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Accreditation No 2013



## Interim Certificate of Analysis

Santos Limited  
GPO Box 2319  
ADELAIDE SA 5000  
Australia

**Attention:** Noel Dowdell

**Project** 08PEAD0018635  
**Client Ref:** 849485-101

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<b>Customer Sample ID</b>	<b>East Mereenie 1</b>
<b>Sample Type</b>	<b>Gas and Oil</b>
<b>Date Sampled</b>	<b>16/06/2008</b>
<b>Time Sampled</b>	<b>1400-1430h</b>
<b>Pressure</b>	<b>2239 kPag</b>
<b>Temperature</b>	<b>35°C</b>
<b>Cylinder ID</b>	<b>WHS 770 &amp; JPE 590</b>

Test/Reference	Unit
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### Recombination of Separator Samples

Results	Attached
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### GAS ANALYSIS

Test/Reference	Unit
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#### Gas Analysis ASTM D 1945-96 (modified)

Nitrogen	Mol %	7.23
Carbon Dioxide	Mol %	0.08
Methane	Mol %	70.88
Ethane	Mol %	13.18
Propane	Mol %	4.99
I-Butane	Mol %	0.52
N-Butane	Mol %	1.46
I-Pentane	Mol %	0.40
N-Pentane	Mol %	0.49
Hexanes	Mol %	0.46
Heptanes	Mol %	0.24
Octanes and higher hydrocarbons	Mol %	0.07
Total	Mol %	100.00

#### Gas Parameters ASTM D 1945-96 (modified)

Average Molecular Weight		22.10
Lower Flammability Limit		4.19
Upper Flammability Limit		14.92
Ratio Of Upper To Lower		3.56
Wobbe Index		51.89
Compressibility Factor (Z)		0.9967
Ideal Gas Density (Rel to Air = 1)		0.763
Real Gas Density (Rel to Air = 1)		0.765
Ideal Nett Calorific Value	MJ/m <sup>3</sup>	41.16
Ideal Gross Calorific Value	MJ/m <sup>3</sup>	45.33
Real Nett Calorific Value	MJ/m <sup>3</sup>	41.29
Real Gross Calorific Value	MJ/m <sup>3</sup>	45.48
Gross Calorific Val Water-Sat Gas	MJ/m <sup>3</sup>	44.54

**Test Description****Gas Parameters**

The above results are calculated on an air and water free basis assuming only the measured constituents are present. The following parameters are calculated from the above composition at 15°C and 101.325 kPa (abs) using ISO 6976 and the physical constants from the GPSA SI Engineering Data Handbook 11 th Ed.

**Authorised By**

Michelle Fordham

Chemist

Accreditation No 2013

**Laboratory Manager**

Diane Cass

Operations Manager



Interim Report. A final report will be issued once all testing is complete

- Indicates Not Requested

\* Indicates NATA accreditation does not cover the performance of this service

Samples will be discarded after 30 days unless otherwise notified.

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**AMDEL PETROLEUM SERVICES**

Method GL-02-03

Client: SANTOS Ltd



The tests, calibrations or measurements covered by this document have been performed in accordance with NATA requirements which include the requirements of ISO/IEC17025 and are traceable to national standards of measurement. This document shall not be reproduced except in full.

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Sample: East Mereenie 1  
2101 kPag @ 30°C  
16/06/08, 1400-1430 h, Cyl# JPE590

Report # 08PEAD0018635

HP Gas Rate 44.17 x 1000 m3/D  
Stock Tank Oil Rate 0.44 m3/D

**COMPOSITIONAL ANALYSIS OF RECOMBINED RESERVOIR FLUID**

Component	Mol %	US Gallon/1000ft3
Nitrogen	7.22	-----
Carbon Dioxide	0.08	-----
Methane	70.74	-----
Ethane	13.16	3.50
Propane	4.99	1.37
I-Butane	0.52	0.17
N-Butane	1.47	0.46
I-Pentane	0.41	0.15
N-Pentane	0.50	0.18
Hexanes	0.49	0.20
Heptanes	0.27	0.13
Octanes plus	0.13	0.07
<b>TOTAL</b>	<b>100.00</b>	<b>6.22</b>

**DERIVED DATA FROM FULL WELL STREAM COMPOSITION**

Molecular Weight		22.24
Gas Density (rel air = 1)		0.768
Molecular Weight C8+		123.3
Density C8+		0.7381
Wobbe Index	52.03	1397
Heating Value	Gross: 45.59 MJ/m3	1224 BTU/ft3
	Nett: 41.40 MJ/m3	1111 BTU/ft3
Critical Temperature Tc	220.2 °K	396.4 °R
Critical Pressure Pc	4493 kPa abs	651.6 psia
Gas Liquid Ratio C4-/C5+	9995 m3/m3	

