. 16 bbls to the formation. Used 'HOWCO' pumping unit for displacing cement
Displaced with 164 bbls of spud mud. Pre-flush to surface at 110 bbls into displacement &
ce at 125 bbls into displacement. Floats held OK. Bled back 1.5 bbls of mud. Top up with

No. JOINTS	DESCRIPTION	MTRS	FROM	TO
	Stick up. (No landing joint on location)	7	-7.00	0.00
56	9.625 36 lb/ft k55 BTC Casing	649.32	-7.00	642.32
1	Pup Joint	3.13	642.32	645.45
1	Float Collar	0.42	645.45	645.87
2	9.625 36 lb/ft K-55 BTC Casing	23.76	645.87	669.63
1	Float Shoe	0.52	669.63	670.15
	RT to top of Bradenhead **4.84**			

Theoretical Bouyed wt of casing(klb):	57	Bradenhead Height above GL	4"(BOP Limitatio
Actual wt of casing (last joint run-block wt, klb)	55	Casing wt just prior to landing csg/	52000.00
Landing WT (after cementing and pressure bleed o	55	setting slips	

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A.C.N. 007 550 923

CASING AND CEMENTING 907987 098

FORM DQMS F-220

Well Name: Penryn #1

Hole Size:	6.750	**T.D.:**	1823	**By:**	Gamache	**Date:** 18/01/00	**Contractor:** Haliburton

PRE-FLUSH 40 bbls.@ 8.33 ppg.

Additives: SAPP - Biocide

SPACER 5 bbls@ 8.33 ppg.

Fresh Water

CEMENT

LEAD SLURRY:	403	sacks class	'G'	
Slurry Yield:	1.99	cu.ft./sack		
Mixwater Req't:	11.20	gal./sack		
Actual Slurry Pumped:	142	bbls	@ 12.8	ppg
TAIL SLURRY:	119	sacks class	'G'	
Slurry Yield:	1.16	cu.ft./sack		
Mixwater Req't:	5.12	gal./sack		
Ac. . Slurry Pumped:	25	bbls	@ 15.8	ppg

ADDITIVES

Product	%	Amount
Bentonite	2.8 %	
HR-5	0.4 Gal/Sk	
Halad-322	1 %	
NF-5	.001 Gal/Sk	

DISPLACEMENT

Fluid: Brine @ 9.2 ppg

Theoretical Displ.:	51	bbl.		
Actual Displ.	51.8	bbl @	4.20	bpm
Displaced via	HOWCO			

Bumped plug with 1124 psi

Pressure Tested to: 2300 psi

Bleed back: 0.5 bbls

ACTIVITY	Time
Start Running c 18th	06:30
Casing on Bottom	18:00
Start Circulation	18:30
Start Pressure Test	19:52
Pump Preflush	19:52
Start Mixing	20:07
Finish Mixing	20:40
Start Displacing	20:56
Stop Displ./Bump	21:10
Press. test	21:20

Returns to Surface: 167 bbls mud 0 bbls cmt.

Reciprocate / Rotate Casing: Yes. Reciprocate only.

Top Up Job run: Yes / No No. Not required sx class

Plug Set Make / Type: Standard Haliburton

Centraliser Placement, type/depth: See casing running list for spring type centralizer placement & depth

Remarks: Pump 70 bbls of Baracor 129 (scavenger) & Aldacide G treated mud followed by 40 bbl of SAPP & Aldacide treated preflush. Pumped 5 bbls fresh water P/Tested surface lines Mix & pump 403 sxs of lead cement and 119 sxs of tail. Good returns throughout. Dropped ball & top plug displaced cement with 51 bbls of 9.2 brine solution. Bumped plug on target & P/Test csg to 2300 ps Bleed dwn and recover .5 bbls of brine.

No. JOINTS	DESCRIPTION		MTRS	FROM	TO
	Stick Up.		0.90	0.90	0.00
172	3.5x 9.3 lb/ft J-55 New NK3SB Tubing		1652.01	0.00	1652.01
1	Pup Joint		3.03	1652.01	1655.04
15	3.5x 9.3 lb/ft J-55 New NK3SB Tubing		144.37	1655.04	1799.41
1	Float Collar		0.39	1799.41	1799.80
2	3.5" x 9.3 lb/ft J-55 New NK3SB Tubing		19.26	1799.80	1819.06
1	Float Shoe		0.39	1819.06	1819.45
	RT to top of Bradenhead	**4.84**			
	Bradenhead to top of first collar	**3.64**			

Theoretical Bouyed wt of casing(klb):	52	Bradenhead Height above GL	4"
Actual wt of casing (last joint run-block wt, klb)	55	Casing wt just prior to landing csg/ setting slips (lbs).	95,000.
Landing WT (after cementing and pressure bleed	40		

