



AGL UPSTREAM INVESTMENTS PTY LTD

GLOUCESTER GAS PROJECT

**October 2014 Water Monitoring Report  
Waukivory Pilot Project: Fracture Stimulation and  
Flow Test  
EPL 20358**

Reporting Period: September - October 2014

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## Foreword

<b>PREMISES</b>	Gloucester Coal Seam Gas Project Bucketts Way Gloucester NSW 2422
<b>LICENCE DETAILS</b>	<a href="#"><u>Environment Protection Licence 20358</u></a>
<b>LICENCEE</b>	AGL Upstream Investments Pty Limited (AGL)
<b>LICENCEE'S ADDRESS</b>	Locked Bag 1837, North Sydney, NSW 2060
<b>MONITORING DATE</b>	30 <sup>th</sup> September, 1 <sup>st</sup> and 8 <sup>th</sup> October, and 4 <sup>th</sup> November 2014
<b>MONITORING BY</b>	Parsons Brinckerhoff, on behalf of AGL
<b>ANALYSIS BY</b>	ALS Laboratory, Smithfield (Work order number: ES1440004; ES1440005; ES1440315)
<b>DATE AGL OBTAINED DATA</b>	20 <sup>th</sup> and 27 <sup>th</sup> October, and 7 <sup>th</sup> November 2014
<b>REPORT DATE</b>	7 <sup>th</sup> November 2014
<b>REPORT PREPARED BY</b>	James Duggleby, Senior Hydrogeologist

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## Introduction

AGL is proposing to build the Gloucester Gas Project (GGP) which comprises several stages of development facilitating the extraction of coal seam gas (CSG) from the Gloucester Basin. Concept plan and project approval (Part 3A Approval) for the Stage 1 GFDA was granted on 22 February 2011 under Part 3A of the Environmental Planning and Assessment Act (1979) (EP&A Act). In addition the project received approval under the Environment Protection and Biodiversity Conservation Act (1999) (EPBC Act) (EPBC Approval) on 11 February 2013.

The GGP will involve depressurising of deep groundwater and the extraction of gas from multiple coal seams within the Gloucester coal measures. Target coal seam depths will vary from site to site but are expected to range between 200 and 1,000 m below ground level (mbgl). The current GGP includes the construction, operation, and decommissioning of not more than 110 coal seam gas wells and associated infrastructure, including gas and water gathering lines within the Stage 1 GFDA. A comprehensive groundwater investigation (Phase 2 Groundwater Investigations) was completed in early 2012 to confirm the hydrogeological conceptual model across the Stage 1 GFDA (PB, 2012). Surface water and groundwater investigations are ongoing pending the commencement of the GGP.

This Monitoring Report relates to the water monitoring activities specified in Part 5, Monitoring and Recording Conditions, of the Environment Protection Licence 20358. This report relates specifically to the monitoring surrounding the Waukivory Pilot Project, and details baseline monitoring results from sampling events carried out before the Waukivory Pilot Project fracture stimulation commenced. As per the Licence, the monitoring encompasses the monitoring points at the locations as shown in Table 1 and Figure 1. The specific analytes and frequency tested are shown in Table 2. The monitoring results for this reporting period are shown in Table 3 and Table 4.

The monitoring points that are the subject of this report are part of the GGP groundwater monitoring network, as described in AGL's Surface and Groundwater Monitoring Plan (SGMP) for the Waukivory Pilot Project (AGL, 2014).

Three methods were used to obtain groundwater and surface water samples:

- A submersible pump at groundwater monitoring bores screened within relatively permeable geological materials, monitoring point 90 (12V pump) and monitoring point 91 (240V pump).
- A micro-purge™ low flow sampling pump at groundwater monitoring points 10, 11, and 12. The micro-purge™ system allows groundwater to be drawn into the pump intake directly from the screened portion of the aquifer, eliminating the need for excessive groundwater purging.
- A telescopic sampler to collect grab samples from the surface water monitoring points 7, 8, and 9.

