Essential Petroleum Resources Limited

PEP 152
ONSHORE OTWAY BASIN, VICTORIA

WELL COMPLETION REPORT

Port Fairy 1

December 2002

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1 SUMMARY

Port Fairy 1 was drilled as an exploration well. The well is located approximately 3.5km north of Port Fairy township as shown on Figure 1. The primary exploration objectives were to test for commercial gas in sandstones of the Waarre and Flaxman Formations. Sandstones in the Nullawarre Greensand and the Pebble Point Formation were secondary objectives.

The Port Fairy structure is a northeast trending anticline with crestal faulting. Closure is mapped at the top of the Waarre Formation and at the top Pebble Point Formation. Other target horizons were also expected to be closed at the drilling location. The location of the well on the structure is shown on Figure 2. A near-crestal location was chosen at VP 345 on seismic line OBE00-01. The location was chosen to coincide with a seismic AVO anomaly. The location was shifted approximately 200m west to avoid boggy surface conditions.

Port Fairy 1 was drilled in January 2002. Mitchell Drilling Rig 50 proved ideal for the project; with capacity for drilling with both air and mud with minimal rig-up time, having low visual and noise impact, and requiring a relatively small drill pad.

The surface basalt was air drilled effectively and a 13? ” conductor was cemented at 67.4m. 12 ¼” hole was drilled to 821m and cased with 9? ” casing. The remainder of the hole to total depth of 1550m was drilled at 8 ½”. High rates of penetration were achieved with a PDC bit. All drilling and casing operations proceeded without significant delays.

Formation tops were intersected approximately as prognosed. Sandstone, and porosity in the target Flaxman/Waarre zone was very poorly developed although good gas shows were recorded. A high gas background continued into the upper Eumeralla Formation. Log interpretations showed potential gas saturation through the Flaxman/Waarre/upper Eumeralla interval, but with low porosities, and also in sands in the Paaratte Formation where gas shows had not been detected while drilling.

A program of straddle testing was undertaken, but repeated plugging of the DST tools prevented flow testing of the target zones. The well was cased with 7” casing, and suspended for further evaluation. The Mitchell Drilling rig was demobilised on 24 January 2002.

The evaluation program was commenced from 18 March 2002 using a mobile crane and an Imperial Snubbing 2? ” snubbing unit. A velocity survey (held over from the original logging program) was carried out prior to well testing. Two zones were perforated and tested (1406m – 1402m, 1443m – 1452m) in the uppermost Eumeralla Formation and produced 5.4 barrels of water over a 1 hour interval. A zone in the upper Paaratte Formation (862m – 866m) flowed fresh water to surface at a stable rate of 240 BWPD. The rig was released on March 26, 2002.

Testing was recommenced with Sclumberger on 7 August 2002. The completion fluid in the tubing was swabbed down to ~591m. Three short intervals in the Flaxman Formation in the zone 1347m – 1358m were perforated. Perforations at 1356.5 to 1358.0m were monitored for 15 minutes with no increase in wellhead pressure. After sitting overnight the fluid level in the wellbore had risen to 529m, there was an air blow (no gas) at the wellhead. The interval 1352.5m to 1354 was perforated with a 2 psi pressure rise noted at the wellhead. Fluid had risen to 518m. The zone 1347m to 1348m was perforated with a 1 psi pressure increase noted at the wellhead. The fluid level was ~520m. The well was swabbed to catch a sample. A black residue in water was analysed and found to be

lubricating oil. The well was left suspended on 10 August pending a decision on future testing.

The well was inspected on 16 September 2002 and a pressure of 900 psi was recorded on the wellhead. The well was flared and gas samples were taken. A static pressure gradient survey on 22 September showed approximately 223m of gas, 15m of oil and 1120m of completion brine in the tubing (measured from the base of the perforated interval at 1358m). Swabbing of the well on 23 September produced samples of light 52º API oil. The wellhead pressure returned to 900 psi.

The well has been resuspended pending further engineering, petrophysical and seismic interpretation studies.

2 WELL HISTORY

2.1 GENERAL DATA

General well data are given in Table 1, and the location shown in Figures 1 & 2.

Table 1: General well data

Well name:	Port Fairy 1
Classification:	Exploration
Permit operator:	Oil Company of Australia Limited
Well operator	Essential Petroleum Resources Limited
Basin:	Otway, onshore western Victoria
Lease:	PEP 152
Seismic location:	Line OBE00-01, Shotpoint 345, location offset 200m west.
Coordinates:	Latitude 38° 21’ 38.40”S, Longitude 142 12’49.03”E Easting 606, 030.35m, Northing 5,753,470.16m, MGA Zone 54
Datum:	GDA94
Elevation:	Ground Level (GL): 7.67 metres AHD Rotary Table (RT): 12.09 metres AHD (All depths relate to RT unless otherwise stated)
Property owner:	Bill McClaren, Tayfield Station
Nearest town:	The coastal township of Port Fairy, approximately 3.5 km south of the well.
Nearest well:	Government water bore Belfast 4, approximately 4km SSE of the well.
Measured depth	Driller: 1550.0 m
	Logger: 1523.0 m (logger could not reach TD)
Spud date:	07:00 hours January 9, 2002.
TD reached:	18:30 hours January 18, 2002.
Days to Drill:	9.5 days
Date suspended:	04:00 hours, January 24, 2002.
Drill rig released:	12:00 hours January 24, 2002.
Testing commenced:	07:00 March 19, 2002
Testing completed:	18:00 September 24, 2002
Well status:	Suspended oil & gas well.