**Sales Gas And Liquid Recovery**

Assuming Liquid Recovery of 75% C2, 95% C3, 100% C4+ and Sales Gas Content of 2.5% CO2

Gas Shrinkage		0.8359
Liquid Content of Raw Gas (US Bbl/MMSCF)	Ethane	62.5
	LPG	45.9
	Pentane +	17.3

All gas and liquid calculations group benzene and cyclohexane with the hexanes, methylcyclohexane with heptanes and toluene with the octanes plus component.

Approved Signatory \_\_\_\_\_

Accreditation No: 2013

23-Jul-08

Method GL-02-03

Client: SANTOS Ltd

Report # 08PEAD0018635

Sample: East Mereenie 1  
 2101 kPag @ 30°C  
 16/06/08, 1400-1430 h, Cyl# JPE590

**COMPOSITIONAL ANALYSIS OF RECOMBINED SEPARATOR FLUID**

Component	Flashed	Flashed	Recomb.
	Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Sep. Liquid Mol %
Nitrogen	-----	2.10	0.44
Carbon Dioxide	-----	0.10	0.02
Methane	-----	25.88	5.42
Ethane	0.64	22.74	5.27
Propane	2.71	24.33	7.24
I-Butane	1.26	3.65	1.76
N-Butane	6.04	12.13	7.32
I-Pentane	4.35	3.15	4.10
N-Pentane	7.94	3.56	7.02
Hexanes	16.94	1.90	13.79
Heptanes	21.05	0.37	16.72
Octanes plus	39.08	0.09	30.91
TOTAL	100.00	100.00	100.00

**RATIOS**

Molar ratio	0.7906	0.2094	1.0000
Mass Ratio	0.9093	0.0907	1.0000
Gas Liquid Ratio	1.00 bbl @ SC	244.6 SCF	-----

**STREAM PROPERTIES**

Molecular Weight	102.2	38.5	88.9
Density obs(g/cc)	0.7095 @ 15°C	-----	-----
API-Gas Density	67.85 API @60°F	1.328 (air=1)	-----
GHV (BTU/scf)	-----	2180	-----

**OCTANE PLUS PROPERTIES**

Mol %	39.08	0.09	30.91
Molecular Weight	133.3	114.2	133.3
Density (g/cc)	0.7719 @ 15°C	-----	-----
API @ 60°F	51.75	-----	-----

**LABORATORY FLASH SEPARATION DETAILS**

Separation Temperature	20	°C
Flash Gas Volume	23.10	litres
Stabilised Liquid Volume	395	ml
Liquid Density	0.7049	g/ml

Method GL-02-03

Client: SANTOS Ltd

Report # 08PEAD0018635

Sample: East Mereenie 1  
 2101 kPag @ 30°C  
 16/06/08, 1400-1430 h, Cyl# JPE590

**COMPOSITIONAL ANALYSIS OF RECOMBINED RESERVOIR FLUID**

Component	Separator Liquid Mol %	Separator Gas Mol %	Recomb. Reservoir Fluid Mol %
Nitrogen	0.44	7.23	7.22
Carbon Dioxide	0.02	0.08	0.08
Methane	5.42	70.88	70.74
Ethane	5.27	13.18	13.16
Propane	7.24	4.99	4.99
I-Butane	1.76	0.52	0.52
N-Butane	7.32	1.46	1.47
I-Pentane	4.10	0.40	0.41
N-Pentane	7.02	0.49	0.50
Hexanes	13.79	0.46	0.49
Heptanes	16.72	0.24	0.27
Octanes plus	30.91	0.07	0.13
TOTAL	100.00	100.00	100.00

**RATIOS**

Molar ratio	0.0021	0.9979	1.0000
Mass Ratio	0.0082	0.9918	1.0000

**STREAM PROPERTIES**

Molecular Weight	88.9	22.1	22.2
Gas Density	-----	0.763 (air=1)	0.768
GHV (BTU/scf)	-----	1217	1224

**OCTANE PLUS PROPERTIES**

Mol %	30.91	0.07	0.13
Molecular Weight	133.3	114.2	123.3
Density (g/cc) @15°C	-----	-----	0.7381
API @ 60°F	-----	-----	60.14