EC and pH were monitored during purging to ensure that they had stabilised prior to sample collection. The water quality samples are analysed by an external NATA certified laboratory (ALS Environmental, Smithfield), in accordance with the EPA Approved Methods Publication "*Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales*" (EPA, 2004), with the exception of:

- Methane, which was analysed with a laboratory developed in-house technique which offers higher resolution based on the "*Technical Guidance for Natural Attenuation Indicators: Methane, Ethane and Ethene*" (USEPA, 2002). The EPA have acknowledged that this method is a suitable technique for detecting dissolved methane in water (EPA, 2014).
- Nitrogen, which was analysed using an updated persulphate digestion method based on the "*Standard Methods for the Examination of Water and Wastewater: 22<sup>nd</sup> Edition*" (APHA, 2012). The EPA have acknowledged that this method is a suitable technique for analysing total nitrogen in water samples (EPA, 2014).

This report is prepared in accordance with the *Requirements for Publishing Pollution Monitoring Data* (EPA, 2012) (Publication Requirements).

The remaining water and land monitoring points in EPL 20358 will be reported in subsequent reports when the requirement for monitoring is triggered.

More information on the groundwater monitoring of the GGP is available on the project website:

[agl.com.au/Gloucester](http://agl.com.au/Gloucester)

**Table 1: Waukivory Pilot Project water monitoring points (as per EPL 20358)**

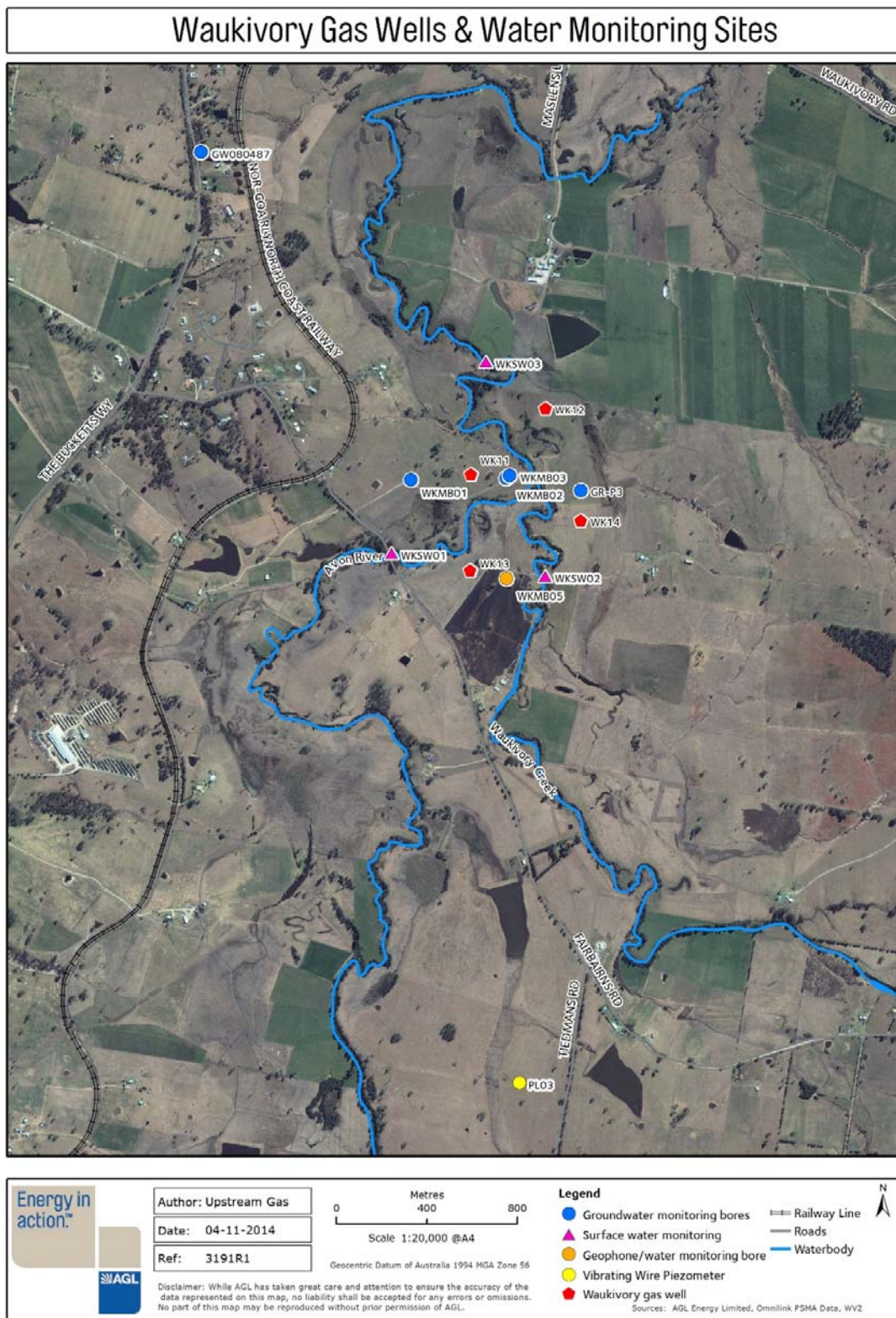
EPA Identification no.	Monitoring Point	Type of monitoring point	Easting (m)	Northing (m)
7	WKSW03	Stream gauge (surface water)	402486.36	6453090.65
8	WKSW02	Stream gauge (surface water)	402748.00	6452139.00
9	WKSW01	Stream gauge (surface water)	402069.00	6452241.00
10	WKMB01	Groundwater monitoring bore	402153.63	6452566.28
11	WKMB02	Groundwater monitoring bore	402575.54	6452572.49
12	WKMB03	Groundwater monitoring bore	402589.87	6452584.93
14	PL03	Vibrating wire piezometer (groundwater)	402633.90	6449898.67
85	WKMB05 <sup>a</sup>	Packer and piezometer completion (groundwater)	402576.59	6452128.62
86	WK11 <sup>a</sup>	Gas well	402419.02	6452589.82
87	WK12 <sup>a</sup>	Gas well	402748.92	6452883.77
88	WK13 <sup>a</sup>	Gas well	402416.74	6452164.46
89	WK14 <sup>a</sup>	Gas well	402906.10	6452384.08
90	GR-P3 <sup>b</sup>	Private groundwater bore	402905.50	6452518.71
91	GW080487	Private groundwater bore	401226.00	6454020.00