Figure 1: Port Fairy Top Waarre Formation Two Way Time

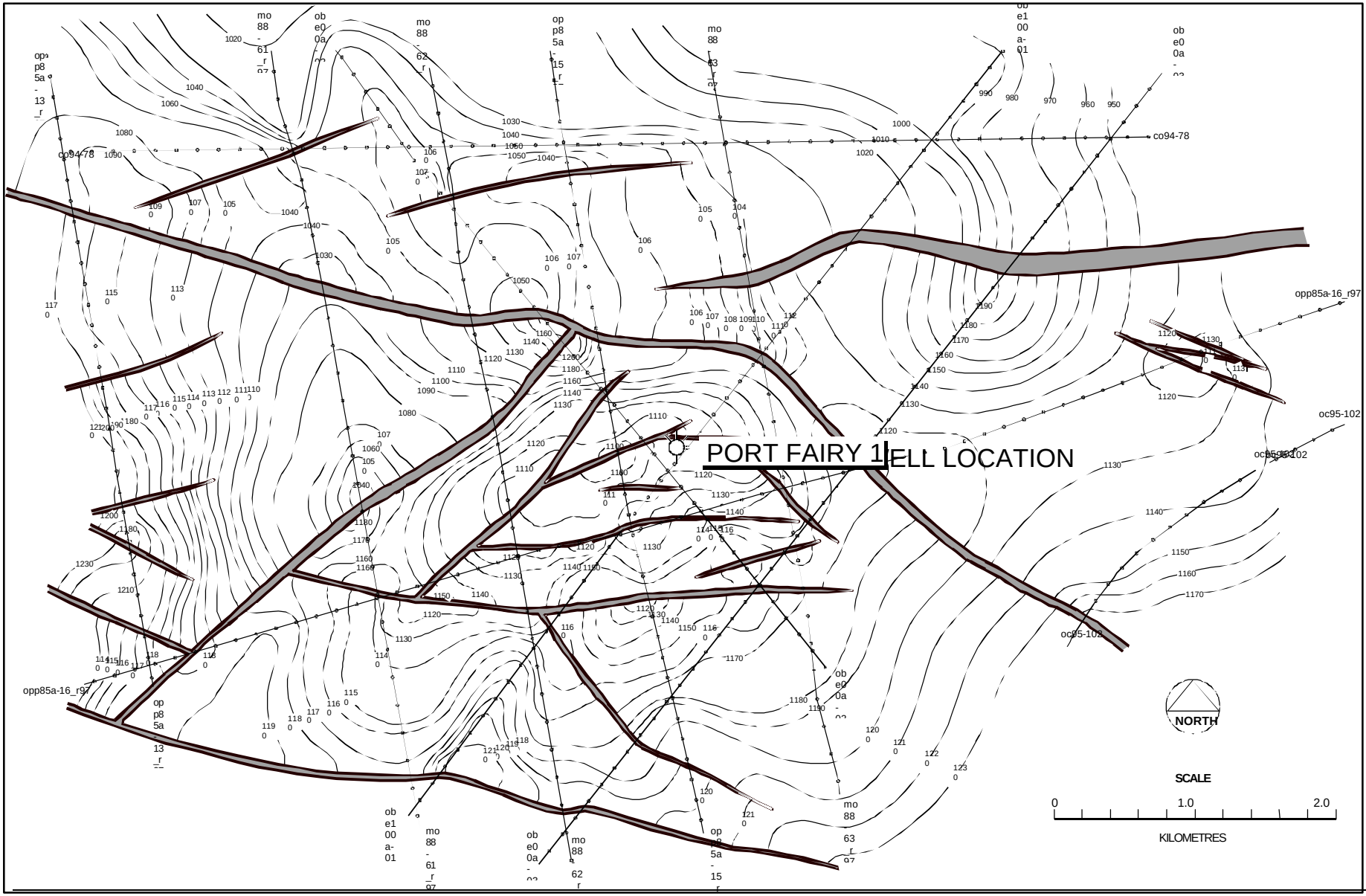
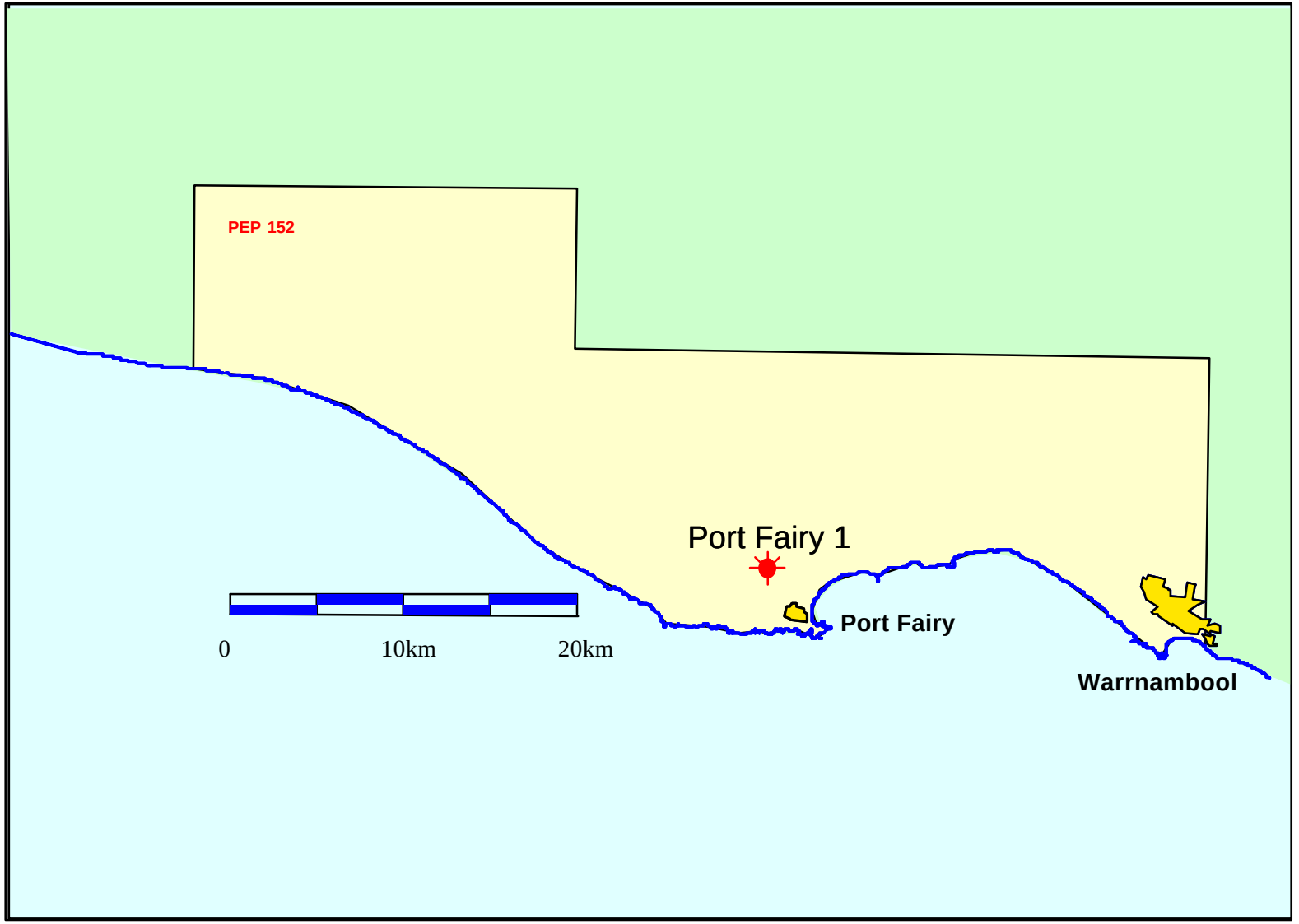


Figure 2: Port Fairy Well Location



2.2 CONTRACTORS

Table 2: List of Contractors

Service	Contractor
Project Managers	Essential Petroleum Resources Limited
Drilling	Mitchell Drilling and Exploration
Location Survey	Paul Crowe, Licensed Surveyor
Site Construction	Walter Mellis
Water Supply	Trucked in by Walter Mellis
Fuel Supply	Supplied by Drilling Contractor
Cementing	Dowell
Mud System - Drilling Fluids - Solids Control	IDFS Via Drilling Contractor
Mud Logging	Geoservices
Electric Logging	Schlumberger
Drilling Tools	Tasman Oil Tools
Casing Services	Drilling Rig
Drill Stem Testing	Australian DST
Casing & Tubing	Itochu
Wellheads And Equipment	Cameron Iron Works
Workover Rig	Imperial Snubbing
Completion Services - Slickline - Completion Components - Perforating - Lubricator	- Expertest - Expertest - Schumberger
Well Testing	Expertest
Environmental - Waste Disposal	Transwest Environmental
Accommodation	Town accommodation. (Port Fairy)
Trucking	Dehne Transport
Crane Services	Timboon Engineering
Communications - Landlines - E Mail/Internet	- Telstra - Via EPRL server

3. ENGINEERING DATA

3.1. WELL STATUS

Figure 3 illustrates the suspended condition of the well as at December 2002.

3.2. OPERATIONAL SUMMARY

3.2.1. Logistics and Planning

Essential Petroleum Resources (EPRL) managed drilling on behalf of the PEP152 Joint Venture. Materials and logistics were managed out of the EPRL offices and from the Port Fairy wellsite.

Mud and cement chemicals were supplied by Independent Drilling Fluid Services, from their Cheltenham facility.

3.2.2. Site Preparation

Site construction for Port Fairy 1 commenced in December 2001. The original selected position (SP 345 on line OBE00a-01) was unsuitable as the land had been subdivided for housing and was also boggy from recent rains. The site was shifted 200m to the west side of Blackwood Road.

