

**A.L. ABBOTT AND ASSOCIATES (PTY) LTD**

(Reg. No. 1982/004379/07)

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*Certificate of Analysis***BERG RIVER MUNICIPALITY****SAMPLE : Nine Samples of Reticulation Water****DATE SAMPLED : 17 January 2011****YOUR REF. : Tender 8/3/18 - 2010****OUR REF. : sc/017/2/1/260  
27 January 2011****LAB DATA SHEET NO. : 11/156&271**

Location :	S33°0.75' E18°59.66'	S33°1.25' E18°59.19'	S32°54.52' E18°45.48'	S32°47.035' E18°09.850'	SANS 241 – 2006 (Drinking Water)		
	Porterville Municipal Office	Porterville Biblioteek	Piketberg Municipal Office	Veldrif Municipal Office	Class I (Recomm. Operation. Limit)	Class II (Maximum Allowable for Limited Duration)	Class II Water Consump. Period, <sup>a</sup> max.
pH (at 25°C)	6,72	6,69	6,89	6,98	5.0-9.5	4.0-10.0	No Limit <sup>c</sup>
Conductivity (at 25°C) (mS/m)	5,6	6,5	26,8	29,3	<150	150-370	7 years
Turbidity (NTU)	1,8	2,0	5,0	0,49	<1	1-5	No Limit <sup>d</sup>
Langelier Saturation Index	-3,16	-3,05	-1,60	-1,38	-	-	-
	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	
Colour (as Pt)	<1	<1	<1	<1	<20	20-50	No Limit <sup>b</sup>
Total Alkalinity (as CaCO <sub>3</sub> )	6,0	7,2	40,0	48,0	-	-	-
Total Hardness (as CaCO <sub>3</sub> )	21,1	23,3	82,7	98,3	-	-	-
Calcium Hardness (as CaCO <sub>3</sub> )	13,3	15,5	59,3	67,5	-	-	-
Calcium (as Ca)	5,3	6,2	23,7	27,0	<150	150-300	7 years
Magnesium Hardness (as CaCO <sub>3</sub> )	7,8	7,8	23,4	30,8	-	-	-
Magnesium (as Mg)	1,9	1,9	5,7	7,5	<70	70-100	7 years
Sodium (as Na)	6,6	7,6	28,4	33,4	<200	200-400	7 years
Potassium (as K)	<0,09	0,11	1,8	2,3	<50	50-100	7 years
Zinc (as Zn)	0,02	0,03	<0,01	0,05	<5.0	5.0-10.0	1 year
Chloride (as Cl)	15,8	11,9	47,5	59,4	<200	200-600	7 years
Fluoride (as F)	0,19	<0,10	0,38	<0,10	<1.0	1.0-1.5	1 year
Sulphate (as SO <sub>4</sub> )	<4,0	<4,0	9,0	14,0	<400	400-600	7 years

Sample Marked :	Porterville Municipal Office	Porterville Biblioteek	Piketberg Municipal Office	Veldrif Municipal Office	SANS 241 – 2006 (Drinking Water)		
					Class I (Recomm. Operation. Limit)	Class II (Maximum Allowable for Limited Duration)	Class II Water Consump. Period, <sup>a</sup> max.
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
Total Dissolved Solids	40	50	200	220	<1000	1000-2400	7 years
Ammonia Nitrogen (as N)	<0,15	<0,15	<0,15	<0,15	<1.0	1.0-2.0	No Limit <sup>d</sup>
Nitrate & Nitrite Nitrogen (as N)	0,09	<0,05	0,46	0,28	<10	10-20	7 years
Nitrite Nitrogen (as N)	<0,08	<0,08	<0,08	<0,08	-	-	-
Free Chlorine	0,02	0,03	0,02	0,04	-	-	-
Total Chlorine	-	-	-	-	-	-	-
	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	
Iron (as Fe)	20	60	40	<10	<200	200-2 000	7 years <sup>b</sup>
Manganese (as Mn)	<40	<40	<40	<40	<100	100-1 000	7 years
Aluminium (as Al)	40	60	300	20	<300	300-500	1 year
<sup>a</sup>	The limits for the consumption of Class II water are based on the consumption of 2 litres of water per day by a person of mass 70 kg over a period of 70 years.						
<sup>b</sup>	The limits given are based on aesthetic aspects.						
<sup>c</sup>	No primary health effect – low pH values can result in structural problems in the distribution system.						
<sup>d</sup>	These values can indicate process efficiency and risks associated with pathogens.						

