AGL UPSTREAM INVESTMENTS PTY LTD

GLOUCESTER GAS PROJECT

July 2015 Water Monitoring Report

Waukivory Pilot Project: Fracture Stimulation and Flow Test
EPL 20358

Reporting Period: December to April 2015

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Foreword

PREMISES	Gloucester Coal Seam Gas Project Bucketts Way Gloucester NSW 2422
LICENCE DETAILS	Environment Protection Licence 20358
LICENCEE	AGL Upstream Investments Pty Limited (AGL)
LICENCEE'S ADDRESS	Locked Bag 1837, North Sydney, NSW 2060
MONITORING DATE(s)	27 May 2015, 24 December 2014 – 1 April 2015
MONITORING BY	Parsons Brinckerhoff, on behalf of AGL
ANALYSIS BY	ALS Laboratory, Smithfield (Work orders: ES1522864) Envirolab Services, Chatswood (Ref: 128768)
DATE AGL OBTAINED DATA	12 June 2015
REPORT DATE	02 July 2015
REPORT PREPARED BY	James Duggleby, Senior Hydrogeologist

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 Gas Field Development Area (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.

The Gloucester Coal Seam Gas Project has Environment Protection Licence (EPL) 20358 for coal seam gas activities. This Monitoring Report relates to the water monitoring activities specified in Part 5, Monitoring and Recording Conditions, of EPL 20358. This report relates specifically to the monitoring surrounding the Waukivory Pilot Project, and details:

- Monitoring results from 6 monthly samples post fracture stimulation at monitoring points 7, 8, 9 (WKSW03, WKSW02, WKSW01) (Appendix B);
- Monitoring results from continuous water level (piezometric level) monitoring at monitoring point 85 (WKMB05) between 12 January 2015 to 1 April 2015 (Appendix C and Appendix E, Figure 4);
- Monitoring results from continuous water level (including piezometric level) monitoring at monitoring points 10, 11, 12, 14, 90 (WKMB01, WKMB02, WKMB03, PL03, GR-P3) between 1 January 2015 to 31 March or 1 April 2015 (Appendix C and Appendix E, Figure 2 and Figure 3); and
- Monitoring results from continuous water level (pressure) at monitoring points 86, 87, 88, 89 (WK11, WK12, WK13, WK14) from the start of the flowback period to 31 March 2015 (Appendix D and Appendix E, Figure 5).

As per the EPL, monitoring encompasses the monitoring points at the locations as shown in Table 1 and Figure 1.

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

One method was used to obtain the surface water samples:

- A telescopic sampler to collect grab samples from the surface water monitoring points 7, 8, and 9.

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:

- Monoethanolamine borate, which was analysed as monoethanolamine using the Liquid Chromatography Triple Quadruple Mass Spectrometry (LC/MSMS) method. The EPA have acknowledged that this method is a suitable technique for representing detections of monoethanolamine borate in water (EPA, 2014b).
- Sodium hypochlorite, where detections of free and total residual chlorine were used as a proxy. The EPA have acknowledged that this method is a suitable technique for representing detections of sodium hypochlorite in water (EPA, 2014a).
- Tetrakis (Hydroxymethyl) Phosphonium Sulphate (THPS), which was analysed using ultra-High Performance Liquid Chromatography methodology with UV detection (uHPLC-UV), based on NIOSH 5046. The EPA have acknowledged, on 19 December 2014, that

this method is a suitable technique for representing detections of THPS in water (EPA, 2014c). Samples collected prior to this date were stored on ice and underwent analysis post 19 December 2014. These results are also presented in this report.

Monitoring point 85 is a multizone monitoring well with six pressure transducers installed at six different horizons to measure the piezometric levels. Details of the individual monitored zones are included in Appendix C.

Monitoring point 90 is a multizone vibrating wire piezometer with two pressure transducers installed at two different horizons to measure the piezometic levels. Details of the individual monitored zones are included in Appendix C.