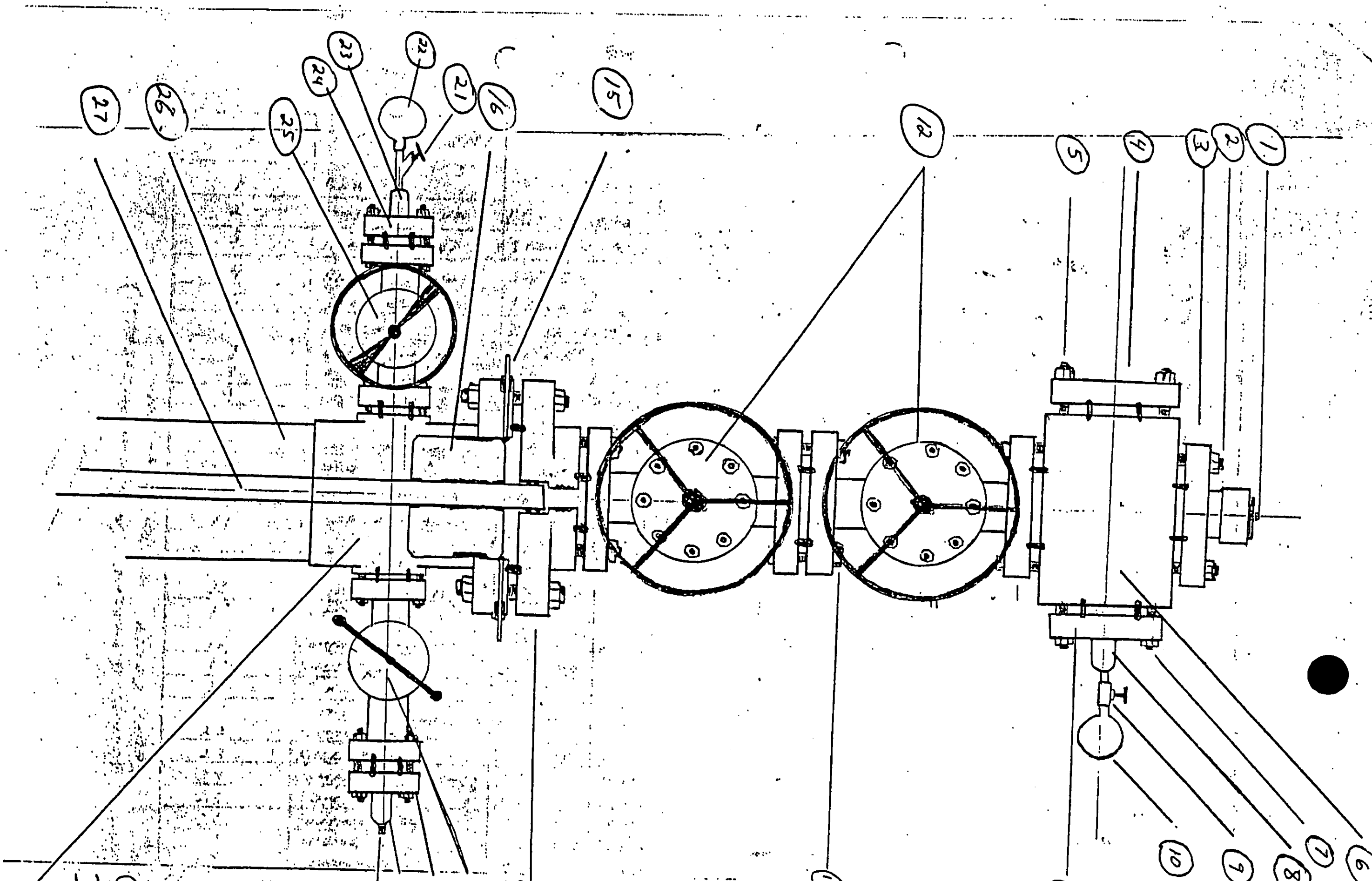
Revision 2, April 1999

907987_098

PENRYN #1 WELL HEAD ASSEMBLY

FROM: NORMAN GAMACHE (MOBILE No. 0412488667)
TO: GEOFF COKER FX: (08) 8224-7141

ITEM	COMPONENT	DESCRIPTION	QTY
1	PLUG	1/2" NPT MALE	1
2	STUD c/w NUTS	1 1/16 x 6" LONG.	8
3	XMASS TREE CAP	3 BOWEN QU PIN + 3.5" EUE BOX / 3 1/8" 5K - R-53 3.12 BORE	1
4	BLIND FLANGE	3 1/8" 5K 3.5" BORE	1
5	STUD c/w NUTS	1 1/16" x 6" LONG	8
6	BLOCK	3 1/8" 5K - R-53 x 3 1/8 5K R-35 x 2 1/16" x 5K - R-24	1
7	STUD c/w NUT	3/4" x 6"	1
8	BULL PLUG	2" NPT TAPPED TO 1/2" NPT 3K	8
9	NEEDLE VALVE	1/2" NPT MALE TO 1/2" NPT FEMALE 10K	1
10	PRESSURE GAUGE	0-5000 PSI 1/2" NPT BOTTOM ENTRY x 4" FACE	1
11	COMPANION FLANGE	2 1/16" 5K TAPPED FOR 2" NPT R-24	1
12	MASTER VALVE	BARTON WOOD 3 1/8" 5K R-35 (TOP VALVE S/N: 30386-000-6 BTM VALVE S/N: 30386-000-4)	2
13	BOLTS c/w NUTS	1 1/8" x 8"	8
14	ADAPTER FLANGE	3 1/8" API 5K R-35 2.95 MIN. BORE 8RD THREAD 3 1/2" NOM. BORE DOUBLE P SEAL TO 11" API 5K R-54 BOTTOM FLANGE	1
15	LOCK DOWN BOLTS		16
16	SLIP + SEAL ASSY.	CAMERON TYPE "S" 11" 5K - 3 1/2" 5K	1
17	GATE VALVE	2 1/16" 5000 PSI CAMERON WKM R-24 S/N: 50005-213	1
18	COMPANION FLANGE	2 1/16" API 5K TO 2" NPT	1
19	BULL PLUG	2" NPT	1
20	PLUG	1/2" NPT MALE	1
21	NEEDLE VALVE	1/2" NPT MALE - 1/2" NPT FEMALE 4K WP.	1
22	PRESSURE GAUGE	0-40000 kPa 1/2" NPT BOTTOM ENTRY x 4" FACE	1
23	BULL PLUG	2" NPT TAPPED TO 1/2" NPT 3K	1
24	COMPANION FLANGE	2 1/16" 5K R-24 TO 2" NPT FEMALE	1
25	GATE VALVE	2 1/16" CAMERON 5K R-24 ASSY No. 141501-31-62-02 TYPE FL	1
26	SURFACE Csg.	9 5/8" BTC 36#/ft K-55	
27	TUBING	3.5" NEW NK3SB J-55 9.3#/ft.	
28	BRADENHEAD	11" 5K R-54 TOP FLANGE TO 9 5/8" BTC BOTTOM ENTRY	1



907987 099

Section 6.0

Time Breakdown Data

- Overview
- Trouble Time Breakdown

907987 (01)

Well : PENRYN #1 **Drilling Co : OD&E** **Rig : OD&E #30**

RT above GL: 4 ft Lat : 38 deg 31 min 40.66 sec Spud Date: 08/01/2000 Release Date: 20/01/2000
GL above MSL : 116 ft Long : 142 deg 57 min 22.52 sec Spud Time: 12:00:00 Release Time: 02:30:00

TIME BREAKDOWN DATABASE - single well overview

Spud date :	**08/01/2000**
TD Depth :	**5,981**
Final Depth :	**5,981**
Total Time (hrs) - Spud/Release :	**268.00**
Total Time (hrs) - Rig Move :	**0.00**
Total NPT (hrs) :	**21.50**

Time-Breakdown : Times by Class and Operation

Class	Hrs
PROGRAMMED EVENT	246.5
TROUBLE - DURING PROGRAM	21.5

Operation	Hrs
DRILLING AHEAD	68.0
TOT. CSG/CMT	55.5
TOT. TRIPPING	37.5
N/U & TEST BOP's	19.5
WIPER TRIP	18.0
CIRCULATE & CONDITION MUD	16.0
WELL-HEAD	14.5
LOGGING	14.0
LAY DOWN PIPE	12.5
SURVEY	7.5
CIRCULATE SAMPLE	1.0
LOT / FIT	1.0
REAM/WASH	1.0
SLIP/CUT DRILL LINE	1.0
BREAK CIRCULATION	.5
RIG SERVICE	.5

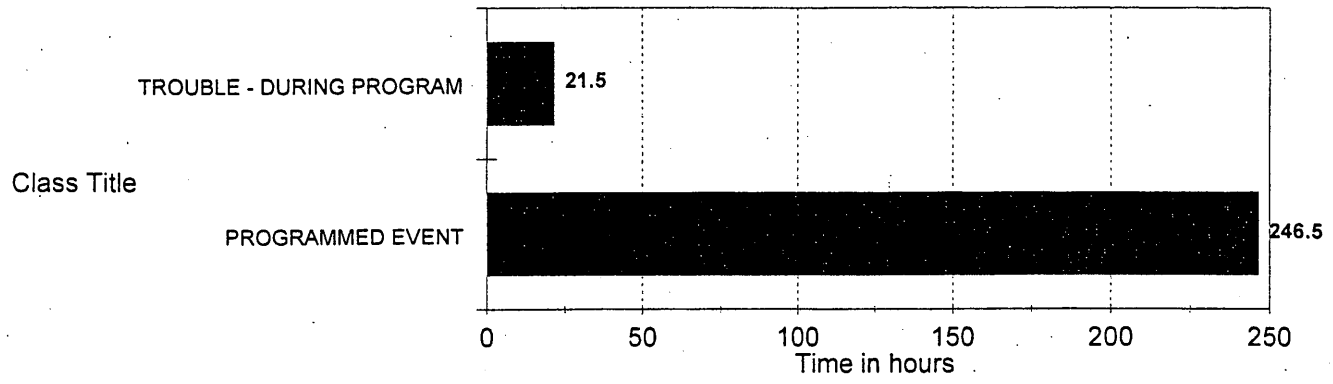
TIME BREAKDOWN DATABASE - single well overview