Fencing and lockable gates were installed. Pits were dug and the site was sheeted with gravel. Hard rock (basalt) at surface limited the depth of the water storage pits. The size of the location was kept relatively compact, as the rig required a small footprint and no rig camp.

Of particular concern throughout construction was adherence to the environmental management plan for the project, which stressed the minimisation of noise and dust levels.

3.2.3. Mobilisation

Mitchell Rig 50 was mobilised from Queensland on January 3 after completion of necessary modifications to the mud system. Mobilisation was timed to avoid the road congestion of the immediate Christmas-New Year period.

The mobilisation to the rigsite was completed in 4 days.

3.2.4. Pre Spud

The Port Fairy 1 pre-spud meeting was held at the rig site at 19:00 on January 8, 2002.

3.2.5. 17 ½" Hole Section

Port Fairy 1 was spudded at 07:00 hrs on the January 9, 2002. The 17½" hole section was initiated with a 20" drag bit to drill the soil above the basalt. A 12 ¼" pilot hole was then air-hammered to 14.5m. Attempts to ream the pilot hole with the drag bit were unsuccessful. A 20" conductor was set to 6.5m and the diverter rigged up. The pilot hole was reamed at 17 ½" diameter with an air hammer to 14.5m and then drilled ahead to 31.5m. Caving sand below the base of basalt at 28m prevented further air drilling. The air hammer was laid down and 23 sacks neat cement was spotted on bottom. After waiting on cement and rigging up mud tanks 17 ½" hole was drilled ahead with no returns to 55m and partial water returns to 78.2m. The 13 ? " conductor was run to 67.4m and cemented with neat class G cement.

3.2.6. 12 1/4" Hole section

Cement was tagged at 57.9m inside the conductor pipe. The 12 ¼" hole section was drilled from 78.2 to 821m with water/gel mud. High instantaneous rates of penetration were achieved. With only one mud pump available, the large cuttings load caused mud rings in the annulus and cutting blockages in the flow line. The flow line was modified to add cleaning jets, and the drill pipe was worked briefly prior to connections to prevent cuttings build-up. The mud was continually diluted to counter viscosity increases due to the native clays and limestone, and treated with SAPP to counter the mud rings. Enerseal lost circulation material (LCM) was used during drilling of the Dilwyn Formation aquifer to ensure minimal contamination of the formation. No losses were experienced.

Further minor time losses were caused by the mud pump losing prime in the section 500 – 687m. LCM in the mud probably contributed to this problem. At 817.5m a wiper trip was carried out. No fill was encountered. The hole was deepened to 821 during the wiper trip to better accommodate the 9 5/8" casing measurement.

Hole deviation in the upper part of the 12 ¼" section was stable at 1°. A survey at 821m was a misrun.

3.2.7. 9 ? " Intermediate String

A string of 9 ? " L80 47 ppf BTC casing was run to a shoe depth of 812m. The string was cemented to surface with 200% annular volume of class G cement and displaced with 195 BBL mud. Good cement returns to surface were noted. Plugs were bumped with 1300psi.

3.2.8. 8 ½" Hole Section

The BOPs were nippled up and tested successfully at 250 and 2500psi without incident. The float and shoe were drilled out and formation drilled to 824m. A leak-off test was performed. Leak-off was recorded at 620 psi, equivalent to mud weight of 13.5ppg. The hole was displaced to PHPA mud. A survey of 3 ½º was recorded at 824m. 8 ½" hole was drilled ahead to 1327m with a PDC bit. Flow check and sample circulation was carried out to evaluate a drilling break at 865m. A survey of 3 ½º was recorded at 1044m. The mud weight was increased to 9.5ppg. Rate of penetration decreased below 1236m and the bit was pulled at 1327m. The PDC bit was in good condition. The low ROP was attributed to poor face cleaning.

A new tricone bit was reamed to bottom and drilled 8 ½" hole to 1550m TD. Samples were circulated at 1343 and 1351m. The hole was logged successfully. Straddle drillstem tests were attempted unsuccessfully. As the zones could not be properly evaluated in open hole by DST the hole was completed for testing through casing.

3.2.9. 7" Production String

A string of 7" J55 BTC casing was run to a shoe depth of 1536m. The string was cemented, to a theoretical depth of 660m RT plus 40% excess, with class G cement and displaced with 199 BBL mud. Plugs were bumped with 3000psi.

During rigging down of the cementing gear the well started to flow. The annular BOP was closed. A stable shut in pressure of 13psi was observed. The pressure bled off and the well was observed to be stable.

3.3 DAILY OPERATIONS

3.3.1 Daily Drilling Reports

The details of the daily activities during rig up and drilling operations for the Port Fairy 1 well are presented in the Daily Drilling reports in Appendix 2.

3.3.2 Time Performance

The time – depth curve for Port Fairy 1 is presented in Figure 3 and a time breakdown presented in Table 2 and Figure 4. Problems due to DST failures at the end of the hole were the most significant cause of delays. Drilling, logging and casing operations were carried out without significant problems. Some delays were incurred dealing with mud rings and poor cuttings clearance, and pump suction problems from LCM in the 12 ¼" section. An unscheduled bit change in the 8 ½" section was due to the PCD bit balling up.

Table 3: Time Breakdown – drilling phase

OPERATION	Days	%
Drill actual	3.17	21%
Reaming	0.71	5%
Rig Repairs & maintenance	0.38	2%
Rig up or modify surface equipment	0.30	2%
Logging	0.48	3%
Circulate to condition mud	0.38	2%
Circulate to evaluate well	0.36	2%
Casing and cementing operations	2.84	19%
Tripping for bit or BHA change, for casing and at TD	1.75	12%
Tripping to condition hole	0.63	4%
Tripping to evaluate well	1.51	10%
Hole problems	0.41	3%
Well surveys	0.15	1%
Drill stem testing operations	1.31	9%
Installing & testing BOPS, Leak-off tests	0.79	5%
Routine HSE operations: site cleanups, safety meetings	0.05	0.3%
HSE time related to incidents	0.00	0%
Total Days	15.21	100%