**MICROBIOLOGICAL REQUIREMENTS**  
**SANS 241 - 2006 (Drinking Water)**

1	2				3	4	5
Determinand	Porterville Municipal Office	Porterville Biblioteek	Piketberg Municipal Office	Veldrif Municipal Office	Allowable Compliance Contribution <sup>e</sup>		
					95% of samples, min.	4% of samples, max.	1% of samples, max.
					Upper Limits		
<i>E.coli</i> <sup>f</sup> (count/100 ml)	Nil	Nil	Nil	Nil	Not Detected	Not Detected	1
Total Coliform Bacteria <sup>g</sup> (count/100 ml)	Nil	Nil	Nil	Nil	-	-	-
Heterotrophic Plate Count <sup>h</sup> (count/ml)	Nil	Nil	Nil	>5000	-	-	-
<sup>e</sup>	The allowable compliance contribution shall be at least 95% to the limits indicated in column 3, with a maximum of 4% and 1% respectively, to the limits indicated in column 4 and column 5. The objective of disinfection should, nevertheless be to attain 100% compliance to the limits indicated in column 3.						
<sup>f</sup>	Definitive preferred indicator of faecal pollution.						
<sup>g</sup>	Only used as an alert indicator of possible problems. Alert level 10 organisms per 100 ml.						
<sup>h</sup>	Only used as an alert indicator of possible problems. Alert level 5 000 organisms per ml.						

Location :	S32°46.966' E18°10.141'	S32°40.176' E18°16.405'	S32°41.098' E18°53.053'	S32°28.621' E18°32.235'	SANS 241 – 2006 (Drinking Water)		
Sample Marked :	Veldrif SDR	Dwarskersbos Water Toring	Eendekuil Kaap Agri.	Redelinghuys Municipal Office	Class I (Recomm. Operation. Limit)	Class II (Maximum Allowable for Limited Duration)	Class II Water Consump. Period, <sup>a</sup> max.
pH (at 25°C)	7,11	7,26	7,35	7,13	5.0-9.5	4.0-10.0	No Limit <sup>c</sup>
Conductivity (at 25°C) (mS/m)	31,4	28,8	15,0	103	<150	150-370	7 years
Turbidity (NTU)	0,38	0,99	0,51	0,58	<1	1-5	No Limit <sup>d</sup>
Langelier Saturation Index	-1,26	-1,19	-1,12	-1,73	-	-	-
	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	
Colour (as Pt)	<1	<1	<1	9	<20	20-50	No Limit <sup>b</sup>
Total Alkalinity (as CaCO <sub>3</sub> )	48,0	40,0	40,0	24,0	-	-	-
Total Hardness (as CaCO <sub>3</sub> )	97,1	92,5	70,7	144	-	-	-
Calcium Hardness (as CaCO <sub>3</sub> )	66,8	65,0	56,8	56,8	-	-	-
Calcium (as Ca)	26,7	26,0	22,7	22,7	<150	150-300	7 years
Magnesium Hardness (as CaCO <sub>3</sub> )	30,3	27,5	13,9	87,3	-	-	-
Magnesium (as Mg)	7,4	6,7	3,4	21,3	<70	70-100	7 years
Sodium (as Na)	32,9	29,5	12,2	114	<200	200-400	7 years
Potassium (as K)	2,4	2,3	0,44	4,3	<50	50-100	7 years
Zinc (as Zn)	<0,01	<0,01	<0,01	0,06	<5.0	5.0-10.0	1 year
Chloride (as Cl)	53,5	45,5	15,8	178	<200	200-600	7 years
Fluoride (as F)	0,23	<0,10	<0,10	<0,10	<1.0	1.0-1.5	1 year
Sulphate (as SO <sub>4</sub> )	19,0	23,0	4,0	122	<400	400-600	7 years
Total Dissolved Solids	220	220	120	740	<1000	1000-2400	7 years
Ammonia Nitrogen (as N)	<0,15	<0,15	<0,15	<0,15	<1.0	1.0-2.0	No Limit <sup>d</sup>
Nitrate & Nitrite Nitrogen (as N)	0,29	0,31	0,20	4,6	<10	10-20	7 years
Nitrite Nitrogen (as N)	<0,08	<0,08	<0,08	<0,08	-	-	-
Free Chlorine	0,05	0,05	0,32	Nil	-	-	-
Total Chlorine	-	-	-	-	-	-	-
	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	
Iron (as Fe)	<10	<10	<10	<10	<200	200-2 000	7 years <sup>b</sup>
Manganese (as Mn)	<40	<40	<40	<40	<100	100-1 000	7 years
Aluminium (as Al)	20	<14	<14	<14	<300	300-500	1 year
<sup>a</sup>	The limits for the consumption of Class II water are based on the consumption of 2 litres of water per day by a person of mass 70 kg over a period of 70 years.						
<sup>b</sup>	The limits given are based on aesthetic aspects.						
<sup>c</sup>	No primary health effect – low pH values can result in structural problems in the distribution system.						
<sup>d</sup>	These values can indicate process efficiency and risks associated with pathogens.						

