

The logo consists of the text "Energy in action." in a blue sans-serif font, with a trademark symbol (TM) to the right of "action.". The text is positioned in the upper left corner of a large, light brown rounded rectangle. Below this rectangle are three smaller, overlapping light brown rectangles of varying sizes, arranged in a descending staircase pattern from left to right. At the bottom right of the entire graphic is the AGL logo, which is a blue square containing a white sunburst icon and the letters "AGL" in white.

AGL UPSTREAM INVESTMENTS
PTY LTD

GLOUCESTER GAS PROJECT

**January 2016 Water Monitoring Report
Revision B (Addendum)**

**Waukivory Pilot Project: Fracture Stimulation and Flow Test
EPL 20358**

Reporting Period: December 2015 – January 2016

AGL Upstream Investments Pty Ltd

ABN 58 115 063 744

Locked Bag 1837, St Leonards NSW 2065

Level 22, 101 Miller Street, North Sydney NSW 2060

Telephone: 02 9921 2999 Facsimile: 02 9921 2474

Complaints Line (24 hours): 1300 799 716



Foreword

PREMISES	Gloucester Coal Seam Gas Project Bucketts Way Gloucester NSW 2422
LICENCE DETAILS	<u>Environment Protection Licence 20358</u>
LICENCEE	AGL Upstream Investments Pty Limited (AGL)
LICENCEE'S ADDRESS	Locked Bag 1837, North Sydney, NSW 2060
MONITORING DATE(S)	10, 15, 16, 17 December 2015 and 20 January 2016
MONITORING BY	Parsons Brinckerhoff, on behalf of AGL
ANALYSIS BY	ALS Laboratory, Smithfield (Work order: ES1538990, ES1539080, ES1601337)
DATE AGL OBTAINED DATA	7 and 20 January 2016
REPORT DATE	27 January 2016 Revision B (Addendum): 24 August 2016
REPORT PREPARED BY	James Duggleby, Senior Hydrogeologist

Changes in Revision B (addendum): correction of continuous data statistics for monitoring points 86 and 87.

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 250 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 monthly samples at monitoring points 7, 8, 9 (WКСW03, WКСW02, WКСW01) (Appendix B);
- > Monitoring results from six monthly samples at monitoring points 10, 11, 90, 91 (WКMB01, WКMB02, GR-P3, GW080487) (Appendix B);
- > Monitoring results from monthly samples at monitoring point 92 (AST2) (Appendix B);
- > Monitoring results from continuous water level (including piezometric level) monitoring at monitoring points 10, 11, 12, 85, and 90 (WКMB01, WКMB02, WКMB03, WКMB05, GR-P3) for the period 5 August 2015 to 4-6 January 2016 (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 (WК11, WК12, WК13, WК14) from 5 August 2015 – 30 or 31 December 2015 (Appendix D and Appendix E, Figure 4).

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, 2015).

Four methods were used to obtain the 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 and 11. 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; and
- > A telescopic sampler to collect grab samples from the flowback water monitoring point 92 and 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 those referenced in Section M2.7 of EPL 20358 and:

- > 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); and
- > 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).

