HYDROILEX PTY LTD
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HYDROILEX

Groundwater
Oil & Gas
Minerals

GEOLOGICAL CONSULTANTS
38 GIBBS STREET, MIRANDA 2228 SYDNEY: (02) 9540 1029
FAX: (02) 9540 1002
5-7 WILLIAM STREET, MOLONG 2866: (02) 6366 8877
FAX: (02) 6366 8929
Email: hydroilex@bigpond.com
International: (612) 9540 1029
www. hydroilex.com.au

AP & MP Carmody & MJ & CA Heffernan
4056 Gundaroo Road
GUNDAROO 2621

Re 'Kyeema' – Proposed Subdivision, Gundaroo. Round 2 Groundwater Sampling of Monitoring Bore 1 – February 2015

BACKGROUND

New South Wales Office of Water (*NOW*) have set requirements for groundwater monitoring at the site of a proposed development, known as 'Kyeema', located on Lots 1 & 2 DP 850916, Gundaroo Road, Gundaroo. A comprehensive hydrogeological report that included details of bore construction, hydrogeological setting and associated baseline water analyses were provided in a report prepared by *Hydroilex* in September, 2014 (Report HG 14.9.8CA).

In that report, water analyses were provided which represented a 'winter' climatic period of baseline data. In this brief report the results of a 'summer' period of baseline data is provided. Both certified analyses and comparative analyses are provided herein with comments on the chemistry.

SAMPLING PROCEDURES

A groundwater sample was 'baled' from the bore on 27th February 2015, and delivered directly to the ALS Laboratory at Fyshwick. The sample was collected after the removal of 5 'hole-volumes' of fluid, in order to sample fluid representative of the natural aquifer water chemistry. Samples were filtered on-site, and preserved for transit, consistent with standard practice.

ANALYTICAL RESULTS

Certified analyses are provided in **Appendix 1**. Comparative analyses with Round 1results are provided in **Table 1**. The following comments are provided:

1. The Round 2 results show a significant (17%) reduction in total dissolved salt (TDS), reflected mainly in reduced chloride and sodium concentrations.
2. The new chemistry is associated with increased bicarbonate (19%).
3. Minor ions – sulphate, calcium, magnesium and potassium show minor variances.
4. Nitrate, nitrite and phosphate, indicators of elevated nutrients remain 'low'.
5. Coliform and E.coli counts are below detection levels.
6. The reduced total salinity, particularly in respect of decreased calcium & magnesium is reflected by a decreased total hardness' from 272 mg/L to 226 mg/L.

7. Dissolved oxygen, chemical oxygen demand, and biochemical oxygen demand concentrations, whilst significantly reduced from the initial sample results, are within 'acceptable' ranges.
8. Round 2 results are considered to reflect a 'stabilised' water chemistry following a period of 7 months post-bore installation. During this time period, without any changes in the land-use, the natural groundwater 'flow' has flushed the system of materials associated with the drilling process. Round 1 sampling was undertaken 1 week after drilling completion. The Round 2 analyses are considered to more closely reflect the natural groundwater chemistry.
9. The water quality in the area, as recognised by the two rounds of sampling clearly defines the groundwater as a 'high quality' resource.

SUMMARY

This report summarises the results of two rounds of groundwater sampling from a groundwater monitoring bore located on the site of the proposed Kyeema subdivision.

Water quality is 'excellent'. There is significant 'improved' water quality in the Round 2 sampling compared with the Round 1 result. There is no evidence of enhanced nutrients or effluent content in the waters.

John Lee

Geoscientist 18th March 2015

TABLE 1

'Kyeema', Gundaroo

Summary of Water Analyses 2014-2015 Sampling Results in Comparison with Various Standards

Met	Test	Units	BORE 1	BORE 1	ABWI Limit[1]	FSANZ limit[2]	NHMRC1996	Comments
	Test Date		**19.8.14**	**27.2.15**			**'Health'**	
	pH	pH units	**6.80**	**6.95**	++	++	++	*
	Sp.Conductance (EC)	υS/cm	**420**	**363**	++	++	++	*
	T Diss Salt - TDS	mg/L	**272**	**226**	250	++	++	*
	Total Hardness	mg/L	**87**	**76**				
	Sodium Absorption Ratio (SAR)		**2**	**2**				
	Anions							
	Bicarbonate	mg/L	**73.20**	**90.10**	++	++	++	*
	Carbonate	mg/L	**0**	**0**	++	++		*
	Fluoride	mg/L	**0.3**	**0.3**	1.5	2	1.5	
	Chloride	mg/L	**72.8**	**49.2**	250	++	++	*
	Bromide	mg/L	**<0.4**	**<0.4**				*
	Sulphate	mg/L	**12.4**	**6.4**				*
	Nitrate (as N)	mg/L	**0.1**	**<0.05**	10.0	45 (as NO3) -11.3 as N	10	*
	Nitrite (as N)	mg/L	**<0.05**	**<0.05**	1.0	0.005 (as NO2) ??	1	*
	Nitrite + Nitrate (as N)	mg/L	**0.10**	**<0.05**				
	Phosphate (as P)	mg/L	**<0.04**	**<0.04**				
	Anions							
	Diss Calcium	mg/L	**10.2**	**9.06**	++	++	++	*
	Diss Magnesium	mg/L	**14.9**	**13.0**	++	++	++	*
	Diss Potassium	mg/L	**2.0**	**1.8**	++	++	++	*
	Diss Sodium	mg/L	**41.5**	**34.5**	++	++	++	* 180 aesthetic
	Dissolved Ox (DO)	mg/L	**7.2**	**3.8**		>5 [4]		*
	Chem Ox Demand (COD)	mg/L	**18**	**10**	++	<40 [4]	++	*
	Biochemical Oxy Demand (BOD)	mg/L	**<2**	**<2**		<15 [4]		
	Coliforms & E.coli				-	-		*
	Faecal coliforms	CFU/100mL	**<2**	**<2**	0	0	0	trace
	E.coli	CFU/100mL	**<2**	**<2**	0	0	0	trace