Figure 3: Port Fairy Time -Depth Curve

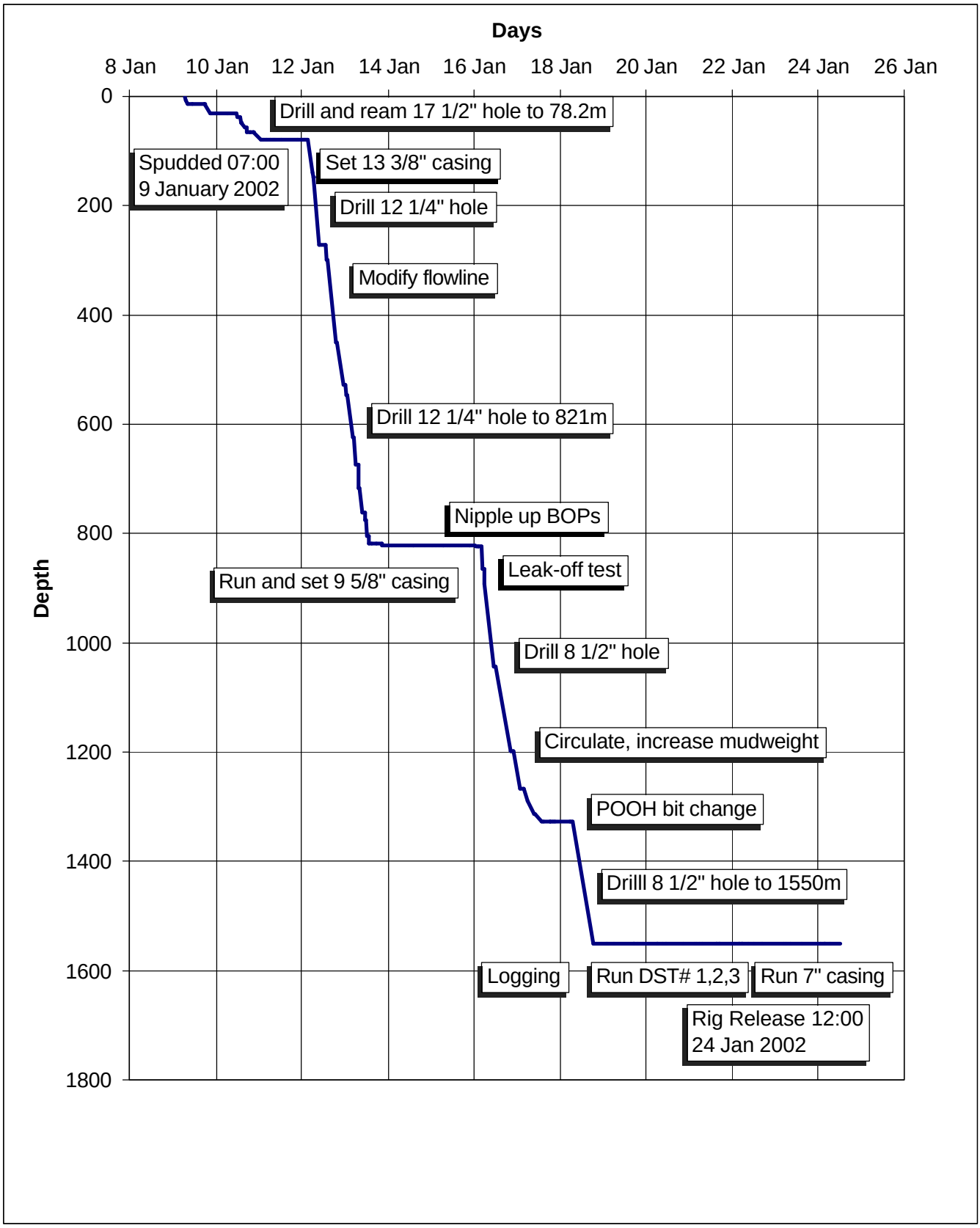
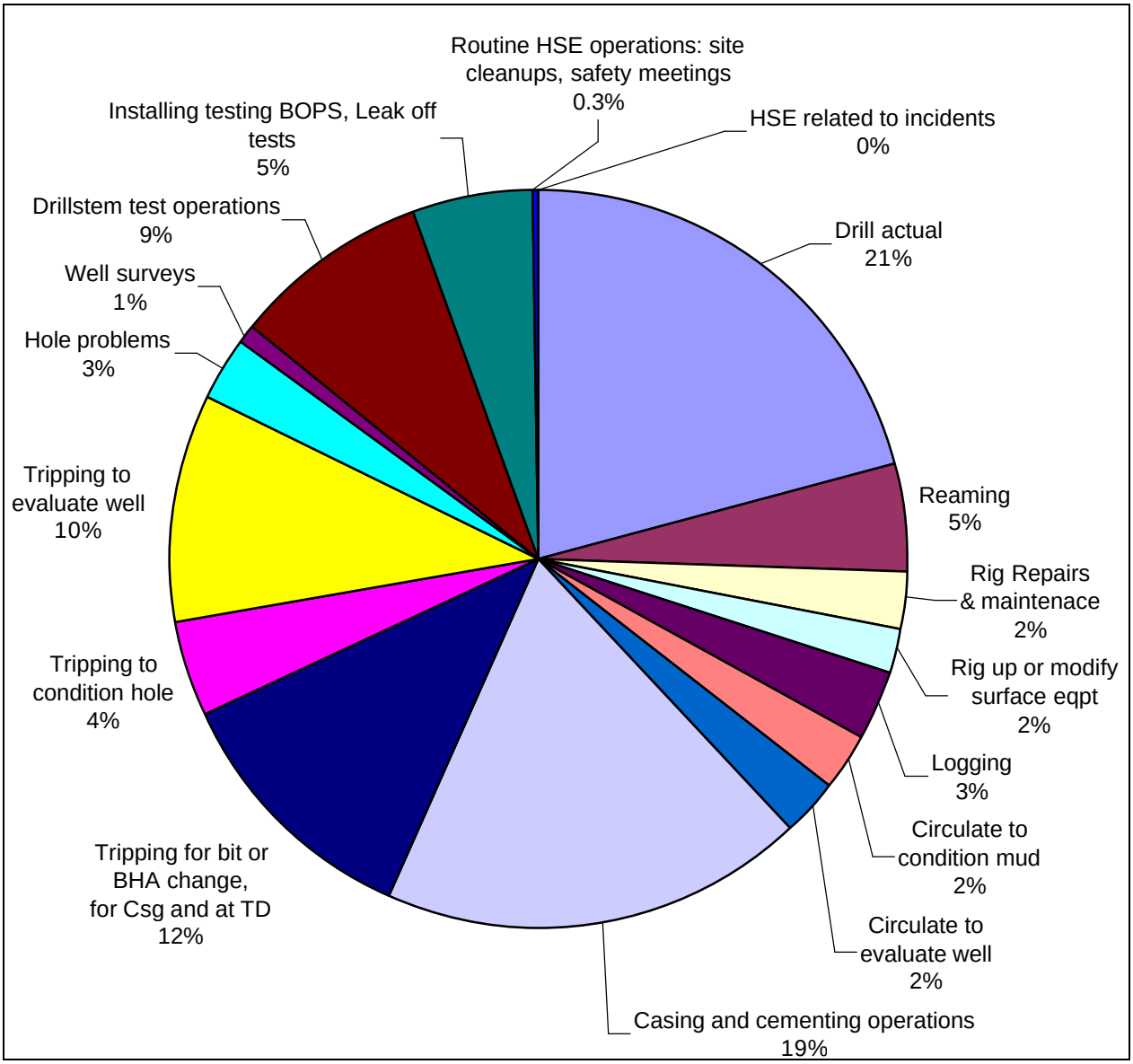


Figure 4: Time Analysis - Drilling Phase



3.3.3 Surveys

Deviation measured in the well did not exceed 3 ½ degrees.

Table 4: Deviation Surveys

Depth	Deviation
148	1°
299	1.5°
450	1°
821	Misrun
824	3 ½°
1044	3 ½°
1327	3 ½°

3.3 BHA AND BIT SUMMARIES

Drilling bits performed adequately. Air hammering proved effective in the basalt at surface. The rental PDC 8 ½" bit delivered very high ROP. Low ROP at the end of the bit run was attributed to sub-optimal face cleaning.

Table 5: Bit and BHA Record

Bit No	in	mm	Jets	Make	Type	IADC code	In	Out	Made	Hrs	Cond	Reason Pulled
1	17 ½	445		Drill quip	Air Hammer		6.5	31.5	25	2.75	good	Hole caving
	notes		Reamed 6.5-31.5m after 12 ¼" pilot hole air hammered to base basalt									
2	17 ½	445		Bourne	Drag		31.5	78.2	46.70	4.75		Casing point
	BHA		2 x 8" DC									
3	12 ¼	311	20-16-16	Varel	ETR1GMPS	115S	78.2	821	742.80	23.5	2-2-WT-A-E-I-D	Casing point
	BHA		2 X 8" DC, 1 x 8" stabilizer, 16 x 6 ¼" DC, drilling jars, XO									
4	8 ½	216	5 x 14	DBS	PDC		821	1327	506.00	28.5	1-1-1-A-X-I-P-R	Low ROP
	BHA		NBR, Pony DC, STB, 1 x DC, STB, jars, 2 x DC, XO									
5	8 ½	216	13-13-13	Hughes	GT-03	417	1327	1550	223.00	11.5	2-2-WT-A-B-I-D	TD
	BHA		NBR, Pony DC, STB, 1 x DC, STB, jars, 2 x DC, XO									

3.4 CASING AND CEMENTING REPORT

The casing and cementing program is summarised in Table 5 below.