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

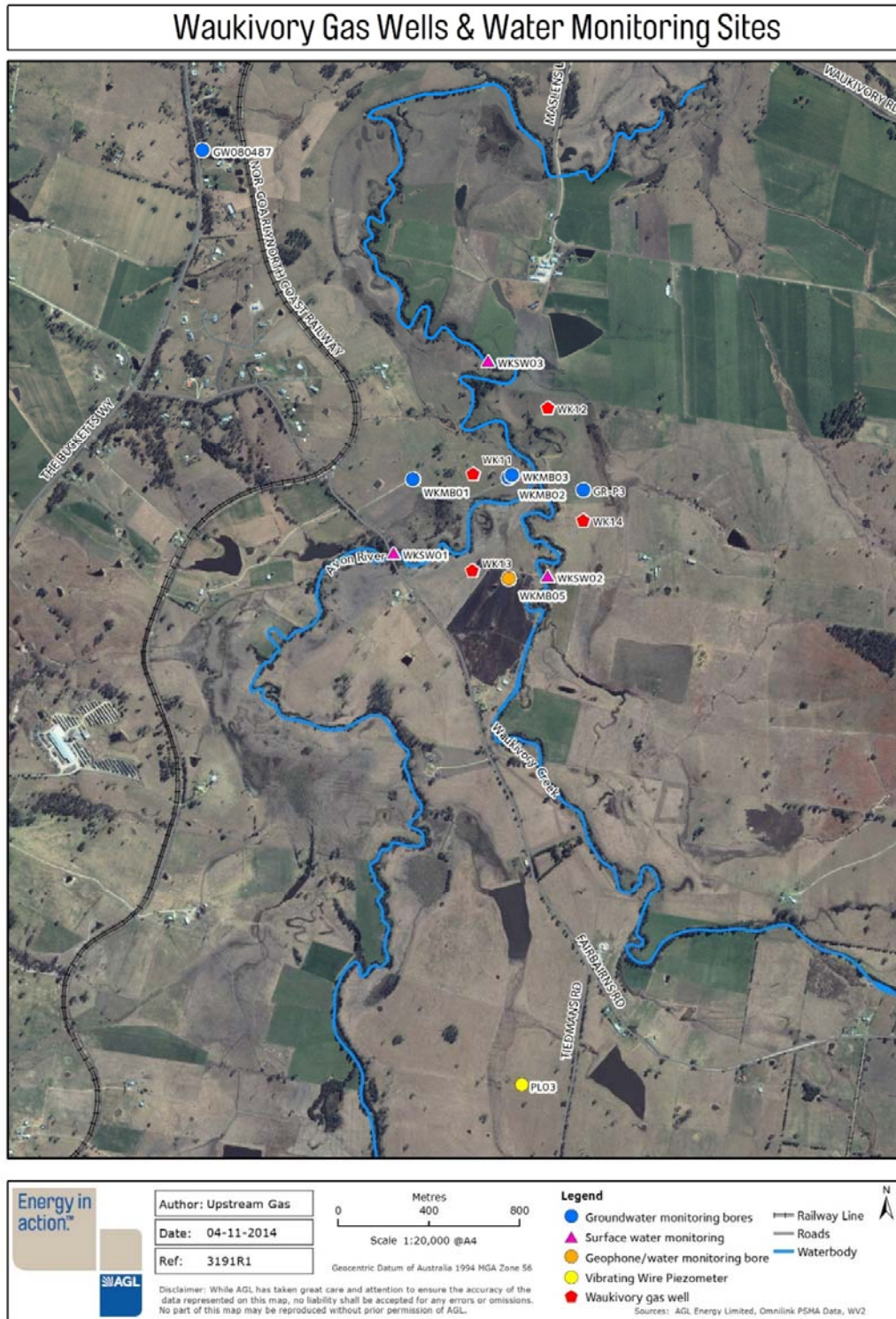
Table 1: Waukivory Pilot Project water monitoring points (as per EPL 20358)

EPA Identification no.	Monitoring Point	Type of monitoring point	Easting (m)	Northing (m)
7	WКСW03	Stream gauge (surface water)	402486.36	6453090.65
8	WКСW02	Stream gauge (surface water)	402748.00	6452139.00
9	WКСW01	Stream gauge (surface water)	402069.00	6452241.00
10	WКMB01	Groundwater monitoring bore	402153.63	6452566.28
11	WКMB02	Groundwater monitoring bore	402575.54	6452572.49
12	WКMB03	Groundwater monitoring bore	402589.87	6452584.93
14	PL03	Vibrating wire piezometer (groundwater)	402633.90	6449898.67
85	WКMB05	Packer and piezometer completion: multizone monitoring well (groundwater)	402576.59	6452128.62
86	WК11	Gas well	402419.02	6452589.82
87	WК12	Gas well	402748.92	6452883.77
88	WК13	Gas well	402416.74	6452164.46
89	WК14	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
92	AST2	Above ground storage tank	Located on the WК13 work pad	