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

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	Packer and piezometer completion: multizone monitoring well (groundwater)	402576.59	6452128.62
86	WK11	Gas well	402419.02	6452589.82
87	WK12	Gas well	402748.92	6452883.77
88	WK13	Gas well	402416.74	6452164.46
89	WK14	Gas well	402906.10	6452384.08
90	GR-P3	Private groundwater bore	402905.50	6452518.71
91	GW080487	Private groundwater bore	401226.00	6454020.00

Notes:

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)

References

AGL, 2014. Surface Water and Groundwater Management Plan for the Waukivory Pilot Program – Gloucester Gas Project. Available online: http://www.resourcesandenergy.nsw.gov.au/__data/assets/pdf_file/0007/532942/FinalversionoftheSGMPfortheWaukivoryPilot-Oct2014.pdf

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Environment Protection Authority (EPA), 2014b. Letter correspondence to AGL Energy Limited. EPA reference: DOC14/279381-01; SF14/602, delivered on the 1 December 2014, signed: Brett Nudd, Acting Special Project Manager – Coal Seam Gas.

Environment Protection Authority (EPA), 2014c. Letter correspondence to AGL Energy Limited. EPA reference: DOC14/279381-12; SF14/602, delivered on the 19 December 2014, signed: Jessica Creed, Acting Unit Head – Coal Seam Gas.

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The State of NSW and Environment Protection Authority (EPA), 2012. Requirements for publishing pollution monitoring data. Environment Protection Authority, Sydney, Australia. Available online: http://www.epa.nsw.gov.au/resources/licensing/130742reqpubpmdata.pdf

Appendix A: Analytes monitored and frequency required for monitoring 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	Frequency	Sampling method
Aluminium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Ammonia	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Arsenic	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Barium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Beryllium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Bicarbonate	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Boron	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Cadmium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Calcium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Carbonate	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Chloride	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Chromium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Cobalt	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Copper	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Electrical conductivity	microsiemens per centimetre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Fluoride	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Iron	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Lead	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Magnesium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Manganese	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Mercury	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	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	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	Special Frequency 3	Grab sample
Monoethanolamine Borate	micrograms 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	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	Special Frequency 3	Grab sample
Nitrate	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	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	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	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	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	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	Special Frequency 3	Grab sample
Selenium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Silica	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Sodium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Sodium Hypochlorite	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	Special Frequency 3	Method approved in writing by the Authority
Standing water level	meters (Australian Height Datum)			Special Frequency 8	Special Method 5	Special Frequency 8	Special Method 5	Special Frequency 9	Special Method 3	Special Frequency 8	Special Method 5	Special Frequency 6	Special Method 1
Strontium (dissolved)	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Sulfate	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
THPS (Phosphonium, Tetrakis (Hydroxymethyl-sulfate)	micrograms per litre	Special Frequency 5	Method approved in writing by the Authority (after the data was received for this report)	Special Frequency 3	Method approved in writing by the Authority (after the data was received for this report)			Special Frequency 4	Method approved in writing by the Authority (after the data was received for this report)	Special Frequency 3	Method approved in writing by the Authority (after the data was received for this report)	Special Frequency 3	Method approved in writing by the Authority (after the data was received for this report)
Total dissolved solids	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Total organic carbon	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Total suspended solids	milligrams per litre			Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Uranium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Vanadium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample
Zinc	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample	Special Frequency 3	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 Project fracture stimulation.

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.

Special method 1 - manual dip

Special method 3 - Use of an automated datalogger. As a back up contingency, by use of Sonolog in the event of an automated datalogger.