<sup>a</sup>will only be sampled and reported from the commencement of the Waukivory Pilot Project flow testing program.

<sup>b</sup>the original monitoring point (EPA Identification no. 90) was replaced with groundwater monitoring bore GR-P3. AGL requested to change the original location of monitoring point 90 as access to the original point 90 was denied by the landowner. AGL proposed the use of private monitoring bore GR-P3. The EPA approved the change on 20 October 2014 noting that GR-P3 is better placed to identify changes that may occur in the alluvial groundwater.

Coordinate reference system: Map Grid of Australia 1994

Figure 1: Location of groundwater and surface water quality monitoring points: Waukivory Pilot Program (as per EPL 20358)





**Table 2: Analytes monitored and frequency for points in Table 1 (as per EPL 20358)**

Pollutant	Units of measure	Monitoring points									
		7,8,9		10,11,12		14,85		86,87,88,89		90, 91	
		Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method
<b>Aluminium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Ammonia</b>	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Arsenic</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Barium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Beryllium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Bicarbonate</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Boron</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Cadmium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Calcium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Carbonate</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample



Pollutant	Units of measure	Monitoring points									
		7,8,9		10,11,12		14,85		86,87,88,89		90, 91	
		Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method
<b>Chloride</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Choline Chloride</b>	milligrams per litre	Special Frequency 5	Method approved in writing by the Authority	Special Frequency 3	Method approved in writing by the Authority			Special Frequency 4	Method approved in writing by the Authority	Special Frequency 3	Method approved in writing by the Authority
<b>Chromium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Cobalt</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Copper</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Electrical conductivity</b>	microsiemens per centimetre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Fluoride</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Iron</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Lead</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Magnesium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Manganese</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample



Pollutant	Units of measure	Monitoring points									
		7,8,9		10,11,12		14,85		86,87,88,89		90, 91	
		Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method
Mercury	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
Methane	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
Molybdenum	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
Monoethanolamine Borate	milligrams per litre	Special Frequency 5	Method approved in writing by the Authority	Special Frequency 3	Method approved in writing by the Authority			Special Frequency 4	Method approved in writing by the Authority	Special Frequency 3	Method approved in writing by the Authority
Nickel	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
Nitrate	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
Nitrite	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
pH	pH	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
Phosphorus (total)	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
Potassium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
Reactive Phosphorus	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample





Pollutant	Units of measure	Monitoring points									
		7,8,9		10,11,12		14,85		86,87,88,89		90, 91	
		Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method
<b>Selenium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Silica</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Sodium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Sodium Hypochlorite</b>	milligrams per litre	Special Frequency 5	Method approved in writing by the Authority	Special Frequency 3	Method approved in writing by the Authority			Special Frequency 4	Method approved in writing by the Authority	Special Frequency 3	Method approved in writing by the Authority
<b>Standing water level</b>	meters (Australian Height Datum)			Special Frequency 8	Special Method 5	Special Frequency 8	Special Method 5	Special Frequency 9	Special Method 3	Special Frequency 6	Special Method 1
<b>Strontium (dissolved)</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Sulfate</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>THPS (Phosphonium, Tetrakis (Hydroxymethyl-sulfate))</b>	milligrams per litre	Special Frequency 5	Method approved in writing by the Authority	Special Frequency 3	Method approved in writing by the Authority			Special Frequency 4	Grab sample	Special Frequency 3	Method approved in writing by the Authority
<b>Total dissolved solids</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Total organic carbon</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample



Pollutant	Units of measure	Monitoring points									
		7,8,9		10,11,12		14,85		86,87,88,89		90, 91	
		Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method	Frequency	Sampling method
<b>Total suspended solids</b>	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Uranium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Vanadium</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample
<b>Zinc</b>	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample

Notes:

Special Frequency 3 – One sampling event before the Waukivory Pilot Project fracture stimulation commences, one sampling event within 24 hours of the completion of the fracture stimulation of each well, and one sample at week 2 and week 4 after the completion of the Waukivory Pilot Project fracture stimulation.

Special Frequency 4 – Every fortnight for 8 weeks from the commencement of the Waukivory pilot flow testing, then every 2 months thereafter until the cessation of the Waukivory pilot flow testing.

Special Frequency 5 – One sampling event within 24 hours of the completion of the fracture stimulation of each well, and one sampling event one week after the completion of the fracture stimulation of each well, and one sampling event every 6 months thereafter until the cessation of the Waukivory pilot flow testing.

Special Frequency 6 – One monitoring event to determine water level prior to the Waukivory Pilot

Special Frequency 8 – Every 6 hours

Special Frequency 9 – Every 6 hours when using an automated datalogger, or, once every fortnight using a Sonolog in the event of failure of an automated datalogger.

Shaded grey = not required to be analysed



## Monitoring Results

Table 3: September 2014 Water quality monitoring results for points 7, 8, 9, 10, 11, 12, 90, and 91

		Monitoring points	7		8		9	10	11	12	90	91
		Location	WKS03		WKS02		WKS01	WKMB01	WKMB02	WKMB03	GR-P3	GW080487
		Sampled date	30/09/2014	8/10/2014 <sup>a</sup>	30/09/2014	8/10/2014 <sup>a</sup>	30/09/2014	30/09/2014	30/09/2014	30/09/2014	30/09/2014	1/10/2014
		Date AGL obtained data	20/10/2014	27/10/2014	20/10/2014	27/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014
Analyte	Units of measure	Limit of reporting										
Aluminium	mg/L	0.01	na	<0.01	0.02	na	0.05	0.02	0.24	0.28	<0.01	<0.01
Ammonia	mg/L	0.01						0.69	0.39	31.8	0.02	0.5
Arsenic	mg/L	0.001	na	<0.001	0.002	na	0.001	0.001	0.002	0.004	<0.001	<0.001
Barium	mg/L	0.001	na	0.056	0.051	na	0.045	0.248	0.082	0.977	0.495	0.222
Beryllium	mg/L	0.001	na	<0.001	<0.001	na	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	1	na	62	na	72	36	800	189	<1	337	1190
Boron	mg/L	0.05	na	<0.05	<0.05	na	<0.05	0.09	<0.05	0.09	<0.05	0.05
Cadmium	mg/L	0.0001	na	<0.0001	<0.0001	na	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	1	na	20	20	24	10	7	<1	2	117	52
Carbonate	mg/L	1	na	<1	na	<1	<1	<1	109	975	<1	<1
Chloride	mg/L	1	na	98	na	102	96	1060	72	360	936	687
Choline Chloride <sup>b</sup>	mg/L	na	na	na	na	na	na	na	na	na	na	na
Chromium	mg/L	0.001	na	<0.001	<0.001	na	<0.001	0.001	<0.001	0.001	<0.001	<0.001
Cobalt	mg/L	0.001	na	<0.001	0.002	na	0.002	<0.001	<0.001	<0.001	0.001	<0.001
Copper	mg/L	0.001	na	<0.001	<0.001	na	0.002	<0.001	<0.001	<0.001	0.002	<0.001
Electrical conductivity	µS/cm	1	na	506	na	525	450	5590	906	4190	4090	3900