Table 6: Casing and Cementing Details

Hole Size (in)	Hole Depth (mRT)	Casing Size (in)	Shoe Depth (mRT)	Casing type	Casing Eqpt	Cementing	Comment
17 1/2	78.2	13 3/8"	67.4	K55 BTC	Open		
12 1/4	821	9 5/8"	812.0	47 ppf L80 BTC	Float shoe, float collar	277bbl 13.2 ppg lead, 52bbl 15.6ppg tail (100% excess), disp w/ 10bbl water 185 bbl mud.	Approx 90 bbl cement returns. Bump plugs w/ 1300psi. Floats held OK
8 1/2	1550.0	7"	1536	23 ppf J55 BTC	Float shoe, float collar	498sx, 578 ft3 Class G 15.8 ppg, rise: 670m +40% excess. Disp w/ 10bbl water & 199 bbl mud	Bump plugs w/ 3000 psi, held 5 min OK. Well flowed, shut in pressure 13PSI, bled off OK.

3.5 DRILLING FLUIDS

Drilling fluid details are summarised in the Operational summaries (Section 3.2). The drilling fluid contractor's mud recap is provided in Appendix 4. Drilling fluid chemistry was effective throughout the program.

3.6 WELL TESTING & COMPLETION

3.6.1 OPERATIONS SUMMARY

Site operations recommenced on 18 March 2002 with unloading and rigging up surface equipment. Contractor personnel worked a day shift, travelling to Port Fairy for accommodation. A well check shot survey was recorded.

A tubing head was installed and the Imperial snubbing unit positioned over the well. The BOP was installed and tested to 2500 PSI. A scraper and mill were run to TD and 7 lb/bbl KCl brine circulated into the well.

The testing assembly was run in to the hole and the packer set at 1389mRT. A 2.8bbl water cushion was pumped. Expertest ran a 2.3" gauge ring and then pulled the PX prong and PX plug. Sclumberger ran in for GR-CCL correlation and ran perforation guns.

The intervals 1402 – 1406mRT and 1443 – 1452mRT were perforated. Well flow was too small to measure. A build-up against a surface shut-in was measured with the Expertest surface-readout gauge.

Expertest ran in with a PX plug. Fluid was tagged at 930m, calculated fluid influx was 5.4 bbl. Fluid was reversed out through the sliding sleeve. No gas was present. The packer was pulled and an ESVZ bridge plug set at 1400m and tested at 2000 psi.

The packer was set above 842mRT, PX plug and prong pulled and 600ft water cushion pumped. Sclumberger ran GR CCL and perforated the interval 862m – 866mRT. Surface pressure built to 70psig but flow died when the well was open at surface. A 1.75" gauge cutter was run to check for hydrate plugging. An EMR gauge was run at 500 ft stages. Pressures indicated a normal water hydrostatic gradient in the tubing. The packer was unseated and re-seated at 870mRT. The well flowed water from the annulus at 10 bbl/hr. The sliding sleeve was opened and the tubing swabbed until steady flow was established. The well flowed fresh water at 10bbl/hr (240 BWPD). The well was shut in at surface and equipment rigged down. Operations ceased on 26 March.

Testing was recommenced on 7 August 2002 with Expertest. The fluid in the tubing was swabbed down to ~591m. Three short intervals in the Flaxman Formation in the zone 1347 – 1358 were perforated. Perforations at 1356.5 to 1358.0m were monitored for 15 minutes with no increase in wellhead pressure. After sitting overnight the fluid level in the well had risen to 529m, there was an air blow (no gas) at the wellhead. The zone 1352.5m to 1354m was perforated with a 2 psi pressure rise noted at the wellhead. Fluid had risen to 518m. The zone 1347m to 1348m was perforated with a 1 psi pressure increase noted at the wellhead. The fluid level was ~520m. The well was swabbed to catch a sample. A sample of oily material in water was taken for analysis and found to contain a refined product (lubricating oil). .

The well was suspended until 16 September 2002 when a pressure of 900 psi was noted on the wellhead. The well was flared and a gas sample was taken on 21 September 2002. A static pressure gradient survey on 22 September showed approximately 223m of gas 15m of oil and 1120m of completion brine in the tubing (measurement from the base of

the perforated interval at 1358m). Swabbing of the well on 23 September produced samples of light oil in water. Wellhead pressure returned to 900 psi. The oil sample was analysed to be 52º oil. Fluid analyses are presented in Appendix 10.

3.6.2 COMPLETION SUMMARY

The details of the completion are shown in the completion status diagram. Completion and testing time performance times achieved are shown in Table 7 and in Figure 5.

Table 7: Completion Time Summary

Operation	Hours	%
Travel to/from wellsite	7.25	6%
Site & surface Equipment	17	14%
Logging & perfs	13.25	11%
Well head & BOPs	10.75	9%
Circulate fluid	1	1%
Tripping tubing	25.5	21%
Wireline & testing ops	41.5	34%
Plugging	2	2%
Rig up/down	5.5	4%
Total Hours	123.75	100%