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, 2015. Surface Water and Groundwater Management Plan for the Waukivory Pilot Program – Gloucester Gas Project. Available online:
http://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/Gloucester%20Document%20Repository/Water%20Plans/20150506_Surface%20Water%20and%20Groundwater%20Management%20Plan%20for%20the%20Waukivory%20Pilot%20Program.pdf
- Environment Protection Authority (EPA), 2014a. Letter correspondence to AGL Energy Limited. EPA reference: DOC14/192084-03; SF14/602, delivered on the 20 October 2014, signed: Carmen Dwyer, Special Project Manager – Coal Seam Gas.
- 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), 2004. Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales, The Department of Environment and Conservation, Sydney, Australia. Available online:
<http://www.environment.nsw.gov.au/resources/water/approvedmethods-water.pdf>
- Parsons Brinckerhoff (PB), 2012. Phase 2 Groundwater Investigations – Stage 1 Gas Field Development Area, Gloucester Gas Project. Report dated January 2012, PR_5630. Available online:
<http://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Assessments%20and%20Reports/2012/January/PB%20Gloucester%20Groundwater%20Report%20Phase%202%20Appendices%20E-P.pdf>
- 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 (dated 17 September 2015))

Pollutant	Units of measure	Monitoring points											
		7,8,9		10,11,90		91		12,14,85		86,87,88,89		92	
		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 3	Grab sample			Special Frequency 4	Grab sample		
Ammonia	milligrams per litre			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Arsenic	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Barium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Benzene	micrograms per litre*			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample					Monthly	Grab sample
Beryllium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Bicarbonate	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Boron	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Cadmium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Calcium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Carbonate	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Chloride	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Chromium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Cobalt	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Copper	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Ethyl benzene	micrograms per litre*			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample					Monthly	Grab sample
Electrical conductivity	microsiemens per centimetre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Fluoride	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Iron	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Lead	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Magnesium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Manganese	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Mercury	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Methane	milligrams per litre			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Molybdenum	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	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 3	Method approved in writing by the Authority			Special Frequency 4	Method approved in writing by the Authority		
Nickel	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Nitrate	milligrams per litre			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Nitrite	milligrams per litre			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
pH	pH	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Phosphorus (total)	milligrams per litre			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Potassium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Reactive Phosphorus	milligrams per litre			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Selenium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Silica	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Sodium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	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 3	Method approved in writing by the Authority			Special Frequency 4	Method approved in writing by the Authority		
Standing water level	meters (Australian Height Datum)			Special Frequency 8	Special Method 5	Special Frequency 6*	Special Method 1	Special Frequency 8	Special Method 5	Special Frequency 9	Special Method 3		
Strontium (dissolved)	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Sulfate	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Toluene	micrograms per litre*			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample					Monthly	Grab sample
Total dissolved solids	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Total organic carbon	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Total suspended solids	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Uranium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Vanadium	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		
Xylene	micrograms per litre*			Special Frequency 3	Grab sample	Special Frequency 3	Grab sample					Monthly	Grab sample
Zinc	milligrams per litre	Special Frequency 5	Grab sample	Special Frequency 3	Grab sample	Special Frequency 3	Grab sample			Special Frequency 4	Grab sample		

Notes:

Special Frequency 3 – 6 monthly

Special Frequency 4 – Every fortnight for the first 8 weeks of extraction from the commencement of the Waukivory pilot flow testing, then every 2 months thereafter until the cessation of the Waukivory pilot flow testing. Should the flow be suspended during that stage, then the timeframes will also be suspended and recommence when flows from the wells recommence.

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 & 6 months after cessation of fracture stimulation, then monthly for the next 12 months. Sampling requirements to be reassessed in May 2016.

Special Frequency 6 – One monitoring event to determine water level prior to the Waukivory Pilot Project fracture stimulation. *monitoring frequency was monthly at the time of monitoring - following the 17 September 2015 revision of EPL 20358, monthly monitoring of water levels at monitoring point 91 is no longer required.

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.