		Monitoring points	7		8		9	10	11	12	90	91
		Location	WKSW03		WKSW02		WKSW01	WKMB01	WKMB02	WKMB03	GR-P3	GW080487
		Sampled date	30/09/2014	8/10/2014 <sup>a</sup>	30/09/2014	8/10/2014 <sup>a</sup>	30/09/2014	30/09/2014	30/09/2014	30/09/2014	30/09/2014	1/10/2014
		Date AGL obtained data	20/10/2014	27/10/2014	20/10/2014	27/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014
Analyte	Units of measure	Limit of reporting										
Fluoride	mg/L	0.1	na	0.1	na	0.1	<0.1	1.1	0.4	2.7	0.2	0.2
Iron	mg/L	0.05	na	0.12	0.7	na	0.77	<0.05	<0.05	0.08	0.24	0.4
Lead	mg/L	0.001	na	<0.001	<0.001	na	<0.001	<0.001	<0.001	0.012	<0.001	<0.001
Magnesium	mg/L	1	na	13	12	14	10	2	<1	<1	71	39
Manganese	mg/L	0.001	na	0.001	0.176	na	0.292	0.016	0.007	0.002	0.616	0.049
Mercury	mg/L	0.0001	na	<0.0001	<0.0001	na	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Methane	mg/L	0.01						14.5	8	16.6	<0.01	0.164
Molybdenum	mg/L	0.001	na	<0.001	<0.001	na	<0.001	<0.001	0.002	0.004	<0.001	<0.001
Monoethanolamine Borate (reported as (mono) ethanolamine))	µg/L	1	2	na	<1	na	<1	<1	<1	2	<1	<1
Nickel	mg/L	0.001	na	<0.001	<0.001	na	0.001	0.001	<0.001	0.003	<0.001	<0.001
Nitrate	mg/L	0.01						<0.01	<0.01	<0.01	<0.01	0.22
Nitrite	mg/L	0.01						<0.01	<0.01	<0.01	<0.01	<0.01
pH	pH Unit	0.01	na	7.41	na	7.21	7.25	8.16	9.32	11.6	7.15	7.55
Phosphorus (total)	mg/L	0.01						0.02	0.12	0.03	0.03	0.02
Potassium	mg/L	1	na	5	5	5	5	4	3	8	2	9
Reactive Phosphorus	mg/L	0.01						0.03	0.14	0.05	0.02	0.01
Selenium	mg/L	0.01	na	<0.01	<0.01	na	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01