1. Australian Bottled Water Institute (Model Code, June 2004)

2. Food Standards Australia and New Zealand (Standard 2.6.2)

3. NHMRC 1996 National Health and Medical Association

4. National Water Quality Management Strategy,Guidelines for fresh and Marine Water Quality,Paper N0.4 (2000)

Note: mg/L Milligrams per litre

++ no health-based guideline is necessary

* high quality, pass on all relevent standards

Ionic balance 1.02

Hydrochemical Classification #1 : *chloride - sodium w*

ALS Environmental

(Water Resources Group)

CERTIFICATE OF ANALYSIS

Work Order	: **CA1500751**	Page	: 1 of 5
Amendment	: **1**		
Client	: **Hydroilex**	Laboratory	: ALS Water Resources Group
Contact	: Mr John Lee	Contact	: Client Services
Address	: 5 - 7 William Street Molong NSW 2866	Address	: 16B Lithgow Street Fyshwick ACT Australia 2609
E-mail	: johnlee@hydroilex.com.au	E-mail	: ecowisecustomerservice@alsglobal.com
Telephone	: 02 6366 8877	Telephone	: +61 2 6202 5404
Facsimile	: ----	Facsimile	:
Project	: Kyeemah, Gundaroo	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 27.2.15	Date Samples Received	: 27-Feb-2015 13:45
C-O-C number	: ----	Date Analysis Commenced	: 03-Mar-2015
Sampler	: John Lee	Issue Date	: 12-Mar-2015 09:15
Site	: ----		
		No. of samples received	: 1
Quote number	: ----	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 992

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Amanda Gonzalez	Technical Officer	Inorganics
Chau Lethitran	Technical Officer	Inorganics
Geetha Ramasundara	Teamleader Wet Chem	Inorganics
Ramya Watawala	Quality Assurance Officer	Microbiology / Biology
Shane Reynolds	Lab Manager	Inorganics
Terry OBrien	Teamleader Nutrients	Inorganics
Titus Vimalasiri	Teamleader Metals	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB1 Bore Water	----	----	----	----
				Client sampling date / time	27-Feb-2015 12:30	----	----	----	----
Compound	CAS Number	LOR	Unit		CA1500751-001	--------	--------	--------	--------
					Result	Result	Result	Result	Result
EA005: pH									
pH	----	0.01	pH Unit		**6.95**	----	----	----	----
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	2	µS/cm		**363**	----	----	----	----
EA015: Total Dissolved Solids									
^ Total Dissolved Solids	----	10	mg/L		**226**	----	----	----	----
ED009: Anions									
Chloride	16887-00-6	0.1	mg/L		**49.4**	----	----	----	----
Bromide	24959-67-9	0.4	mg/L		<0.4	----	----	----	----
Sulfate	14808-79-8	0.4	mg/L		**6.4**	----	----	----	----
Fluoride	16984-48-8	0.1	mg/L		**0.3**	----	----	----	----
Nitrate as N	14797-55-8	0.1	mg/L		<0.1	----	----	----	----
Nitrite as N	----	0.05	mg/L		<0.05	----	----	----	----
Phosphate as P	14265-44-2	0.4	mg/L		<0.4	----	----	----	----
ED037: Alkalinity									
Hydroxide Alkalinity as CaCO3	DMO-210-001	0.1	mg/L		<0.1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	0.1	mg/L		<0.1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	0.1	mg/L		**90.1**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**90**	----	----	----	----
EG005F: Dissolved Metals by ICP-OES									
Calcium	7440-70-2	0.05	mg/L		**9.06**	----	----	----	----
Magnesium	7439-95-4	0.05	mg/L		**13.0**	----	----	----	----
Potassium	7440-09-7	0.1	mg/L		**1.8**	----	----	----	----
Sodium	7440-23-5	0.1	mg/L		**34.5**	----	----	----	----
EK057: Nitrite as N									
Nitrite as N	----	0.01	mg/L		<0.01	----	----	----	----
EK058: Nitrate as N									
^ Nitrate as N	14797-55-8	0.01	mg/L		<0.05	----	----	----	----
EK059: Nitrite plus Nitrate as N (NOx)									
Nitrite + Nitrate as N	----	0.05	mg/L		<0.05	----	----	----	----
EP025: Oxygen - Dissolved (DO)									
Dissolved Oxygen	----	0.5	mg/L		**3.8**	----	----	----	----
EP026: Chemical Oxygen Demand (COD)									
Chemical Oxygen Demand	----	1	mg/L		**10**	----	----	----	----
EP030: Biochemical Oxygen Demand (BOD)									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB1 Bore Water	----	----	----	----
				Client sampling date / time	27-Feb-2015 12:30	----	----	----	----
Compound	CAS Number	LOR	Unit		CA1500751-001	--------	--------	--------	--------
					Result	Result	Result	Result	Result
EP030: Biochemical Oxygen Demand (BOD) - Continued									
Biochemical Oxygen Demand	----	2	mg/L		<2	----	----	----	----
MW006: Faecal coliforms & E. coli by MF									
Thermotolerant Faecal Coliforms (Presumptive)	----	1	CFU/100mL		<2	----	----	----	----
Thermotolerant Faecal Coliforms (Confirmed)	----	1	CFU/100mL		<2	----	----	----	----
E. coli (Confirmed)	----	1	CFU/100mL		<2	----	----	----	----