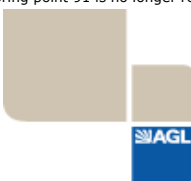
Special method 1 - manual dip Special method 3 - Use of an automated datalogger. As a back up contingency, by use of Sonolog in the event of failure of an automated datalogger.

Special method 5 - Automated datalogger Special method 7 - Sodium Hypochlorite is monitored through its elemental constituents. Free residual and total chlorine are monitored using existing validated methods

Shaded grey = not required to be analysed

*EPL20358 (issued 17 September 2015) contains inconsistencies in the required Units of Measure for Benzene, Toluene, Ethyl Benzene and Xylene. For consistency with laboratory data BTEX concentrations are reported here in micrograms per litre.

The most current version of EPL20358 was issued on 24 December 2015; however the version dated 17 September 2015 has been referenced in this table as that was the version valid at the time of sampling.



Appendix B: Water quality monitoring data for points 7, 8, 9, 10, 11, 90, 91, and 92

Analysis by: ALS Laboratory, Smithfield (Work order: ES1538990, ES1539080, ES1601337)

Monitoring points		7	8	9	10	11	90	91	92	
Location		WКСW03	WКСW02	WКСW01	WКMB01	WКMB02	GR-P3	GW080487	AST2	
Sampled date		15/12/2015	15/12/2015	16/12/2015	16/12/2015	16/12/2015	16/12/2015	17/12/2015	20/01/2016	
Date AGL obtained data		7/01/2016	7/01/2016	7/01/2016	7/01/2016	7/01/2016	7/01/2016	7/01/2016	21/01/2016	
Monitoring event (see key below)		a	a	a	b	b	b	b	a	
Analyte	Units of measure	Limit of reporting								Analyte
Aluminium	mg/L	0.01	<0.01	<0.01	<0.01	0.02	0.2	<0.01	<0.01	Aluminium
Ammonia	mg/L	0.01				0.55	0.42	0.04	0.55	Ammonia
Arsenic	mg/L	0.001	0.002	0.002	0.001	<0.001	0.001	<0.001	<0.001	Arsenic
Barium	mg/L	0.001	0.048	0.034	0.044	0.242	0.098	0.44	0.224	Barium
Benzene	µg/L	1				<1	<1	<1	<1	Benzene
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	Beryllium
Bicarbonate	mg/L	1	78	120	70	853	218	364	1030	Bicarbonate
Boron	mg/L	0.05	<0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	Boron
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	Cadmium
Calcium	mg/L	1	16	24	13	15	1	130	92	Calcium
Carbonate	mg/L	1	<1	<1	<1	<1	136	<1	<1	Carbonate
Chloride	mg/L	0.1	60	75	61.0	962.0	66.6	1150	696	Chloride
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	Chromium
Cobalt	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	Cobalt
Copper	mg/L	0.001	0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001	Copper
Ethyl benzene	µg/L	2				<2	<2	<2	<2	Ethyl benzene
Electrical conductivity	µS/cm	1	346	472	337	4410	956	4140	3960	Electrical conductivity
Fluoride	mg/L	0.1	<0.1	0.1	0.1	1.8	0.5	0.2	0.2	Fluoride
Iron	mg/L	0.05	0.14	0.07	0.14	<0.05	<0.05	0.24	0.57	Iron
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	Lead
Magnesium	mg/L	1	8	13	10	1	<1	72	38	Magnesium
Manganese	mg/L	0.001	0.4	0.241	0.195	0.009	0.005	0.607	0.046	Manganese
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	Mercury
Methane	mg/L	0.01				18.5	7.24	<0.01	0.19	Methane
Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	Molybdenum
Monoethanolamine Borate	µg/L	1	<1	<1	<1	<1	<1	<1	2	Monoethanolamine Borate
Nickel	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	Nickel
Nitrate	mg/L	0.01				0.1	0.03	0.08	0.03	Nitrate
Nitrite	mg/L	0.01				<0.01	<0.01	<0.01	<0.01	Nitrite
pH	pH Unit	0.01	7.41	7.17	7.89	7.95	9.46	6.42	6.8	pH
Phosphorus (total)	mg/L	0.01				0.08	0.09	0.01	<0.01	Phosphorus (total)
Potassium	mg/L	1	3	4	3	3	8	2	6	Potassium
Reactive Phosphorus	mg/L	0.01				0.06	0.1	<0.01	<0.01	Reactive Phosphorus
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	Selenium
Silica	mg/L	0.05	12.7	11	10.8	16.4	21.7	36.5	21.2	Silica
Sodium	mg/L	1	36	50	41	1080	208	632	812	Sodium
Sodium Hypochlorite (reported as free chlorine)	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	Sodium Hypochlorite (reported as free chlorine)
Sodium Hypochlorite (reported as residual chlorine)	mg/L	0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	<0.2	Sodium Hypochlorite (reported as residual chlorine)
Standing water level	mAHD	0.01				Refer to Appendix C and D				Standing water level
Strontium (dissolved)	mg/L	0.001	0.192	0.207	0.221	1.47	0.28	2.03	4.90	Strontium (dissolved)
Sulfate	mg/L	1	<10*	<1	<1	45	28	82	92	Sulfate
Toluene	µg/L	2				<2	<2	<2	<2	Toluene
Total dissolved solids	mg/L	10	217	275	214	2540	538	2460	2270	Total dissolved solids
Total organic carbon	mg/L	1	16	8	10	20	8	2	4	Total organic carbon
Total suspended solids	mg/L	5	58	5	26	<5	<5	13	16	Total suspended solids
Uranium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	Uranium
Vanadium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	Vanadium
Xylene	µg/L	2				<2	<2	<2	<2	Xylene
Zinc	mg/L	0.005	0.006	0.01	0.007	<0.005	<0.005	0.017	0.009	Zinc