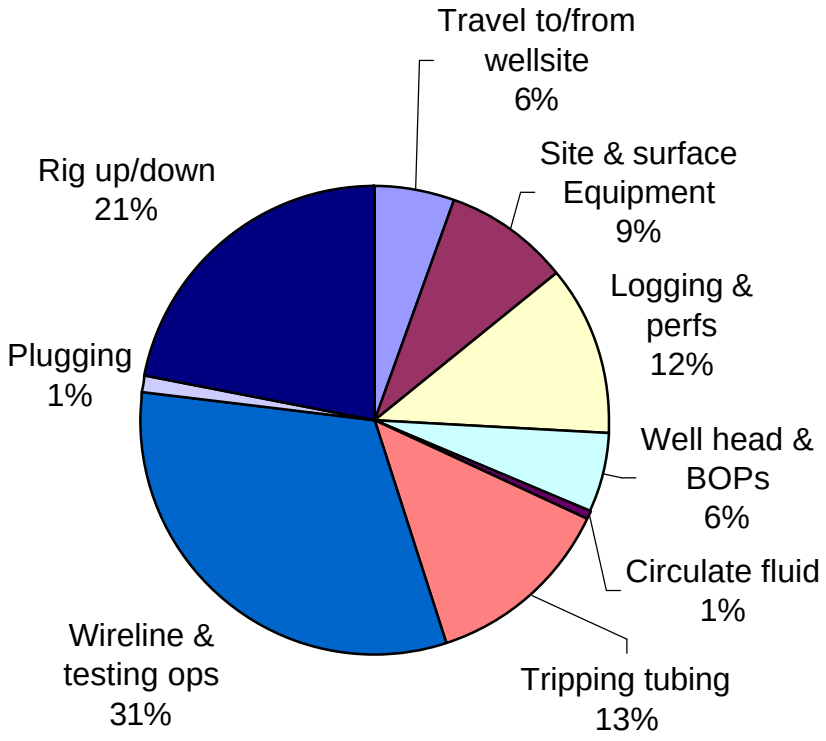
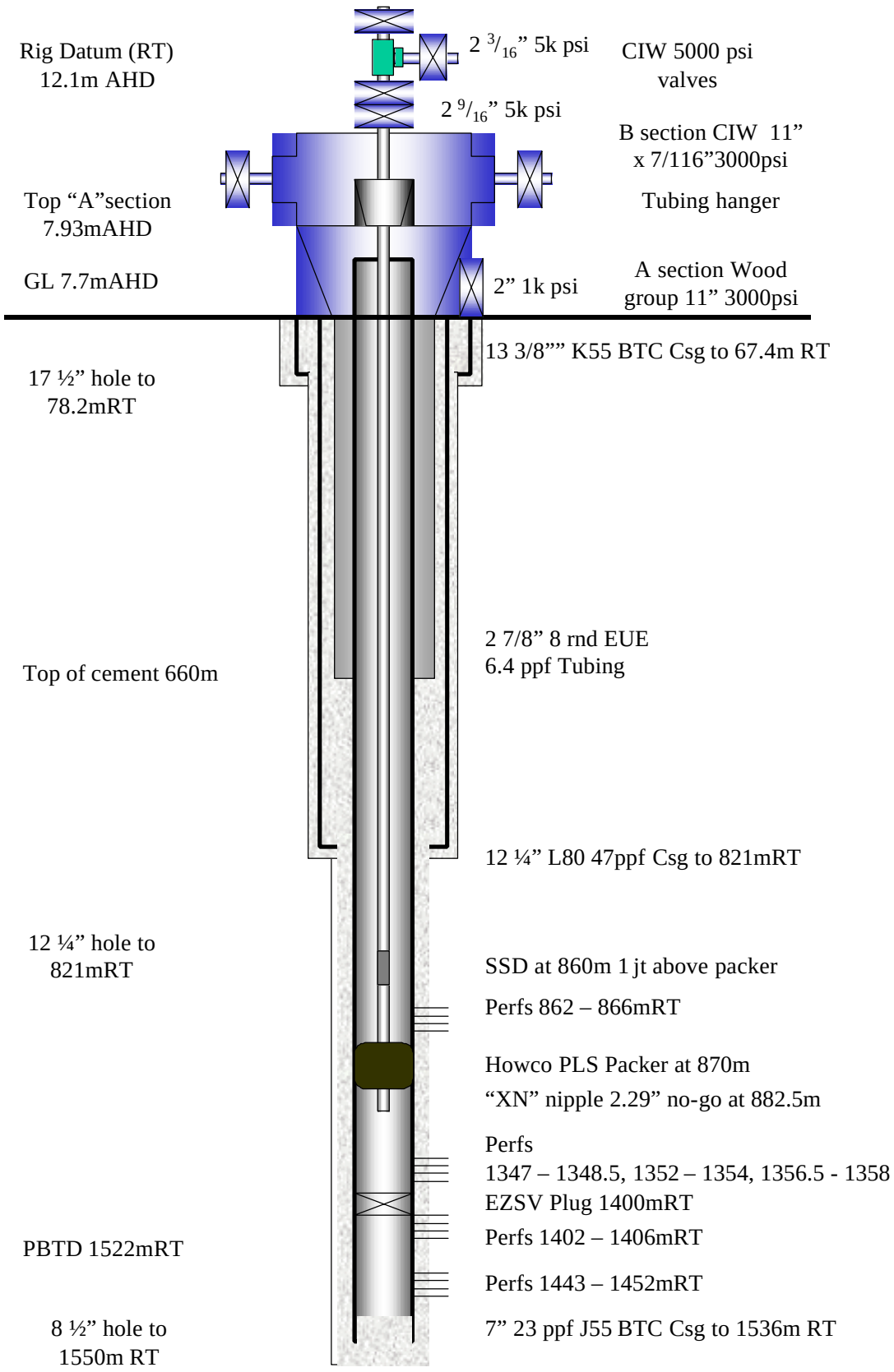


Figure 5: Time Breakdown - Testing phase

Figure 6: Port Fairy 1 - Well Schematic



FORMATION SAMPLING AND TESTING

4.1 CUTTINGS

Cuttings were collected at 10metre intervals in the 12 ¼" hole section and then at 3m intervals to TD. Detailed cuttings descriptions are presented in Appendix 5.

4.2 CORES

No sidewall cores or conventional cores were cut.

4.3 TESTING

Straddle inflate testing was attempted after logging at TD. The results are summarised in Table 8. Drill stem testing was unsuccessful in evaluating the formation due to both the test tool plugging with drill cuttings and formation material, and packer failures. Drill stem test reports are provided in Appendix 6.

Table 8: Drill Stem Test Results

DST No	Interval	IF	ISI	FF	FSI	Result
1	1429 – 1451	9 minutes, weak blow throughout, NGTS	40 minutes	22 minutes. No Blow	40 minutes	Tool plugged during IF
2	1378 – 1402	Packer did not seat.				
3	860 – 868	5 minute, mod blow	45 minutes	No blow. test abandoned		Tool partially plugged during IF
4	859 – 868.9	Could not Inflate				Packer ruptured

4.4 SAMPLE ANALYSIS

Ten cuttings samples were submitted for palynological analysis to Biostrata Pty Ltd. The results of the palynological analysis are presented in Appendix 9. The palynology indicated that zone immediately above the top of the Eumeralla Formation contained an age equivalent of the lower part of the Waarre Formation (Waarre 'B'). No material of age equivalent to the upper Waarre 'C' horizon, where good quality reservoir sands can be expected, was intersected in the well.

4.5 FLUID ANALYSES

Samples from fluid recoveries are presented in Appendix 10

4.6 MUD LOGGING

Geoservices provided a skid mounted mudlogging unit. Depth, penetration rate, mud gas, pump rate, and mud volume data as well as mud chromatographic analysis was recorded

from surface to total depth. Rate of penetration, weight on bit, total gas and chromatography were recorded and plotted on the Formation Evaluation Log (Mud Log) and are presented in Enclosure 2.

4.7 WIRELINE LOGGING

Wireline logging was carried out by Schlumberger Seaco using a truck mounted MAXIS unit. The logging suite consisted of two logging runs. A composite log is provided in enclosure 1.

Logs are presented in Enclosure 3

Details of the log depth intervals for each log run are as follows.

Table 9: Detail of logs run

Run	Depth (mKB)	Log	Top Log Interval	Bottom Log Interval	BHT Deg. C
1	1523	Gamma Ray	15	1515	66
		SP	812	1501	
		LDT	812	1518	
		CNL	812	1515	
		DLL	812	1521	
		MSFL	812	1518	
		NGT	1200	1507	
		PEF	812	1518	
2	1523	Sonic	100	1510	NR

4.8 VELOCITY SURVEY

A velocity check shot survey in open hole was programmed, but could not be carried out because explosives could not be safely used with a microwave transmitter tower in close proximity. The velocity survey was eventually carried out using an airgun during the cased hole testing program. A synthetic seismogram was computed from the sonic log and checkshot surveys. The results are included in Appendix 7.

5 GEOLOGY

5.1 STRATIGRAPHY

The stratigraphic section penetrated in Port Fairy No 1 is shown in Table 9. Formation tops were picked on the basis of cuttings descriptions, rate of penetration and wireline logs and by correlation to Belfast No 4.