Method GL-02-03

Client: SANTOS Ltd

Report # 08PEAD0018635

Sample: East Mereenie 1  
 2101 kPag @ 30°C  
 16/06/08, 1400-1430 h, Cyl# JPE590

Boiling Point Range (Deg.C)	Component	Weight%	Mol%
-88.6	Ethane	0.19	0.64
-42.1	Propane	1.17	2.71
-11.7	I-Butane	0.71	1.26
-0.5	N-Butane	3.44	6.04
27.9	I-Pentane	3.07	4.35
36.1	N-Pentane	5.60	7.94
36.1-68.9	C-6	14.26	16.94
80.0	Benzene	0.00	0.00
68.9-98.3	C-7	18.08	18.44
100.9	Methylcyclohexane	2.51	2.61
110.6	Toluene	0.05	0.06
98.3-125.6	C-8	18.12	16.22
136.1-144.4	Ethylbenz+Xylenes	0.23	0.22
125.6-150.6	C-9	13.45	10.72
150.6-173.9	C-10	8.14	5.85
173.9-196.1	C-11	4.23	2.77
196.1-215.0	C-12	2.03	1.22
215.0-235.0	C-13	1.18	0.66
235.0-252.2	C-14	0.68	0.35
252.2-270.6	C-15	0.42	0.20
270.6-287.8	C-16	0.31	0.14
287.8-302.8	C-17	0.28	0.12
302.8-317.2	C-18	0.20	0.08
317.2-330.0	C-19	0.17	0.06
330.0-344.4	C-20	0.11	0.04
344.4-357.2	C-21	0.08	0.03
357.2-369.4	C-22	0.07	0.02
369.4-380.0	C-23	0.03	0.01
380.0-391.1	C-24	0.07	0.02
391.1-401.7	C-25	0.12	0.03
401.7-412.2	C-26	0.13	0.04
412.2-422.2	C-27	0.14	0.04
>422.2	C-28+	0.73	0.19
	Total	100.00	100.00

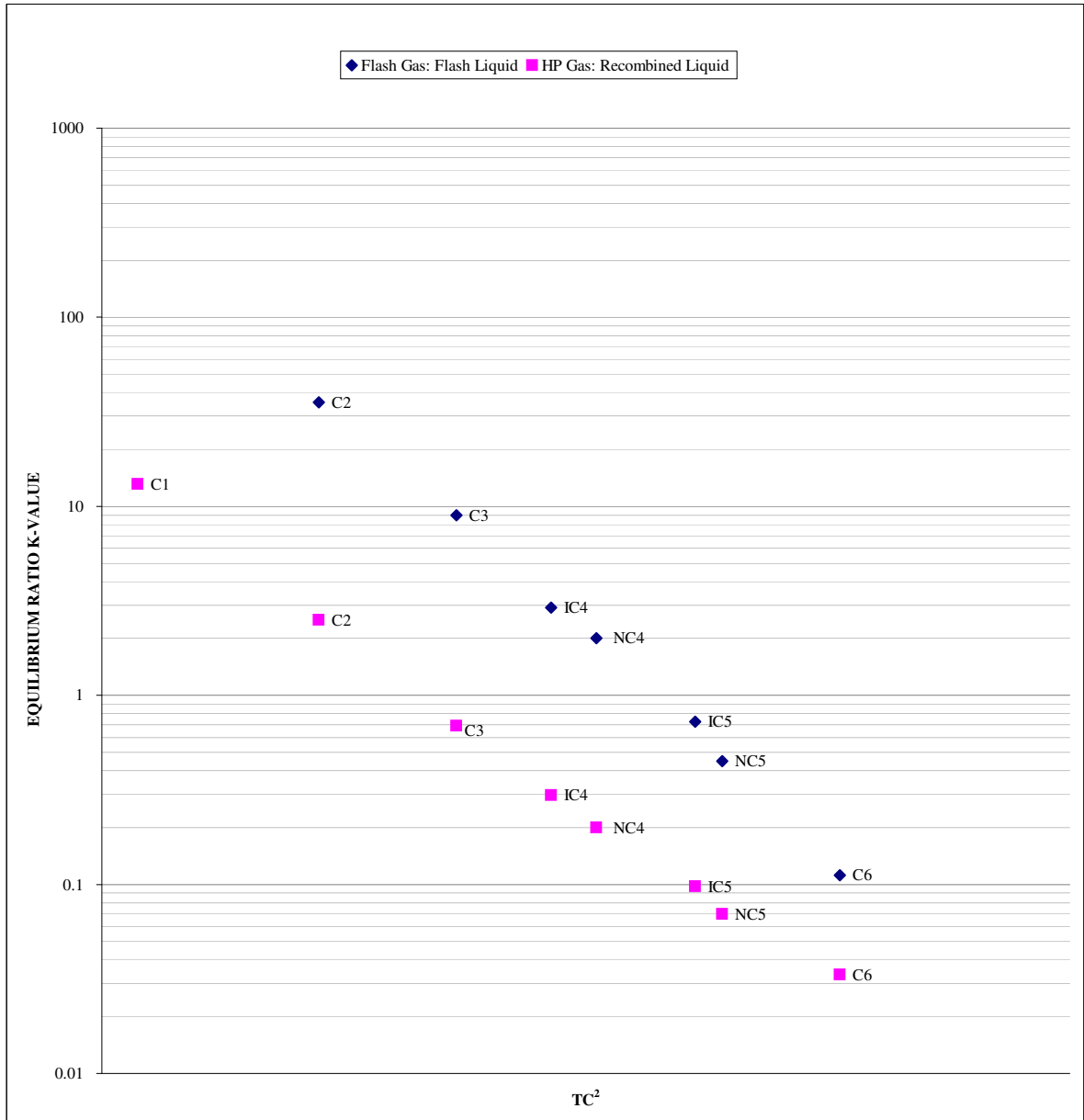
( 0.00 = LESS THAN 0.01% )