Key:

- Shaded grey = not required to be reported
- not analysed / available
- * limit of reporting raised due to matrix interferences
- Monitoring event:
 - a monthly sample
 - b six monthly sample





Appendix C: Continuous water level monitoring results for monitoring points 10, 11, 12, 85, and 90 from 5 August 2015 – 4/5/6 January 2016 (tabulated summary)

Monitoring point	10	11	12	85						90
Location	WKMB01	WKMB02	WKMB03	WKMB05						GR-P3
				Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	
Data type	Standing water level									
Units	mAHD (metres Australian Height Datum)									
Data start	5/08/2015	5/08/2015	5/08/2015	5/08/2015	5/08/2015	5/08/2015	5/08/2015	5/08/2015	5/08/2015	5/08/2015
Date data downloaded	5/01/2016	5/01/2016	5/01/2016	6/01/2016	6/01/2016	6/01/2016	6/01/2016	6/01/2016	6/01/2016	4/01/2016
Date data supplied to AGL	14/01/2016	14/01/2016	14/01/2016	14/01/2016	14/01/2016	14/01/2016	14/01/2016	14/01/2016	14/01/2016	14/01/2016
Monitoring frequency as 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
No. of times measured during monitoring period	508*	615	615	617	617	617	617	617	617	611
Min. value	95.4	96.2	98.6	103.5	100.7	111.5	116.7	141.1	168	97.1
Mean value	95.5	96.3	98.7	103.9	101.5	111.9	117.7	141.7	168.4	97.2
Median value	95.5	96.3	98.7	103.9	101.4	111.9	117.4	141.7	168.3	97.2
Max. value	95.6	96.7	98.7	104.5	102.4	112.2	118.8	142.2	169.2	97.5

*Logger stopped working on 10/12/2015 and was replaced on 20/01/2016.