Special method 5 - Automated datalogger

Shaded grey = not required to be analysed

Appendix B: Water quality monitoring data for points 7, 8, and 9

		Monitoring points	7	8	9
		Location	WKSW03	WKSW02	WKSW01
		Sampled date	27/05/2015	27/05/2015	27/05/2015
		Date AGL obtained data	12/06/2015	12/06/2015	12/06/2015
		Monitoring event (see key below)	a	a	a
Analyte	**Units of measure**	**Limit of reporting**			
Aluminium	mg/L	0.01	0.32	0.13	0.19
Ammonia	mg/L	0.01			
Arsenic	mg/L	0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.001	0.028	0.030	0.030
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	1	38	46	30
Boron	mg/L	0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	1	9	11	6
Carbonate	mg/L	1	<1	<1	<1
Chloride	mg/L	0.1	42.3	44.0	41.6
Chromium	mg/L	0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.003	0.003	<0.001
Electrical conductivity	µS/cm	1	218	233	202
Fluoride	mg/L	0.1	0.1	0.2	0.1
Iron	mg/L	0.05	0.48	0.23	0.54
Lead	mg/L	0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	1	5	6	5
Manganese	mg/L	0.001	0.020	0.014	0.023
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001
Methane	mg/L	0.010			
Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001
Monoethanolamine Borate (reported as (mono) ethanolamine))	µg/L	1	<1	<1	<1
Nickel	mg/L	0.001	<0.001	<0.001	<0.001
Nitrate	mg/L	0.01			
Nitrite	mg/L	0.01			
pH	pH Unit	0.01	8.25	8.33	8.09
Phosphorus (total)	mg/L	0.01			
Potassium	mg/L	1	3	2	3
Reactive Phosphorus	mg/L	0.01			
Selenium	mg/L	0.01	<0.01	<0.01	<0.01
Silica	mg/L	0.05	17.1	18.1	16.6
Sodium	mg/L	1	24	24	23
Sodium Hypochlorite (reported as free chlorine)	mg/L	0.2	<0.2	<0.2	<0.2
Sodium Hypochlorite (reported as total residual chlorine)	mg/L	0.2	<0.2	<0.2	<0.2
Standing water level	mAHD				
Strontium (dissolved)	mg/L	0.001	0.093	0.111	0.083
Sulfate	mg/L	1	9	10	9
THPS (Phosphonium, Tetrakis (Hydroxymethyl-sulfate))	µg/L	50	<50	<50	<50
Total dissolved solids	mg/L	10	161	156	145
Total organic carbon	mg/L	1	9	7	12
Total suspended solids	mg/L	5			
Uranium	mg/L	0.001	<0.001	<0.001	<0.001
Vanadium	mg/L	0.01	<0.01	<0.01	<0.01
Zinc	mg/L	0.005	0.010	0.009	<0.005

Key:

Shaded grey = not required to be reported

Monitoring event:

a 6 months after the completion of the Waukivory Pilot Program fracture stimulation

Appendix C: Continuous water level monitoring results for monitoring points 10, 11, 12, 14, 85, and 90 for the period 1 January 2015 - 1 April 2015 (tabulated summary)

Monitoring point	10	11	12	14		85						90
Location	WKMB01	WKMB02	WKMB03	PL03	PL03	WKMB05						GR-P3
				Sensor 2	Sensor 3	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	
Monitored interval (mbgl)	47 - 53	51 - 60	200 - 209	496	463	340.0 - 343.0	426.0- 429.0	584.0- 587.0	595.4- 598.4	698.5- 701.5	711.0- 714.0	5.0 - 9.0
Data type	Standing water level											
Units	mAHD (metres Australian Height Datum)											
Data start	1/01/2015	1/01/2015	1/01/2015	1/01/2015	1/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	1/01/2015
Date data downloaded	1/04/2015	1/04/2015	1/04/2015	31/03/2015	31/03/2015	1/04/2015	1/04/2015	1/04/2015	1/04/2015	1/04/2015	1/04/2015	1/04/2015
Date data supplied to AGL	12/06/2015	12/06/2015	12/06/2015	12/06/2015	12/06/2015	25/06/2015	25/06/2015	25/06/2015	25/06/2015	25/06/2015	25/06/2015	12/06/2015
Monitoring frequency required by licence	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours	Every 6 hours
No. of times measured during monitoring period	360	360	360	359	359	316	316	316	316	316	316	360
Min. value	91.0	96.0	91.5	82.5	43.2	104.9	103.3	112.6	116.7	143.8	171.1	96.7
Mean value	95.3	96.1	98.1	85.6	44.1	107.1	104.3	112.9	116.8	145.1	171.4	96.8
Median value	95.3	96.1	98.2	85.8	44.0	107.1	104.1	112.9	116.8	144.8	171.4	96.8
Max. value	95.4	96.2	98.4	86.9	45.5	109.2	106.4	113.2	116.9	147.4	171.5	96.9