907987 101

WELL : PENRYN #1

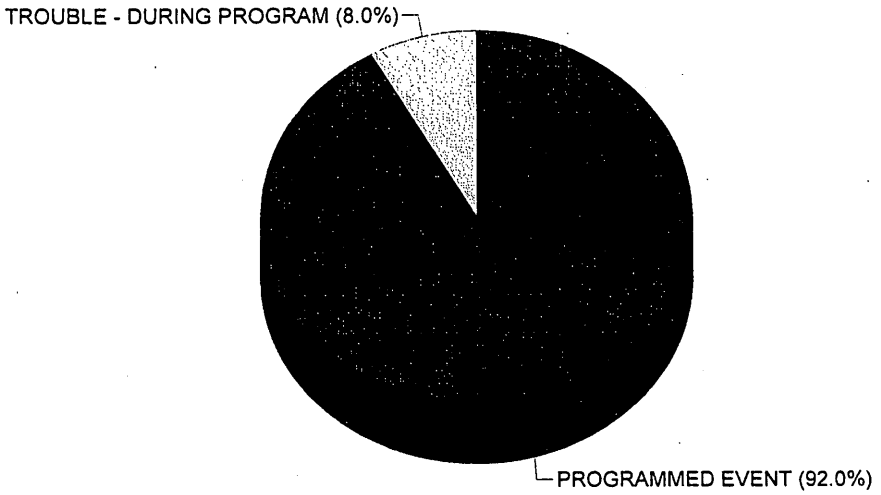
Pacesetter : none selected

Time Breakdown by Class Codes



Time Analysis by Class Codes

Class	Hrs
PROGRAMMED EVENT	246.5
TROUBLE - DURING PROG	21.5



PENRYN #1 Drilling Co.: OD&E [illegible] Rig : OD&E #30

RT above GL: 4 ft Lat : 38 deg 31 min 40.66 sec Spud Date: 08/01/2000 Release Date: 20/01/2000
GL above MSL: 16.5 ft Long : 142 deg 57 min 22.52 sec Spud Time: 12:00:00 Release Time: 02:30:00

TIME BREAKDOWN DATABASE Non-Productive Time Analysis (NPT)

(Pre-Spud time excluded)

Total Time on Well (hrs)	268.0	(days)	11.17	Spud Date :	08/01/2000
Total Trouble Time (hrs)	21.5	(days)	0.90	Total Depth :	5,981
Trouble Time (%)	8.02			Final Depth :	5,981

Total NPT Hours per Phase

PHASE	HOURS
SURFACE HOLE	3.0
SURFACE CASING	0.5
FIRST EVALUATION PHASE	18.0

NPT during programmed time

DATE	PHS	OPERATION	NPT hrs	DEPTH ft	DESCRIPTION OF PROGRAMMED TROUBLE TIME
08/01/2000	SH	SURVEY	0.5	722	Circulate & run MSS survey @ 151m "missrun"
09/01/2000	SH	CIRCULATE & CONDITION MUD	1.0	1,378	Unplug flowline and shaker box.
09/01/2000	SH	CIRCULATE & CONDITION MUD	1.5	1,863	Clean clay from flowline & shaker box.
13/01/2000	SC	CIRCULATE & CONDITION MUD	0.5	2,231	Break circulation, unplug jets and work on pump to obtain constant pump pressure (jacking due to air in system).
15/01/2000	E1	TRIP-OUT TIGHT	4.5	5,981	Pick up kelly and pump out singles from 1464m. to 1387m. Max. overpull= 45,000. Hole periodically packing off. Suspected filter cake build up around stabilisers.
16/01/2000	E1	TRIP-OUT TIGHT	1.0	5,981	Pick up kelly and pump out singles from 1387m. to 1343m. Max. overpull= 30,000
16/01/2000	E1	TRIP-OUT TIGHT	3.5	5,981	Rack kelly & POH from 1343m. to inside casing @ 656m. Max. overpull in open hole = 10,000
16/01/2000	E1	CIRCULATE & CONDITION MUD	0.5	5,981	Pick up kelly & break circulation. Circulate hole clean.
16/01/2000	E1	TRIP-IN	2.0	5,981	RIH to 1772m
16/01/2000	E1	REAM/WASH	1.0	5,981	Pick up kelly, ream & wash 5 singles to bottom (1772m to 1823m).
16/01/2000	E1	CIRCULATE & CONDITION MUD	3.0	5,981	Circulate hole clean, Pump two High vis. sweeps during initial circulation (good hole cleaning on 1st sweep and slight cuttings on final sweep).
16/01/2000	E1	WIPER TRIP	2.5	5,981	Wiper trip 15 stands to 1368m. Encounter tight hole @ 1649m (30, 000 overpull). Work tight hole and continue POH to 1368m. No indications of tight hole on trip in.

NPT during unprogrammed time

DATE	PHS	OPERATION	NPT hrs	DEPTH ft	DESCRIPTION OF UNPROGRAMMED TROUBLE TIME

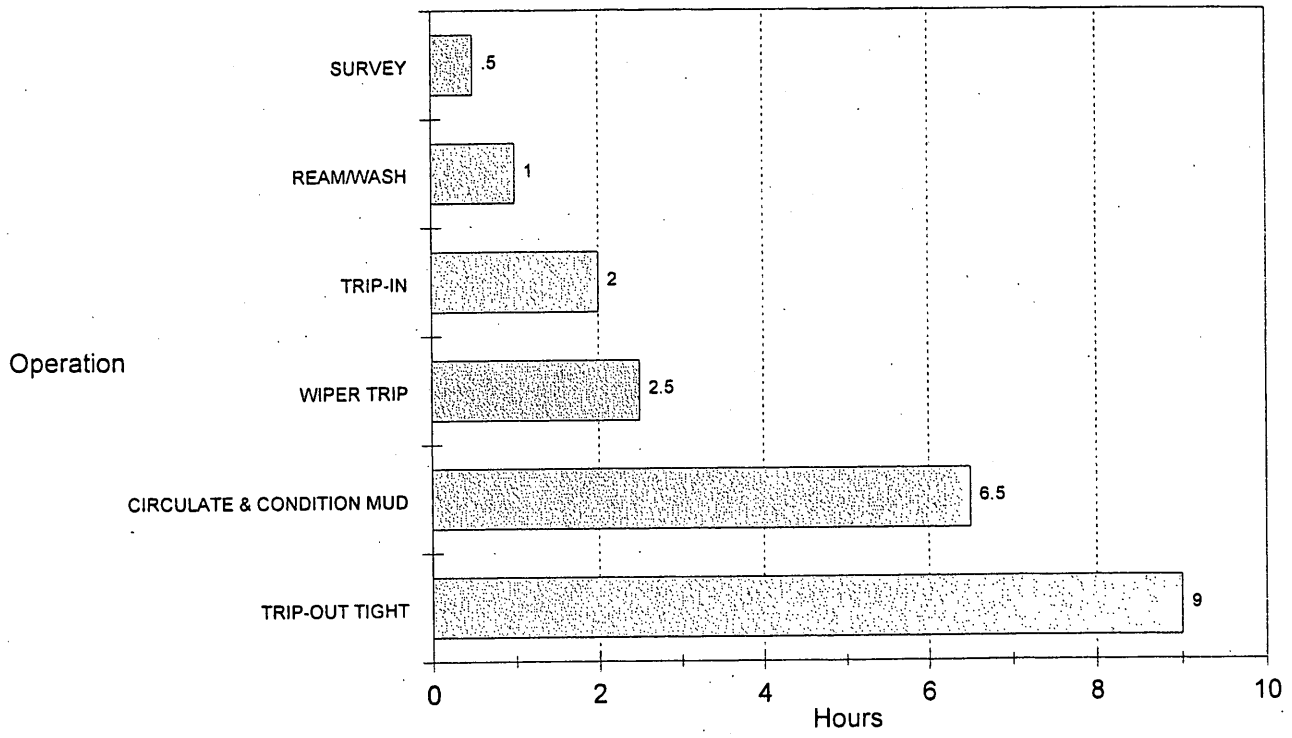
907987_103

RT above GL: 4 ft Lat : 38 deg 31 min 40.66 sec Spud Date: 08/01/2000 Release Date: 20/01/2000
GL above MSL: 115 ft Long : 142 deg 57 min 22.52 sec Spud Time: 12:00:00 Release Time: 02:30:00