Appendix D: Continuous water level monitoring results for monitoring points 86, 87, 88, and 89 from 5 August 2015 – 30/31 December 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	5/08/2015	5/08/2015	5/08/2015	5/08/2015
Date data downloaded	31/12/2015	30/12/2015	31/12/2015	30/12/2015
Date data supplied to AGL	14/01/2016	14/01/2016	14/01/2016	14/01/2016
Monitoring frequency as 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	529	366	484	534
Min. value	-938	-590	-842	-769
Mean value	-771	-455	-801	-703
Median value	-791	-488	-805	-710
Max. value	-20.4	31	-733	-610

Appendix E: Continuous water level monitoring results (hydrographs)

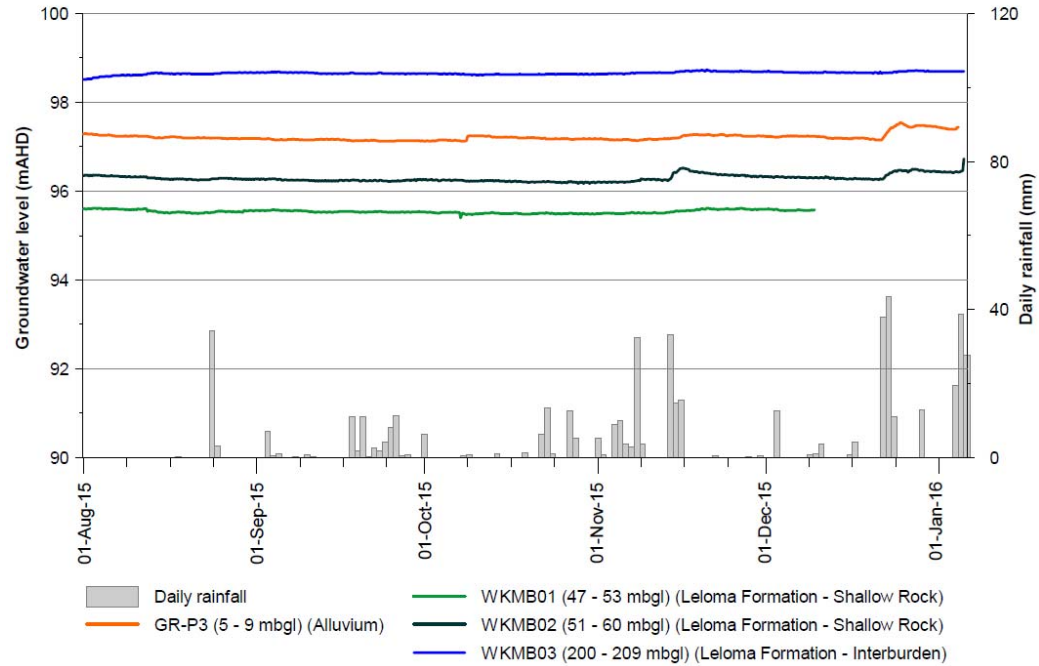


Figure 2: Continuous water level monitoring results for monitoring points 10 (WKMB01), 11 (WKMB02), 12 (WKMB03), and 90 (GR-P3) for the period 5 August 2015 – 6 January 2016.

