Analytical Laboratory Services
OUR QUALITY IS IN THE DETAIL

Windhoek:
analab@mweb.com.na
Tel +264 61 210 132
Cell +264 81 611 8843
71 Newcastle Street

Walvis Bay:
walvisbaylab@analab.com.na
Cell +264 81 122 1588
Unit 16, Ben Amathila Ave.

PO Box 86782, Windhoek, Namibia

TEST REPORT

To: **Phoenix Farming (Pty) Ltd**
P.O. Box 81095
Windhoek

Attn: Nico Weck
e-mail: nweck@peg.com.na
Tel: 081 1246965

Date received: 21/May/21
Date analysed: 25 - 31 May 2021
Date reported: 03/Jun/21

Client Reference no.: verbal
Quotation no.: QU-5988
Lab Reference: I210990
Enquiries: Ms Manuela Mayer

Sample details	water sample
Location of sampling point	-
Description of sampling point	Borehole
Date of sampling	2021/05/08
Test item number	I210990/1

				Salinity/Chloride/RSC Hazard			
Parameter	**Value**	**Units**	**me**	**Low**	**Medium**	**High**	**Very High**
p H	**7.3**			Acceptable pH range: 6.5-8.4			
Electrical Conductivity	**87.2**	**mS/m**		<25	25-75	75-225	>225
P-Alkalinity as $CaCO_3$	**0**	**mg/l**					
Total Alkalinity as $CaCO_3$	**340**	**mg/l**					
Bicarbonate as HCO_3^-	**415**	**mg/l**	6.80				
Carbonate as CO_3^{2-}	**0**	**mg/l**	0				
Total Hardness as $CaCO_3$	**345**	**mg/l**					
Chloride as Cl^-	**23**	**mg/l**		0-105	105-140	140-350	>350
Fluoride as F^-	**0.3**	**mg/l**					
Sulphate as SO_4^{2-}	**98**	**mg/l**					
Nitrate as N	**7.5**	**mg/l**					
Sodium as Na	**44**	**mg/l**	1.91				
Potassium as K	**7.7**	**mg/l**					
Magnesium as Mg	**39**	**mg/l**	3.21				
Calcium as Ca	**74**	**mg/l**	3.69				
Manganese as Mn	**<0.01**	**mg/l**					
Iron as Fe	**0.29**	**mg/l**					
Copper as Cu	**0.06**	**mg/l**					
Zinc as Zn	**0.03**	**mg/l**					
Boron as B	**0.11**	**mg/l**		0.3-1.0	1.0-2.0	2.0-4.0	>4.0
Molybdenum as Mo	**<0.01**	**mg/l**					
Quality Indices:							
Electrical Conductivity	**0.87**	**mS/cm**					
HCO_3:Ca	**1.84**	**me/l**					
Modified calcium value	**1.31**	**me/l**					
Adj. Sodium Adsorption Ratio	**1.80**	**me/l**					
Residual Sodium Carbonate	**-0.10**	**me/l**		<1.25	1.25-2.50	>2.50	
Magnesium Ratio	**46.5**	**me/l**		Acceptable ratio: <50			
Stability pH, at 25°C	**7.08**						
Ryznar Index	**6.86**	stable		<6.5=scaling, >7,5=corrosive, ≥6.5 and ≤7.5=stable			
Corrosivity ratio	**0.40**	increasing corrosive tendency		Applies to water in the pH range 7-8 which also contains dissolved oxygen ratios <0.2 no corrosive properties ratios >0.2 increasing corrosive tendency			

Approved Technical Signatory
Ms. Manuela Mayer

Analytical Laboratory Services
OUR QUALITY IS IN THE DETAIL

Windhoek:
analab@mweb.com.na
Tel +264 61 210 132
Cell +264 81 611 8843
71 Newcastle Street

Walvis Bay:
walvisbaylab@analab.com.na
Cell +264 81 122 1588
Unit 16, Ben Amathila Ave.