TIME BREAKDOWN DATABASE Non-Productive Time Analysis (NPT)

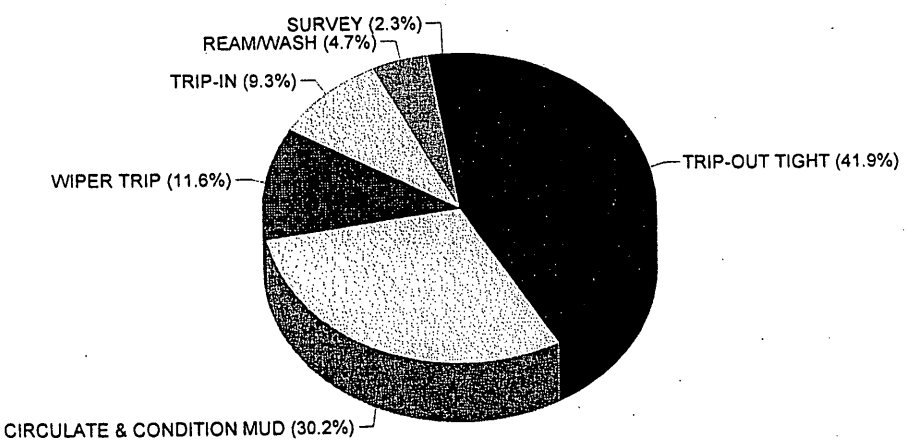
(Pre-Spud time excluded)

Trouble Drilling by Operational Code



Trouble Drilling by Operational Code

OPERATION	HRS
TRIP-OUT TIGHT	9.0
CIRCULATE & CONDITION MUD	6.5
WIPER TRIP	2.5
TRIP-IN	2.0
REAM/WASH	1.0
SURVEY	0.5



907987_104

Section 7.0

Survey Data
- IDS Survey Report

907987 106

PENRYN #1

Drill Co: OD&E **Rig:** OD&E #30

RT above GL: 4 ft Lat : 38 deg 31 min 40.66 sec Spud Date: 08/01/2000 Release Date: 20/01/2000
GL above MSL : 116 ft Long : 142 deg 57 min 22.52 sec Spud Time: 12:00:00 Release Time: 2:30:00

Magnetic Declination (degs): 7.00
Projection:

DEVIATION SURVEY

MD (ft)	TVD (ft)	INCL (deg)	AZIMUTH (deg)	CORRECT. AZ (deg)	DOGLEG (deg/100ft)	'V' SECT (ft)	N/S (ft)	E/W (ft)	CLOSURE (ft)
0		0.00	0	7					
30	30	0.75	55	62	0.7	0	0	0	0
205	205	0.25	55	62	0.1	1	1	2	2
402	402	1.00	55	62	0.1	3	2	3	4
432	432	1.75	50	57	0.8	4	2	4	5
633	633	0.50	155	162	0.3	7	3	7	8
830	830	0.50	85	92	0.1	8	2	8	8
976	976	1.50	305	312	0.4	7	3	7	8
1,120	1,120	1.50	99	106	0.6	7	4	8	9
1,274	1,274	2.00	90	97	0.1	12	3	12	13
1,428	1,428	3.50	90	97	0.3	19	2	20	20
1,580	1,579	4.00	85	92	0.1	29	2	29	30
1,726	1,725	4.50	100	107	0.2	40	-0	40	40
1,813	1,812	5.50	103	110	0.4	47	-3	47	47

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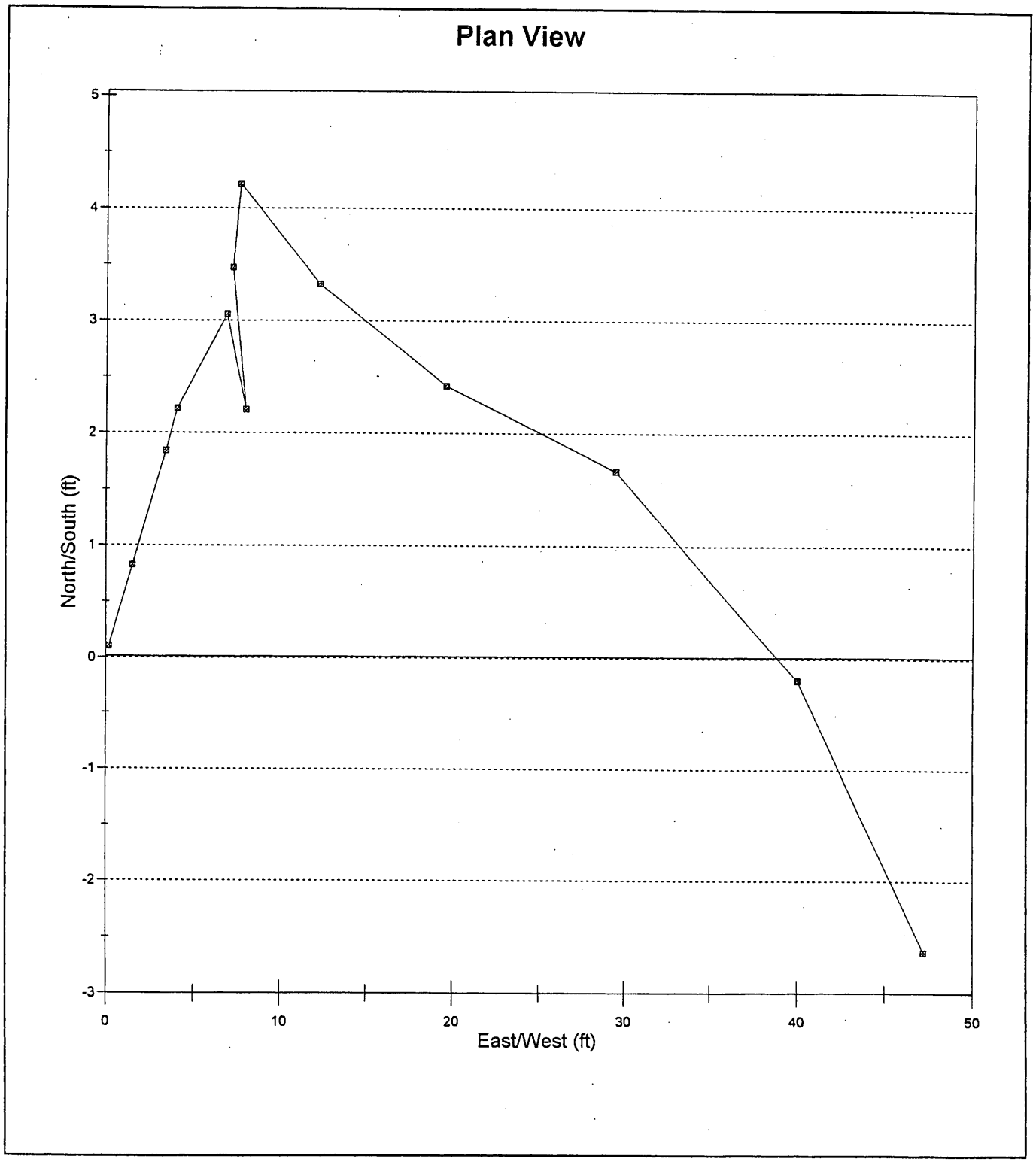
PENRYN #1