**MICROBIOLOGICAL REQUIREMENTS**  
**SANS 241 - 2006 (Drinking Water)**

1	2				3	4	5
Determinand	Veldrif SDR	Dwarskersbos Water Toring	Eendekuil Kaap Agri.	Redelinghuys Municipal Office	Allowable Compliance Contribution <sup>e</sup>		
					95% of samples, min.	4% of samples, max.	1% of samples, max.
					Upper Limits		
<b><i>E.coli</i><sup>f</sup> (count/100 ml)</b>	Nil	Nil	Nil	Nil	Not Detected	Not Detected	1
<b>Total Coliform Bacteria<sup>g</sup> (count/100 ml)</b>	Nil	Nil	Nil	Nil	-	-	-
<b>Heterotrophic Plate Count<sup>h</sup> (count/ml)</b>	>5000	>5000	Nil	>5000	-	-	-
<sup>e</sup>	The allowable compliance contribution shall be at least 95% to the limits indicated in column 3, with a maximum of 4% and 1% respectively, to the limits indicated in column 4 and column 5. The objective of disinfection should, nevertheless be to attain 100% compliance to the limits indicated in column 3.						
<sup>f</sup>	Definitive preferred indicator of faecal pollution.						
<sup>g</sup>	Only used as an alert indicator of possible problems. Alert level 10 organisms per 100 ml.						
<sup>h</sup>	Only used as an alert indicator of possible problems. Alert level 5 000 organisms per ml.						

Location :	S32°42.482 E18°29.105'	SANS 241 – 2006 (Drinking Water)		
Sample Marked :	Aurora Municipal Office	Class I (Recomm. Operation. Limit)	Class II (Maximum Allowable for Limited Duration)	Class II Water Consump. Period, <sup>a</sup> max.
pH (at 25°C)	6,95	5.0-9.5	4.0-10.0	No Limit <sup>c</sup>
Conductivity (at 25°C) (mS/m)	154	<150	150-370	7 years
Turbidity (NTU)	0,45	<1	1-5	No Limit <sup>d</sup>
Langelier Saturation Index	-1,96	-	-	-
	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	
Colour (as Pt)	<1	<20	20-50	No Limit <sup>b</sup>
Total Alkalinity (as CaCO <sub>3</sub> )	20,0	-	-	-
Total Hardness (as CaCO <sub>3</sub> )	245	-	-	-
Calcium Hardness (as CaCO <sub>3</sub> )	68,3	-	-	-
Calcium (as Ca)	27,3	<150	150-300	7 years
Magnesium Hardness (as CaCO <sub>3</sub> )	177	-	-	-
Magnesium (as Mg)	43,1	<70	70-100	7 years
Sodium (as Na)	228	<200	200-400	7 years
Potassium (as K)	1,9	<50	50-100	7 years
Zinc (as Zn)	0,13	<5.0	5.0-10.0	1 year
Chloride (as Cl)	459	<200	200-600	7 years
Fluoride (as F)	<0,10	<1.0	1.0-1.5	1 year
Sulphate (as SO <sub>4</sub> )	49,0	<400	400-600	7 years
Total Dissolved Solids	1120	<1000	1000-2400	7 years
Ammonia Nitrogen (as N)	<0,15	<1.0	1.0-2.0	No Limit <sup>d</sup>
Nitrate & Nitrite Nitrogen (as N)	0,91	<10	10-20	7 years
Nitrite Nitrogen (as N)	<0,08	-	-	-
Free Chlorine	0,04	-	-	-
Total Chlorine	-	-	-	-
	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	
Iron (as Fe)	<10	<200	200-2 000	7 years <sup>b</sup>
Manganese (as Mn)	114	<100	100-1 000	7 years
Aluminium (as Al)	<14	<300	300-500	1 year
<sup>a</sup>	The limits for the consumption of Class II water are based on the consumption of 2 litres of water per day by a person of mass 70 kg over a period of 70 years.			
<sup>b</sup>	The limits given are based on aesthetic aspects.			
<sup>c</sup>	No primary health effect – low pH values can result in structural problems in the distribution system.			
<sup>d</sup>	These values can indicate process efficiency and risks associated with pathogens.			