Appendix D: Continuous water level monitoring results for monitoring points 86, 87, 88, and 89 from the end of fracture stimulation at each individual monitoring point to 31 March 2015 (tabulated summary)

Monitoring point	86	87	88	89
Location	WK11	WK12	WK13	WK14
Data type	Standing water level			
Units	mAHD (metres Australian Height Datum)			
Data start	23/01/2015	24/12/2014	25/12/2014	18/01/2015
Date end	31/03/2015	31/03/2015	31/03/2015	31/03/2015
Date data supplied to AGL	12/06/2015	12/06/2015	12/06/2015	12/06/2015
Monitoring frequency required by licence	Every 6 hours when using an automated datalogger; or, once every fortnight using a Sonolog in the event of failure of an automated datalogger			
No. of times measured during monitoring period	182	247	320	206
Min. value	-70.9	-393.5	-617.2	-348.8
Mean value	46.8	-268.5	-463.1	-253.1
Median value	61.6	-326.5	-494.2	-331.2
Max. value	82.1	93.5	47.8	99.7

Appendix E: Continuous water level monitoring results (hydrographs)

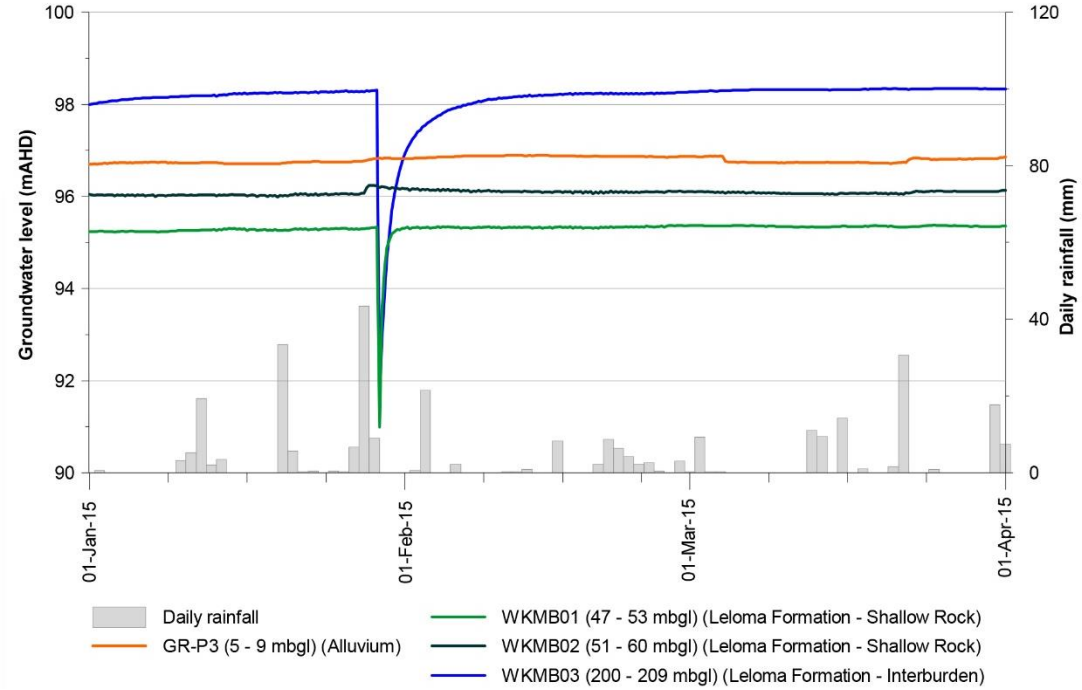

Figure 2: Continuous water level monitoring results for monitoring points 10 (WKMB01), 11 (WKMB02), 12 (WKMB03), and 90 (GR-P3) for the period 1 January 2015 - 1 April 2015.

Note (Figure 2): The brief drop in water levels (shown during late January 2015) is caused when technicians visit a bore to take a water sample, temporarily lowering the amount of water in the borehole.