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 @ 20.0 °C	0.7049	
Specific Gravity @ 15.6 °C	0.7098	
API Gravity	67.85	
Specific Gravity of C8+ fraction	0.7722	(calc)
Average molecular weight of C8+ fraction	133	

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Client: SANTOS Ltd

Report # 08PEAD0018635

Sample: East Mereenie 1  
2101 kPag @ 30°C  
16/06/08, 1400-1430 h, Cyl# JPE590

Full Well Stream

Separator Gas	1.560	MMSCF		
Stock Tank Oil Rate	2.760	BBLs		
			Av Mol Wt	
Flash Gas Moles	0.721		38.47	
Flash Liquid Moles	2.723		102.24	
Recombination Moles	3.445			
Molar Shrinkage Factor	0.791			
Full Well Stream	3853	Moles Liquid	0.21%	
Molar ratio	1864368	Moles Gas	99.79%	

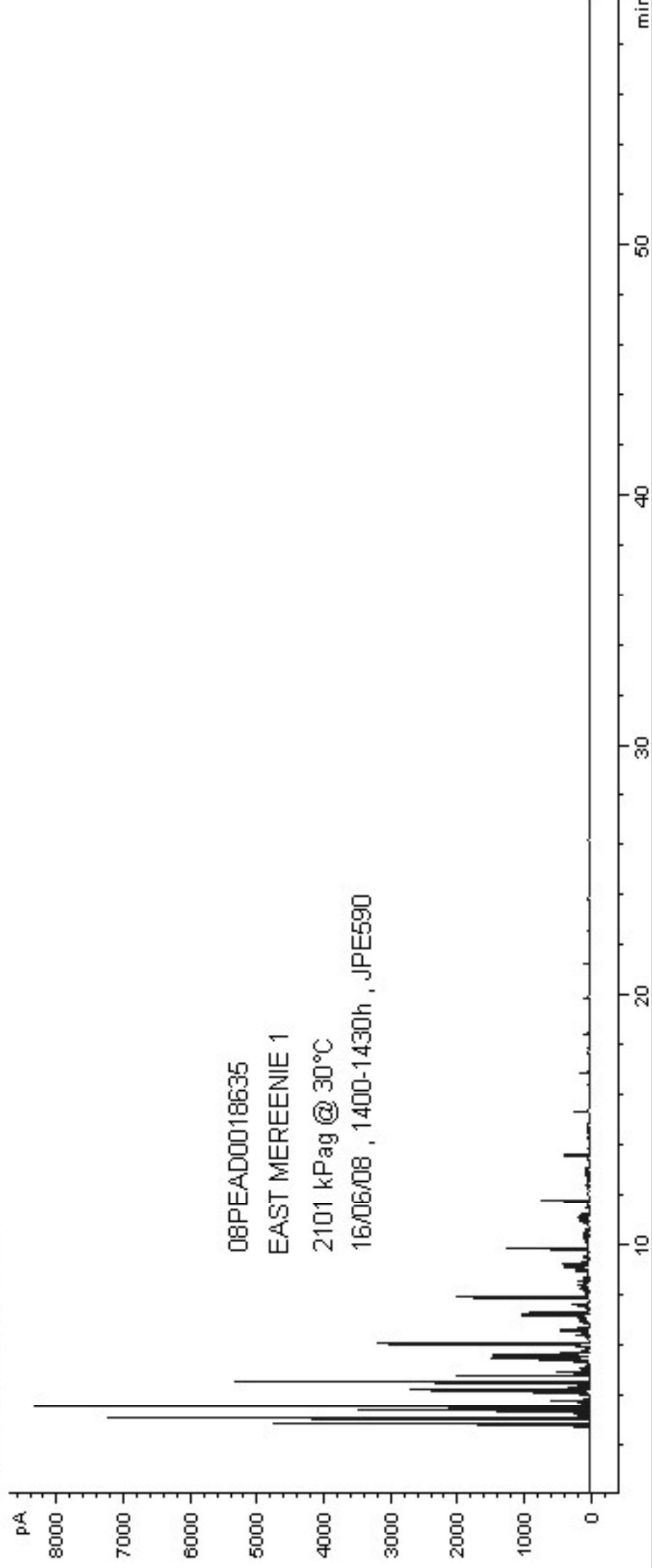
	Flash Gas Mol%	Flash Liquid Mol%	Recomb. Liquid Mol%	HP Gas Mol%	Full Well Stream Mol%
Nitrogen	2.10	-----	0.44	7.23	7.22
Carbon Dioxide	0.10	-----	0.02	0.08	0.08
Methane	25.88	-----	5.42	70.88	70.74
Ethane	22.74	0.64	5.27	13.18	13.16
Propane	24.33	2.71	7.24	4.99	4.99
I-Butane	3.65	1.26	1.76	0.52	0.52
N-Butane	12.13	6.04	7.32	1.46	1.47
I-Pentane	3.15	4.35	4.10	0.40	0.41
N-Pentane	3.56	7.94	7.02	0.49	0.50
Hexanes	1.90	16.94	13.79	0.46	0.49
Heptanes	0.37	21.05	16.71	0.24	0.27
Octanes plus	0.09	39.08	30.92	0.07	0.13
	100.00	100.00	100.00	100.00	100.00