Drill Co: OD&E **Rig:** OD&E #30

RT above GL: 4 ft Lat : 38 deg 31 min 40.66 sec Spud Date: 08/01/2000 Release Date: 20/01/2000
GL above MSL : 116.5 ft Long : 142 deg 57 min 22.52 sec Spud Time: 12:00:00 Release Time: 2:30:00

Magnetic Declination (degs): 7.00
Projection:

DEVIATION SURVEY



907987 108

PENRYN #1

Drill Co: OD&E

Rig: OD&E #30

RT above GL: 4 ft
GL above MSL : 146.6ft

Lat : 38 deg 31 min 40.66 sec
Long : 142 deg 57 min 22.52 sec

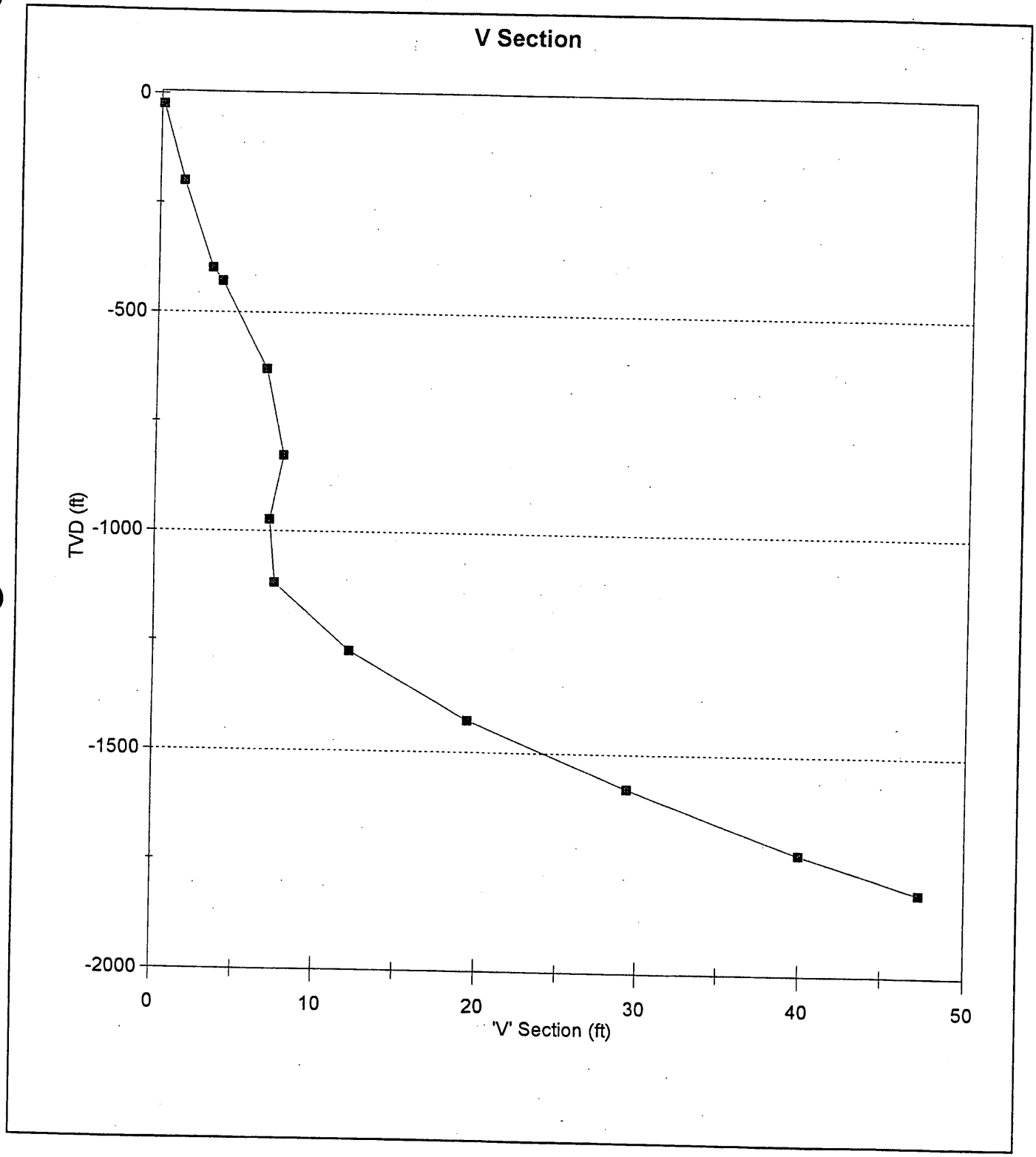
Spud Date: 08/01/2000
Spud Time: 12:00:00

Release Date: 20/01/2000
Release Time: 2:30:00

Magnetic Declination (degs): 7.00

Projection:

DEVIATION SURVEY



Section 8.0

Well Cost Information

- Well Phase Cost Summary
- Internal Supplementary Approval Report/s

WELL:	P			Y DRILLI	TRACKII					
TYPE:	2 String Gas Well	Total Cum Costs	$0	$598,693	$641,618	$849,139	$926,721	$1,092,530	$1,408,485	$328,028
RIG:	ODE 30	Phase Variance	$22,997.38	-$115,903.00	$18,503.63	$8,946.88	$148,144.72	-$11,106.24	-$58,041.09	$175,595.22
	Start Date/Time of Phase			03/01/2000 00:0	01/2000 12:00	10/01/2000 02:30	13/01/2000 02:00	15/01/2000 15:30	17/01/2000 11:30	08/01/2000 12:00
	End of Phase Date/Time			8/01/00 12:00	10/01/2000 02:30	13/01/2000 02:00	15/01/2000 15:30	17/01/2000 11:30	20/01/2000 02:30	15/01/2000 16:30
	Actual Time for Each Phase (days)			32:00 hrs	38:30 hrs	71:30 hrs	61:30 hrs	44:00 hrs	63:00 hrs	171:30 hrs
	End of Phase Depth			0.0 m	2,218.0 m	2,218.0 m				
Account #	DESCRIPTION	NOPE ($A)	TOTAL ($A)	PreSpud ($A)	Top hole ($A)	Surface Casing ($A)	Prod Hole ($A)	Total Evaluation ($A)	Prod.Casing ($A)	Spud to TD drilling ONLY
	IN-HOUSE & LABOUR COSTS			Day 5.50	Day 7.10	Day 10.08	Day 2.56	Day 1.83	Day 17.10	Day 7.15
TOTAL: 001	001 For SA only	$74,162	$74,162	$74,162	$0	$0	$0	$0	$0	$0
812 / 001	Drilling Time costs-Office & Field	$74,162	$74,162	$74,162	$0	$0.00	$0	$0.00	$0.00	$0
880 / 001	Operations Geology-Time Costs	$0	$0	$0	$0	$0.00	$0	$0.00	$0.00	$0
218 / 001	Petroleum Development-Time Costs	$0	$0	$0	$0	$0.00	$0	$0.00	$0.00	$0
225 / 001	Exploration-Time Costs	$0	$0	$0	$0	$0.00	$0	$0.00	$0.00	$0
226 / 001	Drilling-Time Costs	$0	$0	$0	$0	$0.00	$0	$0.00	$0.00	$0
242 / 001	Jackson Field Services-Time Costs	$0	$0	$0	$0	$0.00	$0	$0.00	$0.00	$0
629	Overheads	$44,992	$44,992	$44,992	$0	$0.00	$0	$0.00	$0.00	$0
012	Australian travel and Accommodation	$5,000	$5,000	$5,000	$0	$0.00	$0	$0.00	$0.00	$0
072	Data Reproduction	$500	$500	$500	$0	$0.00	$0	$0.00	$0.00	$0
183	Insurance	$4,000	$4,000	$4,000	$0	$0.00	$0	$0.00	$0.00	$0
558	Camp Accomodation	$2,000	$2,000	$2,000	$0	$0.00	$0	$0.00	$0.00	$0
249	MIS Overheads	$0	$0	$0	$0	$0.00	$0	$0.00	$0.00	$0
558	Flights Allocation (to/from) Field	$4,000	$4,000	$4,000	$0	$0.00	$0	$0.00	$0.00	$0
		$134,654	$134,654	$134,654	$0	$0	$0	$0	$0	$0
	DRILLING COSTS									
301	Rig Rate	$228,500	$218,824	$2,400	$29,324	$54,459	$48,843	$33,513	$50,385	$130,628
301	Rig Extras (Drilling Tools)	$10,379	$0	$0	$0	$0	$0	$0	$0	$0
303	Mob/Demob	$147,000	$147,000	$147,000	$0	$0	$0	$0	$0	$0
304	Rig Move	$90,000	$104,000	$104,000	$0	$0	$0	$0	$0	$0
351	Misc Drilling Contractor Charges	$75,804	$46,808	$14,868	$4,243	$7,880	$6,024	$4,849	$6,843	$20,147
390	Wet Weather Standby	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$551,683	$514,731	$268,268	$33,567	$62,339	$54,866	$38,362	$57,328	$150,772
	LOGISTICS									
329	Water Source & Supply/Haulage	$10,000	$14,679	$13,800	$0	$0	$0	$0	$870	$0
331	Access & Lease Preparation	$81,108	$82,644	$82,644	$0	$0	$0	$0	$0	$0
332	Lease Clean Up	$32,978	$32,978	$32,978	$0	$0	$0	$0	$0	$0
391	Lease Maintenance	$4,063	$4,063	$4,063	$0	$0	$0	$0	$0	$0
502/501	Air Charter Flights	$0	$0	$0	$0	$0	$0	$0	$0	$0
509	Transport	$42,000	$35,078	$14,600	$470	$0	$0	$0	$20,000	$470
460	Communications	$3,700	$4,196	$1,875	$321	$596	$513	$367	$525	$1,429
295 / 620	Supply Support Allocation	$0	$0	$0	$0	$0	$0	$0	$0	$0
557	Road Maintenance-SABU	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$173,847	$173,821	$149,960	$791	$596	$513	$367	$21,395	$1,899
	MATERIALS									
306	Drill Bits	30152	$4,839	$0	$0	$4,839	$0	$0	$0	$4,839
307	Drilling Fluids - Materials	26543	$15,065	$0	$1,039	$265	$10,177	$3,585	$0	$11,481
309	Cement - Materials	26500	$29,938	$0	$0	$14,120	$0	$0	$15,818	$14,120
340	Casing & Tubing	124575	$131,790	$0	$0	$61,483	$0	$0	$70,307	$61,483
342	Casing Equipment	10199	$10,803	$0	$0	$4,585	$0	$0	$6,218	$4,585
349	Downhole Production Equipment	0	$0	$0	$0	$0	$0	$0	$0	$0
350	Wellhead Equipment	20637	$60,464	$0	$0	$10,464	$0	$0	$50,000	$10,464
424	Fuel	0	$0	$0	$0	$0	$0	$0	$0	$0
471	Misc Equipment / Materials	5000	$0	$0	$0	$0	$0	$0	$0	$0
		$243,606	$252,899	$0	$1,039	$95,756	$10,177	$3,585	$142,343	$108,971
	CONTRACT SERVICES									
310	Cement - Services	$59,500	$75,062	$0	$0	$34,849	$0	$0	$40,213	$34,849
311	Coring - Services, Rentals & Materials	$4	$0	$0	$0	$0	$0	$0	$0	$0
312	Core Analysis	$0	$0	$0	$0	$0	$0	$0	$0	$0
313	Electric Logging & Ancillaries costs	$116,800	$114,891	$0	$0	$0	$0	$114,891	$0	$0
315	Mud Logging	$31,450	$29,077	$9,350	$2,727	$5,065	$4,356	$3,117	$4,483	$12,148
316	DSTs - Services	$0	$0	$0	$0	$0	$0	$0	$0	$0
318	Sample Analysis (DSTs)	$0	$0	$0	$0	$0	$0	$0	$0	$0
328	Fishing	$0	$0	$0	$0	$0	$0	$0	$0	$0
333	Tubular Goods Inspection & Repair	$15,000	$0	$0	$0	$0	$0	$0	$0	$0
335	Equipment Lost In Hole	$0	$0	$0	$0	$0	$0	$0	$0	$0
338	Casing/Tubing Running	$30,000	$32,357	$0	$0	$0	$0	$0	$32,357	$0
357	Drilling Fluids - Services	$13,630	$10,947	$3,520	$1,027	$1,907	$1,640	$1,173	$1,680	$4,573
370	Directional / MWD	$0	$0	$0	$0	$0	$0	$0	$0	$0
382	Air Underbalanced Drilling Incrementals	$0	$0	$0	$0	$0	$0	$0	$0	$0
386	Drilling Tool Rental and servicing	$8,418	$16,011	$5,792	$1,689	$3,137	$2,699	$1,930	$2,764	$7,525
206	Geologicist/Geophysicst - Field	$0	$0	$0	$0	$0	$0	$0	$0	$0
006	Contract Rig Supervision - Field	$27,750	$28,380	$6,875	$2,005	$3,724	$3,203	$2,292	$8,281	$8,932
008	Office Based Professional Services	$6,750	$0	$0	$0	$0	$0	$0	$0	$0
212	Adhoc Contract Services - Field	$15,000	$25,000	$20,000	$0	$0	$0	$0	$5,000	$0
260	Rental Equipment (Santos)	$3,330	$855	$279	$80	$149	$128	$92	$131	$357
303	Fixed Costs Allocation	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL		$327,692	$332,580	$45,812	$7,528	$48,831	$12,026	$123,495	$94,889	$68,385
	IN-HOUSE LABOUR	$134,654	$134,654	$134,654	$0	$0	$0	$0	$0	$0
	DRILLING COSTS	$551,683	$514,731	$268,268	$33,567	$62,339	$54,866	$38,362	$57,328	$150,772
	LOGISTICS	$173,847	$173,821	$149,960	$791	$596	$513	$367	$21,395	$1,899
	MATERIALS	$243,606	$252,899	$0	$1,039	$95,756	$10,177	$3,585	$142,343	$108,971
	CONTRACT SERVICES	$327,692	$332,580	$45,812	$7,528	$48,831	$12,026	$123,495	$94,889	$68,385
	TOTAL COSTS	$1,431,482	$1,408,485	$598,693	$42,925	$207,521	$77,581	$165,809	$315,955	$328,028
	TOTAL WELL COST TO DATE			$598,693	$641,618	$849,139	$926,721	$1,092,530	$1,408,485	$328,028
	NOPE COST PER PHASE	$1,431,480	$1,421,242	$482,790	$61,429	$216,468	$225,726	$176,915	$257,914	$503,623
	DIFFERENCE (actual - estimate)		$12,757.38	-$115,903.00	$18,503.63	$8,946.88	$148,144.72	-$11,106.24	-$58,041.09	$175,595.22