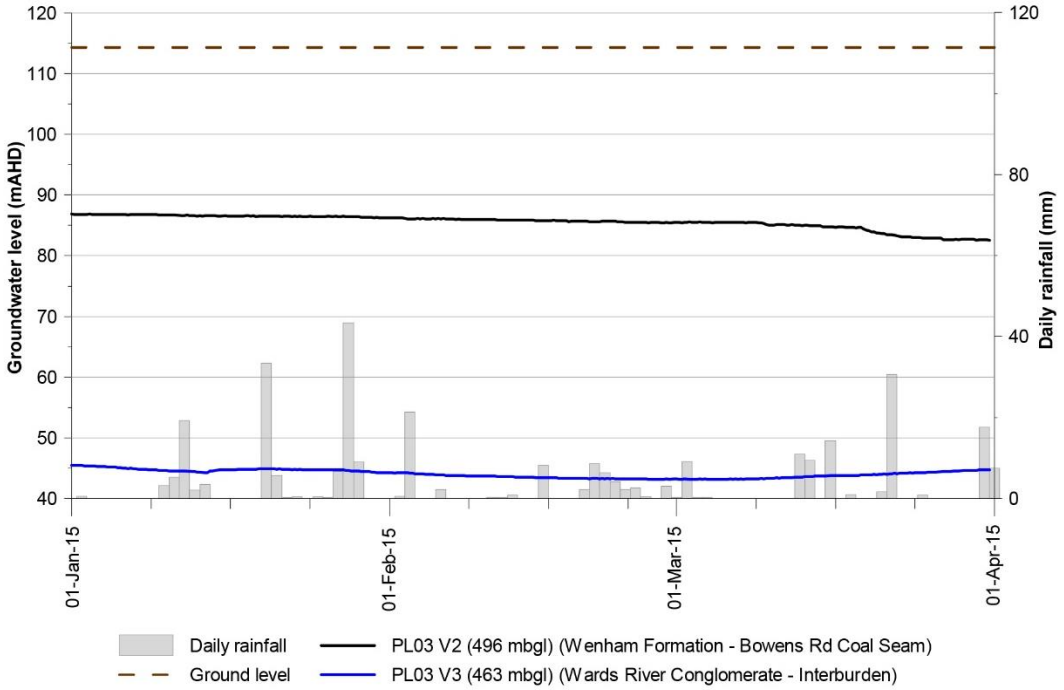

Figure 3: Continuous water level monitoring results for monitoring point 14 (PL03) for the period 1 January 2015 - 1 April 2015