		Monitoring points	7		8		9	10	11	12	90	91
		Location	WKSW03		WKSW02		WKSW01	WKMB01	WKMB02	WKMB03	GR-P3	GW080487
		Sampled date	30/09/2014	8/10/2014 <sup>a</sup>	30/09/2014	8/10/2014 <sup>a</sup>	30/09/2014	30/09/2014	30/09/2014	30/09/2014	30/09/2014	1/10/2014
		Date AGL obtained data	20/10/2014	27/10/2014	20/10/2014	27/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014
Analyte	Units of measure	Limit of reporting										
Silica	mg/L	0.05	na	0.87	na	3.98	7.89	17	21.9	161	35.9	19.1
Sodium	mg/L	1	na	54	51	51	57	1260	232	934	676	811
Sodium Hypochlorite (reported as free chlorine)	mg/L	0.2	na	<0.2	na	0.5	<0.2	<0.2	<0.2	0.9	<0.2	<0.2
Sodium Hypochlorite (reported as total residual chlorine)	mg/L	0.2	na	<0.2	na	0.5	<0.2	<0.2	<0.2	0.9	<0.2	<0.2
Standing water level	mAHD	0.001									96.76	14.225 <sup>d</sup>
Strontium (dissolved)	mg/L	0.001	na	0.293	0.305	na	0.21	2.23	0.239	1.11	1.95	4.55
Sulfate	mg/L	1	na	28	na	24	36	189	29	<1	78	104
THPS (Phosphonium, Tetra kis (Hydroxymethylna sulfate)) <sup>c</sup>	mg/L	na	na	na	na	na	na	na	na	na	na	na
Total dissolved solids	mg/L	10	na	255	na	235	250	3070	472	2420	2050	1980
Total organic carbon	mg/L	1	12	na	9	na	19	29	6	104	1	<1
Total suspended solids	mg/L	5						<5	<5	38	43	<5



		Monitoring points		7		8		9	10	11	12	90	91
		Location		WKSW03		WKSW02		WKSW01	WKMB01	WKMB02	WKMB03	GR-P3	GW080487
		Sampled date		30/09/2014	8/10/2014 <sup>a</sup>	30/09/2014	8/10/2014 <sup>a</sup>	30/09/2014	30/09/2014	30/09/2014	30/09/2014	30/09/2014	1/10/2014
		Date AGL obtained data		20/10/2014	27/10/2014	20/10/2014	27/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014	20/10/2014
Analyte	Units of measure	Limit of reporting											
Uranium	mg/L	0.001		na	<0.001	<0.001	na	<0.001	<0.001	0.001	<0.001	0.003	<0.001
Vanadium	mg/L	0.01		na	<0.01	<0.01	na	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	mg/L	0.005		na	<0.005	0.006	na	0.01	0.01	<0.005	9.1	0.013	0.009

Notes:

- Shaded grey = not required to be reported
- na = not analysed
- <sup>a</sup> = WKSW02 and WKSW03 were resampled at a later date due to laboratory sample loss of the initial sample.
- <sup>b</sup> = Choline chloride was not analysed as it will not be included in the fracture stimulation chemicals for the Waukivory Pilot Program, therefore analysis of choline chloride in the groundwater, surface water and flow back water is not required.
- <sup>c</sup> = THPS (Phosphonium, Tetrakis (Hydroxymethyl-sulfate)) was not able to be analysed by the date of this report pending development and validation of an approved method of analysis. Samples have been collected and stored in anticipation of the approved method.
- <sup>d</sup> = groundwater level in metres below ground level (mbgl) since survey level data is not currently available for this location. Level survey scheduled for November 2014.

**Table 4: Continuous water level monitoring results for monitoring points 10, 11, 12, and 14 for the period 6 August – 30 September 2014**

Monitoring point	10	11	12	14	
Location	WKMB01	WKMB02	WKMB03	PL03 Sensor 2	PL03 Sensor 3
Data type	Standing Water Level				
Units	mAHD (metres (Australian Height Datum))				
Date data downloaded	30/09/14	30/09/14	30/09/14	04/11/14	04/11/14
Date data supplied to AGL	07/11/14	07/11/14	07/11/14	07/11/04	07/11/14
Monitoring frequency required by licence	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours
No. of times measured during monitoring period	57 <sup>a</sup>	190 <sup>b</sup>	224	224	224
Min. value	91.2	94.6	90.9	89.9	55.7
Mean value	95.2	96.0	98.5	91.0	60.3
Median value	95.3	96.1	98.5	91.0	60.2
Max. value	95.3	96.1	98.6	92.2	66.4

Notes:

- <sup>a</sup> = Datalogger operational from 16/09/2014
- <sup>b</sup> = Datalogger operational from 14/08/2014

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