DailyCostTrack sheet Jan_2000_R2 Penryn #1.xls

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Section 9.0

Safety and Environment
- Field Safety Reports

APPENDIX XIII: RIG SPECIFICATIONS

ODE RIG #30 SPECIFICATIONS

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CONTRACTOR'S EQUIPMENT

CONTRACTOR'S RIG	:	Rig #30 - rated to 11,000 ft. with 4.1/2," drill pipe
DRAWWORKS	:	Ideco H725 Hydrair, driven by EMD D79 electric motor. Maximum input 900 hp Parmac V-80 Hydromatic brake. Transmission - 3 speed transmission with Fawick 40CB525 air clutch.
ENGINES	:	Four (4) Caterpillar Model 3412 PCTA diesel engines.
SUBSTRUCTURE	:	One piece substructure 14' high x 13'6" wide x 50' long with 12' BOP clearance. Setback area loading: 250,000 lbs Casing area loading: 275,000 lbs
MAST	:	Dreco Model #: M12713-510 Floor Mounted Cantilever Mast designed in accordance with API Specification 4E Drilling & Well Servicing Structures. Hook load Gross Nominal Capacity - 510,000 lbs with:- 10 lines strung - 365,000 lbs 8 lines strung - 340,000 Lbs Clew working height of 127' Base width of 13'6". Adjustable racking board with capacity for:- i) 108 stands of 4.1/2" drill pipe, ii) 10 stands of 6.1/2" drill collars, iii) 3 stands of 8" drill collars Designed to withstand an API windload of 84 mph with pipe racked and 100 mph with no pipe racked.
CATHEADS	:	One (1) Foster Model 37 make-up spinning cathead mounted on drillers side. One (1) Foster Model 24 break-out cathead mounted off drillers side.
CROWN BLOCK	:	215 ton with five (5) 36" sheaves and one (1) 36" fastline sheave grooved 1.1/8".
TRAVELLING BLOCK	:	One (1) 667 Crosby McKissick 250 ton combination block hook Web Wilson. 250 ton Hydra hook Unit 5 - 36" sheaves.
SWIVEL	:	One (1) Oilwell PC-300 ton swivel. 192 tons API bearing rating at 100 rpm.
RIG LIGHTING	:	Explosive proof fluorescent. As per approved State Specifications.
MUD PUMPS	:	Two (2) Gardner Denver mud pumps Model PZ-8 each driven by 800 HP EMD motors. 8" stroke with liner size 6".
MIXING PUMPS	:	Five (5) Mission Magnum 5" x 6" x 14" centrifugal pumps complete with 50 HP, 600 Volt, 60 Hz, 3 phase explosion proof electric motors.
MUD AGITATORS	:	Six (6) Geolograph/Pioneer 40TD - 15" 'Pitbull' mud agitators with 15 HP, 60 Volt, 60 HZ, 3 phase electric motors.
SHALESHAKER	:	Two (2) DFE SCR-01 Linear motion shale shakers. Adjustable screen deck - 1° to + 5°.
DEGASSER	:	One (1) Drilco See-Flo.
DESILTER	:	One (1) Pioneer T12-4 'Siltmaster' desilter. 12 x 4" cones. Approximate output of 2,250 litres per minute.

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

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

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

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

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

- Sixteen (16) 11 gallon bladder type bottles.
- One (1) 20 HP electric driven triplex pump 600 volts, 60 HZ, 3 phase motor and controls.
- One (1) Wagner Model A - 60 auxiliary air pump 4.5 gals/minute.
- One (1) Wagner Model UM2SCB5S mounted hydraulic control panel with five (5) 1" stainless steel fitted selector valves and two (2) stripping controls and pressure reducing valves.
- Three (3) 4" hydraulic readout gauges:
  - one for annular pressure
  - one for accumulator pressure
  - one for manifold pressure

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

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

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

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

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

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

MUD TANKS (SHAKER) : One (1) Shaker tank total 236 bbls

- trip tank - 24 bbls
- sand trap - 92 bbls
- settling tank - 120 bbls

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(INTERMEDIATE)	:	One (1) Intermediate tank total 337 bbls. • with desilter tank - 113bbls • with desander tank - 112bbls • with reserve tank - 112bbls
SUCTION)	:	One (1) Suction tank total 222 bbls. • with pill tank - 23 bbls • with two (2) suction tanks - 100 bbls each Total system: 795 bbls
TRIP TANK PUMP	:	One (1) Mission Magnum 2" x 3" centrifugal pump complete with 20 HP, 600 Volts, 60 HZ, 3 phase explosion proof motors.
CHOKE MANIFOLD	:	One (1) Choke manifold, complete with Cameron type 'FL' 3" 5000 psi valves and Hydraulic Swaco "super" choke.
DRILL PIPE	:	2,280m - 4.1/2" OD 16.60 lb/ft Grade "G" drill pipe. 465m - 4.1/2" OD 16.60 lb/ft Grade "E" drill pipe. 2,500m - 3.1/2" OD 13.30 lb/ft Grade "G" drill pipe.
PUP JOINTS	:	One (1) - 5' 4.1/2" OD Grade 'G'. One (1) - 5' 3.1/2" OD Grade 'G'. One (1) - 10' 4.1/2" OD Grade 'G'. One (1) - 10' 3.1/2" OD Grade 'G'. One (1) - 15' 4.1/2" OD Grade 'G'.
HEVI-WATE DRILL PIPE	:	142m (15 jts) of 4.1/2" H.W.D.P. 142m (15 jts) of 3.1/2" H.W.D.P.
DRILL COLLARS	:	60m - 8" OD drill collars 230m - 6.1/4" OD drill collars 285m - 4.3/4" OD drill collars
KELLY	:	One (1) Square Kelly drive 4.1/4" x 40' complete with Scabbard - 4" IF pin connection. One (1) Hex Kelly drive 3.1/2" x 40' complete with Scabbard. 3.1/2" IF pin connection.
KELLY DRIVE	:	One (1) 20 HDP Varco kelly drive bushing to suit 4.1/4" square kelly and changeable rollers to suit 3.1/2" Hex Kelly.
KELLY COCK (UPPER)	:	One (1) Griffith Upper Kelly Cock 7.3/4" with 6.5/8" API connections.
KELLY COCK (LOWER)	:	One (1) Griffith Lower Kelly Cock 6.1/2" OD with 4" IF connections. One (1) Griffith Lower Kelly Cock 4.3/4" OD with 3.1/2," IF connections.
FISHING TOOLS	:	One (1) only 10.5/8" Bowen series 150 FS overshot c/w grapples md packoffs to fish Contractors downhole equipment. One (1) only 8.1/8" Bowen series 150 FS overshot c/w grapples and packoffs to fish Contractors downhole equipment. One (1) only 5.3/4" Bowen series 150 FS overshot c/w grapples & packoffs to fish Contractors downhole equipment. One (l) only 8" OD fishing magnet 4.1/2" reg pin. One (l) only Reverse circulating junk basket 4" IF box. One (1) only Fishing Jar 6.1/2" OD 4" IF pin & box.