**MICROBIOLOGICAL REQUIREMENTS  
SANS 241 - 2006 (Drinking Water)**

1	2	3	4	5
Determinand	Aurora Municipal Office	Allowable Compliance Contribution <sup>e</sup>		
		95% of samples, min.	4% of samples, max.	1% of samples, max.
		Upper Limits		
<i>E.coli</i> <sup>f</sup> (count/100 ml)	Nil	Not Detected	Not Detected	1
Total Coliform Bacteria <sup>g</sup> (count/100 ml)	Nil	-	-	-
Heterotrophic Plate Count <sup>h</sup> (count/ml)	88	-	-	-
<sup>e</sup>	The allowable compliance contribution shall be at least 95% to the limits indicated in column 3, with a maximum of 4% and 1% respectively, to the limits indicated in column 4 and column 5. The objective of disinfection should, nevertheless be to attain 100% compliance to the limits indicated in column 3.			
<sup>f</sup>	Definitive preferred indicator of faecal pollution.			
<sup>g</sup>	Only used as an alert indicator of possible problems. Alert level 10 organisms per 100 ml.			
<sup>h</sup>	Only used as an alert indicator of possible problems. Alert level 5 000 organisms per ml.			

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**DIRECTOR**

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**APPENDIX 1 : Specific Methods used for the Analysis of Parameters indicated in this report.**

Parameter	Method	Estimated Uncertainty (%)
pH (at 25 °C) - Lab	SABS 11 : (1990 – 3 <sup>rd</sup> Revision)	0,019
pH (at 25 °C) – Field*	SABS 11 : (1990 – 3 <sup>rd</sup> Revision)	-
Langelier Saturation Index (at 25 °C)*	Calculation	-
Conductivity (mS/m) (at 25 °C)	STD Method 2501 A (1992)	2,15
Turbidity (NTU)	Hach 8237	1,81
Colour (mg/l as Pt)*	Hach 8025	-
Total Alkalinity (mg/l as CaCO <sub>3</sub> )*	STD Methods 2320 (1992)	-
Total Hardness (mg/l as CaCO <sub>3</sub> )	SABS SM 1265 (2000)	0,09
Calcium (mg/l as CaCO <sub>3</sub> )	SABS SM 1265 (2000)	0,09
Magnesium (mg/l as CaCO <sub>3</sub> )	SABS SM 1265 (2000)	0,08
Chloride (mg/l as Cl)	SABS 202 (2 <sup>nd</sup> Revision)	0,08
Fluoride (mg/l as F)	Hach 8029	0,19
Iron (µg/l as Fe)	SANS 5207 (2004)	0,09
Manganese (µg/l as Mn)	SANS 5209 (2005)	0,09
Aluminium (µg/l as Al)	SANS 6169 (2005)	0,14
Calcium Carbonate Precipitation Potential*	Calculation	-
Free Chlorine (mg/l)*	Lovibond Method 3	-
Sodium (mg/l as Na)	SANS 6050 (2004)	0,08
Potassium (mg/l as K)	STD Method 3111 B (1992)	0,07
Zinc (mg/l as Zn)	SANS 5214 (2005)	0,08
Nitrate Nitrogen (mg/l as N)	Hach 8150	0,12
Nitrate Nitrogen (mg/l as N)	Lovibond Method using Brucine	0,057
Nitrite Nitrogen (mg/l as N)	Lovibond Method	0,08
Nitrate & Nitrite Nitrogen (mg/l as N)	Hach 8150	-
Ammonia (mg/l as N)	STD Method 4500-NH <sub>3</sub> :C (1992)	0,07
Sulphate (mg/l as SO <sub>4</sub> )	Hach 8051	0,17
Total Dissolved Solids*	STD Method 2501 A (1992)	1,63
E.coli (organisms per 100 ml)	SABS 221 (2002)	-
Coliforms (organisms per 100 ml)	SABS 221 (2002)	-
Total Plate Count (organisms per ml)	Petrifilm <sup>TM</sup>	-
Faecal coliforms (organisms per 100 ml)	SABS SM 221 (2002)	-
Settleable Solids (ml/l)*	STD Method 2540 F (1992)	-
Chemical Oxygen Demand (mg/l)	SANS 6048 (2005)	0,08
Total Kjeldahl Nitrogen (mg/l)*	Hach 8075	-
Dissolved Oxygen (mg/l)*	STD Method 4500 O-G	-
Total Suspended Solids (mg/l)*	STD Method 2540 D (1992)	-
Volatile Suspended Solids (mg/l)*	STD Method 2540 E (1992)	-
Total Phosphate (mg/l as P)*	STD Method 4500-PB (1992) / Hach 8114	-
Ortho Phosphate (mg/l as P)*	Hach 8114	-
Copper (µg/l as Cu)	SANS 5203 (2005)	0,13

\* Tests marked “Not SANAS Accredited” in this report are not included in the SANAS Schedule of Accreditation for this laboratory.

(Schedule of Accreditation excludes sampling)