PO Box 86782, Windhoek, Namibia

Assessment of water quality and its subsequent effect on soils

pH value	:	**suitable**, even when crop foliage is wetted, this should not casue foliar damage
Salinity hazard	:	**high**, water cannot be used on soils with restricted drainage, special management for salinity control may be required. A 95% relative yield of moderately salt sensitive crops can be maintained by using a low frequency irrigation system.
Chloride hazard	:	**low,** should prevent the accumulation of chloride to toxic levels in all but the most sensitive plants, even when chloride uptake is through foliar absorption
Boron hazard	:	Boron, though a plant nutrient, becomes toxic if present in water beyond a particular level. **Safe**
Sodium hazard	:	**low**, water can be used for irrigation on almost all soils with little danger of the development of harmful levels of exchangeable sodium Should prevent the accumulation of sodium to toxic levels in all but the most sensitive plants, even when crop foliage is wet.
RSC hazard	:	This index indicates the tendency of carbonate and bicarbonates to precipitate calcium as calcium carbonate. **Safe**
Magnesium ratio	:	Magnesium deteriorates soil structure particularly when waters are sodium-dominated and highly saline. Higher level of Mg usually promotes higher development of exchangeable Na in irrigated soils. **Safe**
Fluoride	:	Its contents beyond 1 mg/l in drinking water and 10ppm in irrigation water is harmful. It is not directly toxic to the plant but to animals feeding on plants which have been irrigated with high fluoride waters.
Nitrate	:	Nitrate generally occurs in trace quantities in surface water but can be present in higher concentrations in some groundwaters. Beneficial effect of nitrates on crop production has been widely reported. The presence of potassium and nitrate in appreciable amounts in irrigation water has been found to partially counteract the adverse effect of salinity and sodicity on plant growth.
Potassium	:	Being a plant nutrient, its presence in saline water counteracts the adverse effect of sodium on crop growth.
Manganese	:	**Safe**
Iron	:	Safe; moderate problems encountered with clogging of drip irrigation systems
Copper	:	**Safe**
Zinc	:	**Safe**
Molybdenum	:	**Safe**

Approved Technical Signatory
Ms. Manuela Mayer

Analytical Laboratory Services
OUR QUALITY IS IN THE DETAIL

Windhoek:
analab@mweb.com.na
Tel +264 61 210 132
Cell +264 81 611 8843
71 Newcastle Street

Walvis Bay:
walvisbaylab@analab.com.na
Cell +264 81 122 1588
Unit 16, Ben Amathila Ave.

PO Box 86782, Windhoek, Namibia

Summary of test methods - Water Quality

Determinant	Unit	DL	Technique	Method reference
Absorbed oxygen	mg/l O_2	1	titrimetric	SANS 5220:2005
Acidity	mg/l $CaCO_3$	20	titrimetric	AWWA 2310 B
Alkalinity	mg/l $CaCO_3$	20	titrimetric	AWWA 2320 B
Ammonium	mg/l N	0.02	colorimetric	AWWA 4500-NH_3 F / modified Berthelot
Bicarbonate & Carbonate	mg/l $CaCO_3$	1	by calculation	
Biological oxygen demand, 5-day	mg/l O_2	2	electrometric	AWWA 5210 B
Biological oxygen demand, carbonacious	mg/l O_2	2	electrometric	AWWA 5210 B
Bromide & Iodide	mg/l Br^-	0.01	iodometric	P. Höfer
Chloride	mg/l Cl^-	1	argentometric	AWWA 4500-Cl^- B
Chlorine, free and total	mg/l Cl_2	0.05	colorimetric	AWWA 4500-Cl G
Chlorophyll a	µg/L	0.01	spectrophotometric	ISO 10260:1992 E
Chemical oxygen demand	mg/l O_2	1	colorimetric	AWWA 5220 D
Colour	Pt	10	colorimetric	AWWA Pt-Co-2120 B
Cyanide	mg/l CN	0.02	colorimetric	AWWA 4500-CN E
Density	mg/l g/ml	-	gravimetric	METH W 016
Dissolved oxygen	mg/l O_2	0.1	electrometric	AWWA 4550-O G
Electrical conductivity	mS/m	0.1	electrometric	AWWA 2510 B
Fat, oil & grease	mg/l	1	extraction/gavimetric	AWWA 5520 B
Fixed and volatile solids, ignited at 550°C	mg/l	1	gravimetric	AWWA 2540 E
Fluoride	mg/l F^-	0.1	electrometric	AWWA 4500-F C
Hardness	mg/l $CaCO_3$	1	by calculation	AWWA 2340 B
Hexavalent chromium	mg/l Cr	0.02	colorimetric	AWWA 3500-Cr B
Hydrolysable phosphates	mg/l P	0.01	digestion, PO4	AWWA 4500-P B.2 + E
Kjeldahl nitrogen	mg/l N	0.5	by calculation	
Molybdosilicate	mg/l SiO_2	0.4	colorimetric	AWWA 4500-Si C
Nitrate	mg/l N	0.5	colorimetric	Spectroquant / AWWA 4500-NO_3 E
Nitrite	mg/l N	0.01	colorimetric	AWWA 4500-NO2 B
Oxidation reduction potential (Redox)	mV	-	electrometric	AWWA 2580 B
pH		-	electrometric	AWWA 4500-H^+ B
Phenols	mg/l Phenol	0.05	colorimetric	ASTM D1783-01, B
Reactive phosphorous	mg/l PO_4	0.03	colorimetric	AWWA 4500-P E
Settable solids	mg/l	1	gravimetric	AWWA 2540 F
Sulfide	mg/l S^{2-}	0.05	colorimetric	AWWA 4500-S^{2-} D
Sulfite	mg/l SO_3^{2-}	2	iodometric	AWWA 4500-SO_3^{2-} B
Sulphate	mg/l SO_4	1	nephelometric / colorimetric	AWWA 4500-SO4 E / F
Total dissolved solids	mg/l	1	gravimetric	AWWA 2540 C
Total nitrogen	mg/l N	0.5	digestion, NO3	EN ISO 11905-1:1997
Total phosphorous	mg/l P	0.01	digestion, PO4	AWWA 4500-P B.5 + E
Total solids	mg/l	1	gravimetric	AWWA 2540 B
Total suspended solids	mg/l	1	gravimetric	AWWA 2540 D
Turbidity	NTU	0.05	nephelometric	AWWA 2130 B
UV absorbing organic constituents at 254nm	cm^{-1}	-	colorimetric	AWWA 5910 B