Table 10: Stratigraphic Table

Stratigraphic Unit		Depth RT (m)	Thickness (m)	Elevation AHD (m)
Newer Basalt		5.4	22.6	6.7
Quaternary undiff		28.0	14.0	-15.9
Pt Campbell Lst	Heytebury	42.0	151.0	-29.9
Gellibrand Fm	Heytebury	193.0	174.0	-180.9
Clifton Fm	Heytebury	367.0	20.0	-354.9
Narrawaturk Marl	Nirranda	387.0	33.0	-374.9
Mepunga Fm	Nirranda	420.0	75.0	-407.9
Dilwyn Fm	Wangerrip	495.0	168.0	-482.9
Top progrades	Wangerrip	663.0	153.0	-650.9
Pebble Pt Formation	Wangerrip	816.0	37.0	-803.9
Paaratte Fm	Sherbrook	853.0	266.5	-840.9
Skull Ck Mbr	Sherbrook	1119.5	98.5	-1107.4
Nullawarre Gsnd	Sherbrook	1218.0	32.0	-1205.9
Belfast Mdst (lwr)	Sherbrook	1250.0	93.0	-1237.9
Flaxman Fm	Sherbrook	1343.0	15.0	-1330.9
Waarre Fm	Sherbrook	1358.0	44.0	-1345.9
Eumeralla Fm		1402.0	>148.0	-1389.9
TD		1550.0		-1537.9

5.2 LITHOLOGY

The full cutting descriptions are provided in Appendix 5 and summarised by interval on the Composite Well Log. Formations encountered in Port Fairy No 1 are described below.

5.2.1 Newer Basalt and unnamed Quaternary sediments

Basalt was encountered at a depth of 2m below the ground surface (6.5m). The base of basalt was at 29.5m. Below the basalt there was 1m of black sand overlying green clay to a depth of 39.5m. The sand below the basalt was unconsolidated and flowed into the well bore causing problems with the air drilling.

5.2.2 Heytesbury Group Late Eocene to Pliocene

5.2.2.1 Port Campbell Limestone (39.5 – 193m)

The Port Campbell Limestone consisted of a thin upper section of light grey to pale yellow fine to coarse grained *calcarenite*, overlying a lower section of calcareous *claystone* and *marl*. The sandy section is extremely friable and porous. The lower section consists of light grey soft marl interbedded with only minor light to yellowish grey calcarenite. The section is fossiliferous. The finer grained lithologies in the lower section are difficult to differentiate from those of the Gellibrand Marl in the cuttings. On logs the lower Port Campbell Limestone appears to be very thinly bedded. The base of the formation is picked on a slight change in log character to slightly thicker bedding and in increase in clays.

5.2.2.2 Gellibrand Marl (193 – 367m)

The Gellibrand Marl becomes increasingly lime-rich towards the base of the formation.

Marl: medium to predominantly light grey, soft and sticky, dispersive in the drilling mud, very fossiliferous in part, with trace glauconite and pyrite. The marl was interbedded with minor *Calcarenite:* white to pale greenish and brownish grey, fine to coarse grained, very fossiliferous, becoming finer grained toward the base of the formation and grading to *calcisiltite*.

5.2.2.3 Clifton Formation (367 – 387m)

Calcarenite: grading to *calcisiltite*, light grey, mottled, occasionally light greenish grey, fossiliferous. The Clifton Formation is poorly developed. On logs the interval appears as slightly cleaner, and more interbedded than the overlying basal Gellibrand Marl.

5.2.3 Nirranda Group Middle Eocene to Early Oligocene

5.2.3.1 Narrawaturk Marl (387 – 420m)

Marl: medium grey, soft, dispersive, calcarenitic at top of the interval, grades to *Calcilutite*: light grey. The top of the formation is picked at a slight increase on the gamma ray log. The base is picked at a sharp boundary. Overall the formation coarsens and cleans upward.

5.2.3.2 Mepunga Formation (420 – 495.0 m)

Sandstone: clear to brown, fine to very coarse, poorly sorted, subrounded, silty matrix and calcareous cement, quartzose, loose Fe-stained grains and soft aggregates, common carbonaceous fragments. *Siltstone:* carbonaceous in part, medium to dark brownish grey, abundant silt, micromicaceous, massive, soft, dispersive. Sandstone is the dominant

lithology. On logs the formation can be subdivided into an upper, siltier zone and a lower sandstone-dominated zone separated by a high gamma spike at 455m.

5.2.4 Wangerrip Group, Palaeocene to Middle Eocene

5.2.4.1 Dilwyn Formation (495 – 816m)

Sandstone: clear, white, light grey, occasionally pale brown, fine to predominantly coarse occasionally very coarse, well sorted, subangular, polished, predominantly loose, predominantly clean with occasional trace calcite cement and occasional trace dispersive silty matrix. Occasional fossils. There are rare thin interbeds of *siltstone:* dark to very dark brown, carbonaceous, grades to silty coal.

Siltstone bands at 663m on the gamma ray log are interpreted to be the top of a sequence of prograding beds identified in the seismic data. The base of the formation consists of a massive sandstone with a variable calcareous silty matrix increasing in prevalence toward the base. The sandstone is quartzose, but with trace greyish green lithic grains appearing near the base of the formation.

5.2.4.2 Pember Mudstone

The Pember Mudstone was prognosed but was not identified at Port Fairy No 1.

5.2.4.3 Pebble Point Formation (816 – 853m)

The Pebble Point Formation is thin and poorly developed. Lithologies are *siltstone*: greyish brown, mottled green, very sandy and argillaceous, glauconitic interbedded with *sandstone:* medium greyish brown, light mottled, green and brown, very fine to very coarse, poorly sorted, brown silty dispersive and occasionally calcitic/dolomitic matrix and grading to *claystone:* very soft, glauconitic.

On the wireline logs a characteristic high gamma spike occurs toward the base of a fining upward interbedded sequence. The age of this unit is tentatively assigned to the latest Cretaceous because caved material of Tertiary age was absent in cuttings samples taken immediately below, at 874m, suggesting there is minimal Tertiary section exposed below the casing shoe at 812mRT.

5.2.5 Sherbrook Group, Late Cretaceous

5.2.5.1 Paaratte Formation (853 – 1119.5m)

The Parratte Formation consists of interbedded clean sands, siltstones and claystones. Overall the formation coarsens from silty clays with 1-2m silty sands, up to predominantly massive clean sandstones with 1-5m siltstone interbeds. Individual clean sand units at the top of the formation have fining-upward upper contacts.

Sandstone: clear to milky, very coarse to granular, well sorted, angular to subrounded occasionally well rounded, clean, loose, quartzose, trace grey cherty lithic grains, visible porosity excellent. Sandstone reservoir quality decreases with depth becoming clear to light brown, fine to very coarse grained, poorly sorted, dispersive silty matrix, irregular aggregates with dense pyrite cement, trace glauconite and coaly fragments, porosity poor to nil.

Claystone: medium to dark grey, soft to firm, micaceous in part, common pyrite nodules, *siltstone:* light to medium greyish brown, sticky, very finely quartz sandy. Minor *coal:* black to very dark brown, fibrous.

5.2.5.2 Skull Creek Mudstone (1119.5 – 1218.0 m)

The Skull Creek Mudstone is a silt and claystone dominated sequence with minor sandstone.

Siltstone: medium grey, finely sandy, laminated, pyritic in part. *Claystone:* blocky, trace carbonaceous material. Interbedded with to *sandstone:* very fine to coarse predominantly very fine grained, variable calcareous and dolomitic cement, glauconite trace to common, Toward base of the formation the sandstones become very light grey to light greyish brown, very fine to occasionally medium grained, silty in part, rare dolomite cement, poorly sorted, trace glauconite.

5.2.5.3 Nullawarre Greensand (1218.0 – 1250.0 m)

The Nullawarre Greensand is a coarsening upward sequence, the top is picked on a gamma break from the Skull Creek Mudstone silts to sand. The gamma ray response is affected by the high glauconite content.

Sandstone: greyish brown, very fine to fine occasionally medium, moderately sorted, common argillaceous matrix washing out, with occasional thin, very glauconitic laminae. The sandstone grades downward to *siltstone:* medium brownish grey to medium grey, very finely sandy, soft, amorphous, and minor *silty claystone:* rare carbonaceous flecks and fossil fragments

5.2.5.4 Belfast Mudstone (1250.0 – 1343.0 m)

The Belfast Mudstone is a relatively homogenous siltstone grading downwards to silty claystone. The top of the Belfast Formation is picked at an increase in clay content observed in the lithology and on the gamma ray and nuclear log characteristics.