Av.Mol.Weight	38.47	102.24	88.88	22.10	22.24
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K Factors	Flash Gas/ Flash Liquid Ratio	HP Gas/ Recombined Liquid Ratio
C1	-----	13.08
C2	35.49	2.50
C3	8.98	0.69
IC4	2.91	0.30
NC4	2.01	0.20
IC5	0.72	0.10
NC5	0.45	0.07
C6	0.11	0.03
C7	0.02	0.01



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**NATIONAL HYDRO TESTING SERVICES**  
 1 ELLEMSEA CCT. LONSDALE SA 5160  
 PH 8326 7755 MOBILE 0418 804 144

REGISTERED MARK REF #AA0419 (WAS 770)

Date of Test: 8/08
Previous Test Date:
Reference Temperature: 14
Service: I

TESTED IN COMPLIANCE WITH AS2030.1	<b>CERTIFICATE OF TEST</b>	<b>29591</b>	S.A.A. APPROVED
			TEST STATION No.: 308A

Client: AMDEL Serial No.: AA0419

Specification No.: DOT 3E 1800

Water Capacity: .5L Test Pressure: 2925 PSI Working Pressure: 1800 PSI

Condition: External <u>Good</u>	Condition: Internal <u>Good</u>	HYDROSTATIC/VISUAL TEST RESULT: <u>Passed</u>	WEIGHT TEST: Passed
Recommendation or Remarks:			
Average	Average		
Poor	Poor		

Approved Signatory: 



**NATIONAL HYDRO TESTING SERVICES**  
 1 ELLEMSEA CCT. LONSDALE SA 5160  
 PH 8326 7755 MOBILE 0418 804 144

REGISTERED MARK REF #JPE590

Date of Test: 8/08
Previous Test Date:
Reference Temperature: 14
Service: I

TESTED IN COMPLIANCE WITH AS2030.1	<b>CERTIFICATE OF TEST</b>	<b>29433</b>	S.A.A. APPROVED
			TEST STATION No.: 308A

Client: AMDEL Serial No.: 07EK096

Specification No.: DOT 3E 1800

Water Capacity: .5L Test Pressure: 2925 PSI Working Pressure: 1800 PSI

Condition: External <u>Good</u>	Condition: Internal <u>Good</u>	HYDROSTATIC/VISUAL TEST RESULT: <u>Passed</u>	WEIGHT TEST: Passed
Recommendation or Remarks:			
Average	Average		
Poor	Poor		

Approved Signatory: 