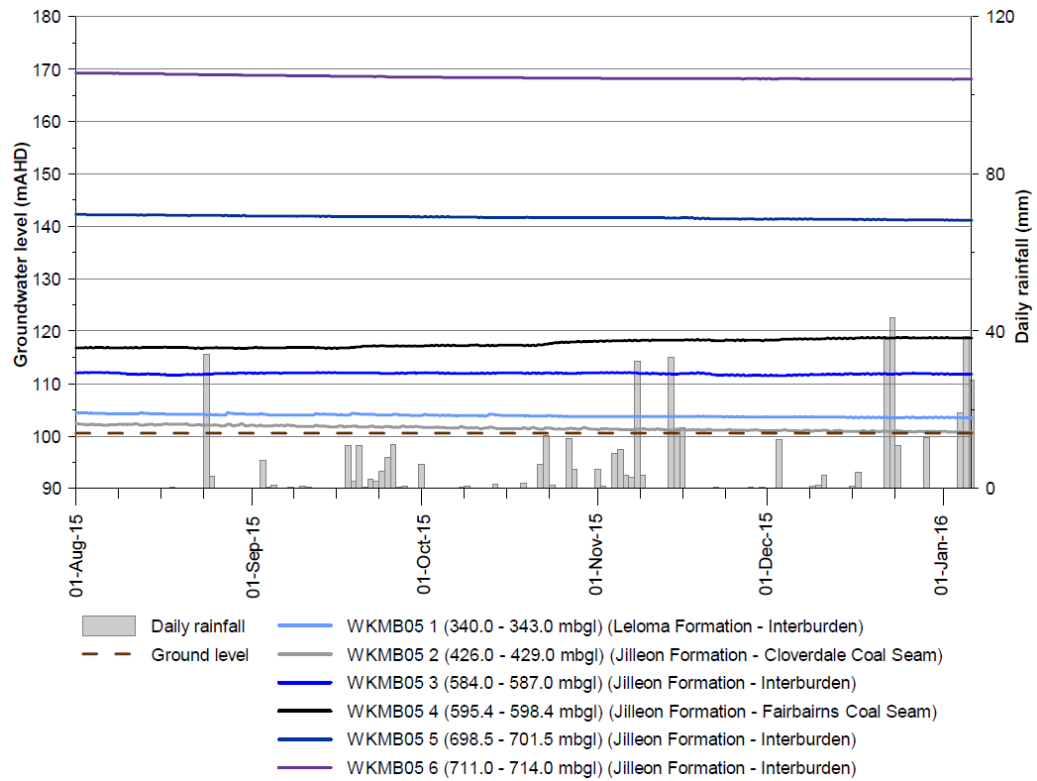


Figure 3: Continuous water level monitoring results for monitoring point 85 (WKMB05) for the period 5 August 2015 – 6 January 2016.

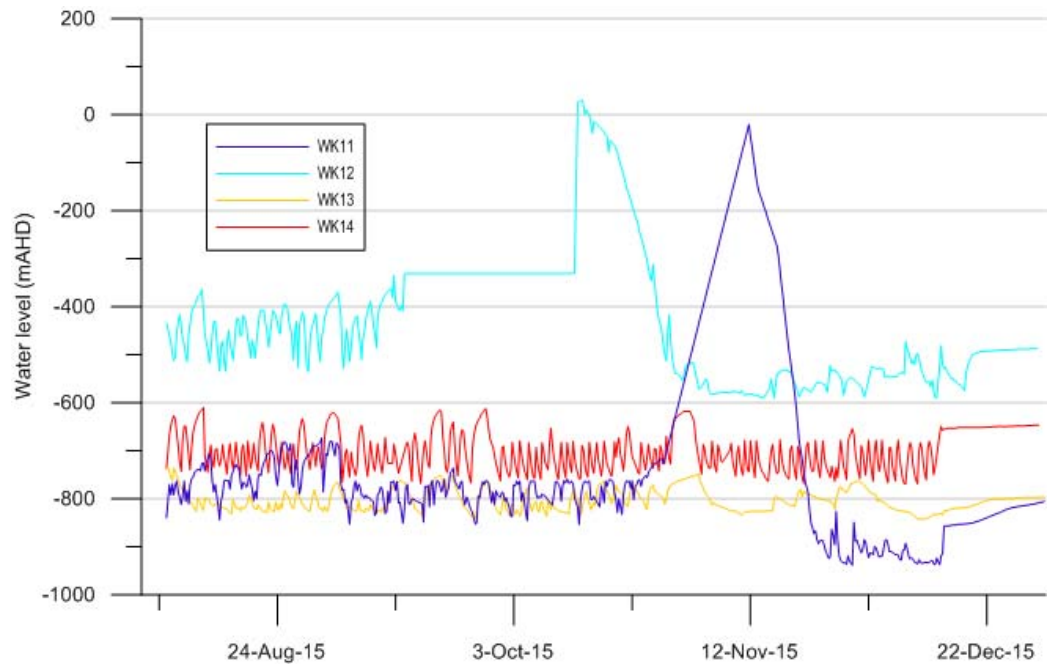


Figure 4: Continuous water level monitoring results for monitoring points 86 (WK11), 87 (WK12), 88 (WK13), and 89 (WK14) for the period 5 August 2015 – 6 January 2016.

Note (**Figure 4**): 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.