Aluminium	mg/l Al	0.01		AWWA ICP-3500-Al C
Antimony	mg/l Sb	0.01		AWWA ICP-3500-Sb C
Arsenic	mg/l As	0.01		AWWA ICP-3500-As D
Barium	mg/l Ba	0.01		AWWA ICP-3500-Ba C
Beryllium	mg/l B	0.01		AWWA ICP-3500-Be
Bismuth	mg/l Bi	0.01		AWWA ICP-3500-Bi
Boron	mg/l B	0.01		AWWA ICP-3500-B D
Cadmium	mg/l Cd	0.01		AWWA ICP-3500-Cd C

Analytical Laboratory Services
OUR QUALITY IS IN THE DETAIL

Windhoek:
analab@mweb.com.na
Tel +264 61 210 132
Cell +264 81 611 8843
71 Newcastle Street

Walvis Bay:
walvisbaylab@analab.com.na
Cell +264 81 122 1588
Unit 16, Ben Amathila Ave.

PO Box 86782, Windhoek, Namibia

Calcium	mg/l Ca	0.1		AWWA ICP-3500-Ca C
Chromium (total)	mg/l Cr	0.01		AWWA ICP-3500-Cr C
Cobalt	mg/l Co	0.01		AWWA ICP-3500-Co C
Copper	mg/l Cu	0.01		AWWA ICP-3500-Cu C
Gold	mg/l Au	0.01		AWWA ICP-3500-Au
Iron	mg/l Fe	0.01		AWWA ICP-3500-Fe C
Lead	mg/l Pb	0.01		AWWA ICP-3500-Pb C
Lithium	mg/l Li	0.01		AWWA ICP-3500-Li C
Magnesium	mg/l Mg	0.1		AWWA ICP-3500-Mg C
Manganese	mg/l Mn	0.01		AWWA ICP-3500-Mn C
Mercury	mg/l Hg	0.01		AWWA ICP-3500-Hg
Molybdenum	mg/l Mo	0.01		AWWA ICP-3500-Mo C
Nickel	mg/l Ni	0.01		AWWA ICP-3500-Ni C
Potassium	mg/l K	0.1		AWWA ICP-3500-K C
Rubidium	mg/l Rb	0.01		ICP-OES
Selenium	mg/l Se	0.01		AWWA ICP-3500-Se I
Silica	mg/l Si	0.01		ICP-OES
Silver	mg/l Ag	0.01		AWWA ICP-3500-Ag
Sodium	mg/l Na	0.1		AWWA ICP-3500-Na C
Strontium	mg/l Sr	0.01		AWWA ICP-3500-Sr C
Thallium	mg/l Th	0.01		AWWA ICP-3500-Tl C
Tellurium	mg/l Te	0.01		AWWA ICP-3500-Te
Tin	mg/l Sn	0.01		AWWA ICP-3500-Sn
Titanium	mg/l Ti	0.01		AWWA ICP-3500-Ti
Uranium	mg/l U	0.01		AWWA ICP-3500-U
Vanadium	mg/l V	0.01		AWWA ICP-3500-V C
Zinc	mg/l Zn	0.01		AWWA ICP-3500-Zn C

Lower reporting limit
These are estimated values only; accurate lower levels of detection (LLDs) (measurement as part of a method) and method detection levels (MDLs) (measurement for the whole method) still have to be established
Given the varied matrices submitted to the laboratory and divers quality needs method and/or reagent blanks, performance evaluation samples and duplicate results may be included to assist in appropriate use of laboratory data.

All submitted samples are initially run undiluted unless sample dilutions are required in order to reduce or eliminate known matrix / interference effects. When an analyte concentration exceeds the calibration or linear range, the sample is re-analysed after appropriate dilution. The analyst will use the least dilution necessary to bring the analyte within the range. In both cases, a loss of sensitivity is experienced. All sample dilutions result in an increase in the lower reporting limit by a factor equal to the dilution. The less than symbol "<" is used for qualified data below the lower reporting limit.