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

SUBSTITUTES :

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

HANDLING TOOLS :

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

ROTARY TONG : One set Web Wilson type 'AAX' c/w latch & lug jaws 13.3/8" - 3.1/2".

BIT BREAKERS : One (1) each 17.1/2", 12.1/4", 8.1/2", 6".

FUEL TANK :

1 only 25,000 litres.
1 only 30,000 litres.

WATERTANK : 1 only 400 bbls.

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DRILLING RATE RECORDER	:	1 only 6 pen drill sentry recorder to record: • weight (D) • penetration (feet) • pump pressure (0-6,000 psi) • electric rotary torque • rotary speed (rpm) • pump spm (with selector switch)
DEVIATION INSTRUMENT	:	1 set Totco 'Double Shot' deviation instrument 0°-8°.
INSTRUMENTS & INDICATORS	:	1 only Martin Deck Type 'D' weight gauge. 1 only National Type 'D 'dead man anchor. • Electric rotary torque gauge • Pit scan • SPM gauge (2 per console) • Rotary rpm gauge
MUD TESTING	:	1 set Baroid mud testing laboratory (standard kit).
RATHOLE DRILLER	:	One (1) fabricated rotary table chain driven.
WATER PUMPS	:	Three (3) Mission Magnum 2" x 3" centrifugal pumps c/w 20 HP, 600 Volts, 60 HZ, 3 phase explosion proof motors.
CUP TESTER	:	One (1) Grey Cup Tester c/w test cups for 9.5/8" & 133/8".
DRILLING LINE	:	5,000' 1.1/8" - E.I.P.S.

TRANSPORT EQUIPMENT AND MOTOR VEHICLES

1 - International 530 Forklift

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

CAMP EQUIPMENT

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

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

SAFETY EQUIPMENT

General Safety Equipment to be provided By the drilling Contractor

Wet weather gear
Safety glasses

Sufficient personal protective equipment will be available at

Safety hats	all times. All equipment will
Safety footwear	comply with International
Safety belts c/wlines	standards.
Ear protection -grade 4	
Leather gloves	
Rubber gloves	
Rubber aprons	
Fullface visors	
Eye shields (for grinding machines, etc)	
Dust masks	Pictographic signs will be
Rubber gloves - elbow length for chemical handling	displayed in prominent
"No-Smoking" signs	locations around the Rig giving
"Hard-Hat" signs	wanting to a specific hazard.
Eye Wash Stations	
Quantity	3
Make/model	1 x Enware eye wash
	Deluge shower.
	2 x Protector eye wash station
Located at	Intermediate tank
	Dog House
	Mud Hopper
Derrick Safety Equipment	
Derrick escape (Geronimo)	Geronimo
Derrick safety belts	Lewis Type SC
Derrick Climbing Assist	
Make	R.T.C.
Fire Extinguishers	
Make	Quell or equivalent
Type: 1. Dry Chemical	10 x 9kg
2. Other	2 x 11.5 BCF
<u>First Aid Equipment</u>	
First Aid Kits	
Quantity	2
Located at office	Dog House, Toolpushers Office
Bum Kits/Fire Blankets	
Quantity	2 - H2O GEL blanket
Located at office	Toolpushers office (1), Dog House (1)
Stretchers	
Quantity	2
Type	1 MSA Stokes
	1 MSA Stokes Fold canvas
Located at	Dog House/Offices

ENCLOSURE I: 1: 200m COMPOSITE LOG

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PE603027

This is an enclosure indicator page.
The enclosure PE603027 is enclosed within the container PE907987 at this location in this document.

The enclosure PE603027 has the following characteristics:

ITEM_BARCODE	PE603027
CONTAINER_BARCODE	PE907987
NAME	Encl.1 Penryn-1 Composite Well Log
BASIN	OTWAY
ONSHORE?	Y
DATA_TYPE	WELL
DATA_SUB_TYPE	MONTAGE_LOG
DESCRIPTION	Encl.1 Penryn-1 Composite Well Log, Scale1:200, Resistivity-Sonic-GR (PEX-AS), Wireline Pressure Points (MDT), W1299, PEP108. Enclosure 1 contained within "Penryn-1 Well Completion Report" [PE907987].
REMARKS	
DATE_WRITTEN	
DATE_PROCESSED	
DATE_RECEIVED	07-AUG-2000
RECEIVED_FROM	Santos (BOL) Pty Ltd
WELL_NAME	Penryn-1
CONTRACTOR	
AUTHOR	
ORIGINATOR	Santos (BOL) Pty Ltd
TOP_DEPTH	25
BOTTOM_DEPTH	1822.5
ROW_CREATED_BY	DN07_SW

(Inserted by DNRE - Vic Govt Mines Dept)

ENCLOSURE II: 1: 500m MUDLOG

PE603028

This is an enclosure indicator page.
The enclosure PE603028 is enclosed within the container PE907987 at this location in this document.

The enclosure PE603028 has the following characteristics:

ITEM_BARCODE	PE603028
CONTAINER_BARCODE	PE907987
NAME	Encl.2 Penryn-1 Mud Log
BASIN	OTWAY
ONSHORE?	Y
DATA_TYPE	WELL
DATA_SUB_TYPE	MUD_LOG
DESCRIPTION	Encl.2 Penryn-1 Mud Log, Scale 1:500, by Santos (BOL) Pty Ltd, W1299, PEP108. Enclosure 2 contained within "Penryn-1 Well Completion Report" [PE907987].
REMARKS	
DATE_WRITTEN	
DATE_PROCESSED	
DATE_RECEIVED	07-AUG-2000
RECEIVED_FROM	Santos (BOL) Pty Ltd
WELL_NAME	Penryn-1
CONTRACTOR	Santos (BOL) Pty Ltd
AUTHOR	
ORIGINATOR	Santos (BOL) Pty Ltd
TOP_DEPTH	0
BOTTOM_DEPTH	1900
ROW_CREATED_BY	DN07_SW

(Inserted by DNRE - Vic Govt Mines Dept)

ENCLOSURE III: STRUCTURE MAPS

PE907988

This is an enclosure indicator page.
The enclosure PE907988 is enclosed within the container PE907987 at this location in this document.

The enclosure PE907988 has the following characteristics:

ITEM_BARCODE	PE907988
CONTAINER_BARCODE	PE907987
NAME	Encl.3 Penryn Gas Field Depth Map
BASIN	OTWAY
ONSHORE?	Y
DATA_TYPE	SEISMIC
DATA_SUB_TYPE	HRZN_CONTR_MAP
DESCRIPTION	Encl.3 Penryn Gas Field Near Top Waarre Sand Depth Structure Map (Pre-Drilling) (Based on average velocity at Penryn-1) Scale 1:10000, C.I: 5m, W1299, PEP108. Enclosure 3 contained within " Penryn-1 Well Completion Report" [PE 907987].
REMARKS	Enclosure is labelled 'Enclosure 1' but listed as 'Enclosure 3' in contents.
DATE_WRITTEN	29-FEB-2000
DATE_PROCESSED	
DATE_RECEIVED	07-AUG-2000
RECEIVED_FROM	Santos (BOL) Pty Ltd
WELL_NAME	Penryn-1
CONTRACTOR	
AUTHOR	
ORIGINATOR	Santos (BOL) Pty Ltd
TOP_DEPTH	
BOTTOM_DEPTH	
ROW_CREATED_BY	DN07_SW

(Inserted by DNRE - Vic Govt Mines Dept)