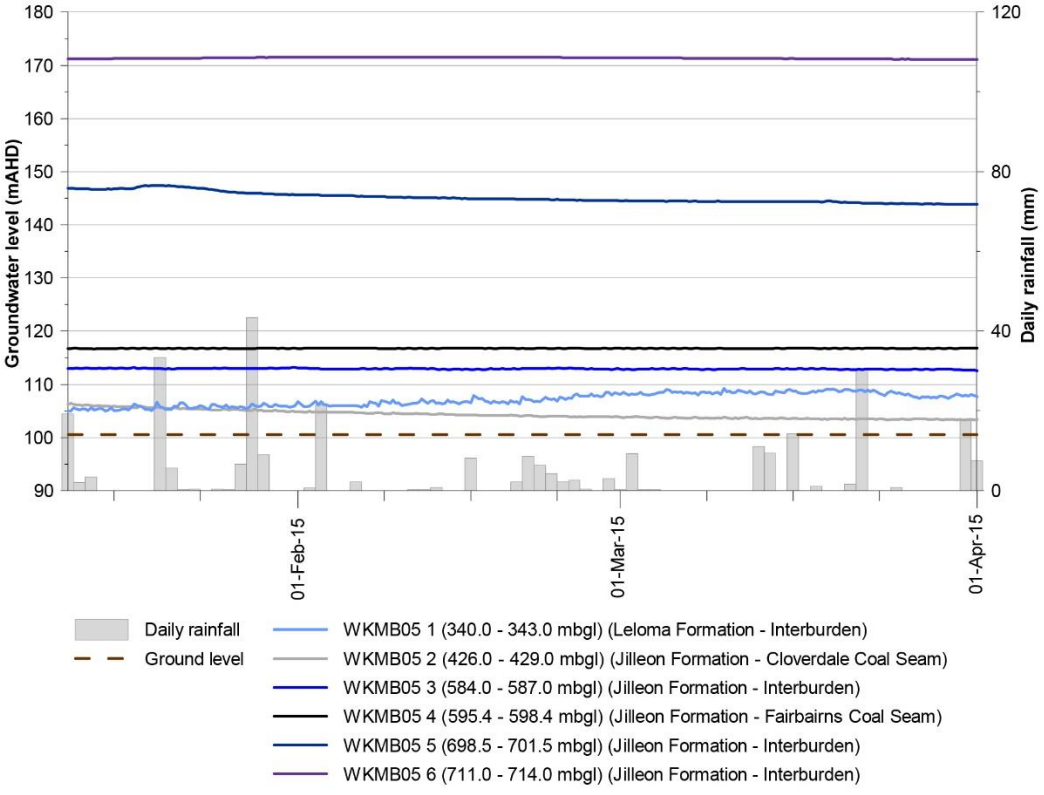

Figure 4: Continuous water level monitoring results for monitoring point 85 (WKMB05) for the period 12 January 2015 - 1 April 2015

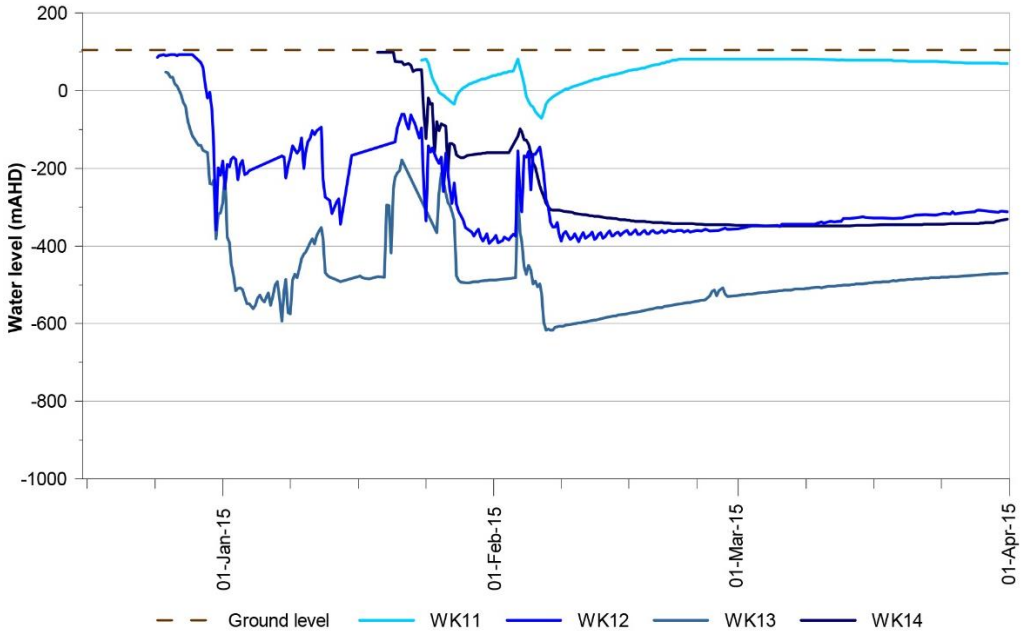

Figure 5: Continuous water level monitoring results for monitoring points 86 (WK11), 87 (WK12), 88 (WK13), 89 (WK14) from the end of fracture stimulation at each individual monitoring point to 31 March 2015

Note (Figure 5): Water levels (pressure levels) in the pilot wells are highly variable and dependent on pump commissioning and operation (including fluctuating pumping rates). When pumping is taking place, pressure level declines (drawdown) are observed in the pilot wells and when pumping ceases the pressure levels re-equilibrate (recover) to that of the target formations. The pump commissioning and flowback phases comprise periods where the pumps have been in operation and periods where pumping has ceased either due to workover intervention or suspension.