Siltstone: medium brownish grey to dark grey, dark greenish grey, finely quartz sandy in part, in part abundantly glauconitic, interbedded at the base of the interval with minor thin *sandstone:* glauconitic, very fine to fine grained, soft, argillaceous, grades to *glauconitic claystone:* dark greenish grey, trace pyrite, firm.

5.2.5.5 Flaxman Formation (1343 – 1358m)

The Flaxman Formation was not differentiated from the lower Waarre Formation during drilling as the characteristic sandstone of the upper Waarre "C" Formation was not present. Differentiation into separate formations is based on wireline logs, and post-drill palynological results, which indicated a time break. The cuttings description is:

Claystone: glauconitic/pelloidal, very dark grey to greenish black, grades to argillaceous *glauconitic sandstone:* fine to medium grained, with loose quartz grains washing out of a grey clay matrix, inferred porosity poor, grades to *siltstone.*

Toward base of the interval the claystone becomes dark grey to medium brown, firm, subfissile, grades to *siltstone:* medium grey to brown, finely quartz sandy, Trace to common loose, very coarse quartz grains.

On logs the interval can be distinguished by a variable log character including slightly cleaner gamma ray curve, lower densities, very high neutron porosity and anomalously high PEF response.

5.2.5.6 Waarre Formation (1358 – 1402)

On wireline logs the Waarre Formation consists of a relatively homogenous mudstone.

From post-drilling analysis of palynological samples the Waarre section intersected is equivalent to the lower Waarre "B" Formation in the Port Campbell area. The upper Waarre 'C' interval is not represented. Cuttings descriptions are:

Claystone: similar to that in the overlying Flaxman Formation interbedded toward base of interval with minor *Sandstone:* very light to medium grey, very fine to fine grained, loose grains and poorly sorted aggregates with silty clay matrix and/or trace calcareous cement, rarely w/ white tuffaceous grains and *siltstone:* light grey, trace lithic grains and biotite, Trace *?Tuff:* pale bluish to greenish grey, translucent, aphanitic, friable.

5.2.6 Eumeralla Formation (1402 – 1550mTD)

The Eumeralla Formation consists of interbedded volcaniclastic sandstones and siltstones in coarsening upward cycles. Overall however the interval drilled was sandier toward the base.

Finer grained intervals consist of *Siltstone:* very light grey, finely sandy, argillaceous, with common white, grey, and trace red lithic grains, trace biotite soft, sticky, grades to *silty sandstone* and to *silty claystone*: light grey to greyish brown, trace carbonaceous flakes. Minor *tuffaceous claystone:* pale greyish green, waxy, smooth.

Sandstone: clear to grey, very fine to medium grained, moderately to poorly sorted, argillaceous matrix washing out, variable calcareous cement, abundant grey and black and trace red lithic grains, trace feldspar, trace biotite inferred porosity nil to poor.

5.3 RESERVOIR QUALITY AND HYDROCARBON INDICATIONS

Porosity was well developed in the sandstones of the Dilwyn and upper Paaratte Formations and the lower Mepunga Formation. Porosity in the Nullawarre, Flaxman, and Waarre Formations was generally poor. The Eumeralla Formation sands were of poor to moderate porosity.

Background gas became apparent within the lower Paaratte Formation and increased through the Skull Creek Mudstone. Heavy components (C2-C5) appeared in the Belfast Mudstone. Gas shows during drilling were recorded from 1143m to TD, particularly from the Flaxman, Waarre and uppermost Eumeralla Formations. Maximum gas readings came from the Waarre Formation. Gas background decreased in the Eumeralla Formation.

Apparent mobile hydrocarbons were interpreted in the upper Paaratte Formation from wireline logs. Petrophysics was complicated by the presence of glauconite. The zone was tested through casing and flowed fresh water. Subsequent testing of the well has proven the existence of mobile hydrocarbons in the Flaxman Formation (see Section 3.6 testing and Completion)

The observed and interpreted porosity and hydrocarbon indications in individual zones of interest are detailed in Table 11.

Table 11:Reservoir Quality and Hydrocarbon Indications

Formation	Interval	Drill Porosity	Drill HC (maximum)	Log results	Test results
Mepunga Fm	480-495m	excellent	Nil	N/a	
Dilwyn Fm	495 - 780	Very good - excellent	Nil	N/a	
	780-816	fair	Nil	N/a	
Pebble Point Fm	816-842	Reverse drill breaks in sands, visible porosity nil	Nil	SW ~100% Øeff 10-15%	
Paaratte Fm	861 - 866	Drill break, clean sand, excellent visible porosity	Nil	3m Øeff 25-35% Sw 90-100%	Flowed 240 bbl/day fresh water
	889 – 928	Clean sand, vis porosity excellent	Nil	38m Øeff 25-35%. upper 9m SW 55-80%	
Skull Ck	1146 - 1160	Silty sand, vis porosity trace	C1 350ppm	2m Øeff 10-18% Sw 100%	
Nullawarre Greensand	1228 – 1243	silty sand, glauconite laminae, occ clean bands, vis porosity nil-poor	C1 120ppm	11m @ Øeff 10-23%, Sw 80-90%	
Flaxman Fm	1343 - 1359	Glauconitic sand and clay, vis porosity nil	C1 1000ppm C2 380ppm C3 120ppm nC4 35ppm iC5 20ppm	6.5m @ Øeff 10– 25% 2m Sw 50-90%	Gas plus 15m light 52ºAPI crude oil and 1120m water in tubing.
Waarre Fm	1381 - 1399	Logged as Claystone with minor sand. Visible porosity Nil.	C1 89,000ppm C2 6,800ppm C3 120ppm nC4 35ppm iC5 20ppm	<1m at Øe 10% Sw 100%	
Eumeralla Fm	1442 - 1453	Vis porosity poor	C1 26,600ppm C2 850ppm C3 400ppm nC4 222ppm iC5 20ppm	8m Øeff 10-15 1.5m Øeff 20-30% Sw 70-90%	Produced 5.4 bbl water

5.4 CONTRIBUTION TO GEOLOGICAL KNOWLEDGE

1) Gas has flowed from the well, and a 15m column of oil has been observed in the production tubing by gradient survey. A swabbed sample showed a light 52º API full range naphtha. The oil and gas was produced from a glauconitic fine sand in the Flaxman Formation.
2) The sandy upper Waarre Formation (equivalent to Waarre C in the Port Campbell area) is absent at this location.
3) The interval from the uppermost Eumeralla to the Flaxman Formation contains gas and light oil fractions and would be prospective in the permit where a complete section of Waarre Formation is present.
4) The Pember Mudstone seal required to trap hydrocarbons in the Pebble Point or top Paaratte Formation is absent or very poorly developed at this location
5) The Eumeralla Formation is comparatively sand-prone in cuttings, has porosity but low permeability as evidenced by the small water influx during cased-hole testing.
6) Gas values observed in the lower Paaratte Formation were higher than normally seen at this stratigraphic horizon.

Appendix 1: Location Survey

Appendix 2: Daily Drilling Reports

Appendix 3 Casing Tables

Appendix 4: Drilling Fluid Recap

Appendix 5: Cuttings Description

Appendix 6: Drill Stem Test Results

Appendix 7: Well checkshot survey and synthetic seismogram.

Appendix 8: Cased hole testing results

Appendix 9: Palynological Report

Appendix 10: Fluid Analysis