



AGL UPSTREAM INVESTMENTS PTY LTD

GLOUCESTER GAS PROJECT

**September 2014 Water Monitoring Report:
Irrigation Program
EPL 20358**

Reporting Period: August 2014

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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	Quarterly monitoring: (9 th – 21 st August) and 28 th August 2014
MONITORING BY	Parsons Brinckerhoff, on behalf of AGL
ANALYSIS BY	ALS Laboratory, Smithfield (Work orders: ES1418484/ES1418514/ES1418533/ES1419122)
DATE AGL OBTAINED DATA	5 th , 10 th and 24 th September 2014
REPORT DATE	25 th September 2014
REPORT PREPARED BY	James Duggleby, Senior Hydrogeologist

Table 1: Groundwater quality monitoring points: Irrigation Program (as per EPL 20358)..	4
Table 2: Analytes monitored and frequency (as per EPL 20358): monitoring points 27 – 35	6
Table 3: Analytes monitored and frequency (as per EPL 20358): monitoring points 36 – 52	9
Table 4: August 2014 Water monitoring results for monitoring points 27 – 38	12
Table 5: August 2014 Water monitoring results for monitoring points 39 – 52	17
Table 6: Continuous electrical conductivity monitoring results for monitoring points 33,34,36,37,38 for the period 6 August 2014 – 20 August 2014	20
Table 7: Continuous water level monitoring results for monitoring points 39 - 44 for the period 6 August 2014 – 20 August 2014	21
Figure 1: Location of groundwater and surface water quality monitoring points: Irrigation Program (as per EPL 20358)	5

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 and soil 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 Irrigation Trial program, and as per the Licence, 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 and Table 3. The monitoring results for this reporting period are shown in Table 4, Table 5, Table 6, and Table 7.

The monitoring points that are the subject of this report are part of the GGP groundwater monitoring network, as described in AGL's Water Management Plan for the Tiedman Irrigation Program (AGL, 2012a) and Soil Quality Monitoring and Management Program (AGL, 2012b)). Water monitoring results for the Irrigation Trial program are presented in a baseline water monitoring report (PB, 2013a) and six-monthly compliance reports (PB, 2013a, 2013b, 2014a, 2014b).

Four sampling methods were used to obtain surface water and groundwater samples:

- Submersible 12V pump at the groundwater monitoring bores screened within relatively permeable geological materials: TMB01, TMB02 and TMB03. A minimum of three well volumes was purged prior to sampling.
- Submersible 12V pump at the seepage monitoring bores TMB04 and TMB05 which are screened within material of very low permeability. The physical parameters of the purged groundwater were initially tested, then the bores were purged dry and if any inflow was observed within 12 hours then physical parameters were tested again and a sample taken for analysis.
- Disposable bailer at the shallow perched soil water piezometers (with piezometers purged dry and if any inflow was observed within 12 hours then physical parameters were tested again and a sample taken for analysis).
- In-situ snap sampler for groundwater monitoring bore S4MB01, screened within material of relatively low permeability.
- Grab sample using a telescopic sampler for surface water and dam water samples

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 calcium, which underwent filtration rather than acid extraction as a preliminary treatment prior to analysis.

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

The monitoring data for August 2014 relating to the other water monitoring points monitored in August 2014 for EPL 20358 (points 15 – 17 (Craven Flow Test)) are contained within a separate report also hosted on: <http://www.agl.com.au/about-agl/how-we-source-energy/monitoring-data>. The remaining water and land monitoring points in EPL 20358 will be reported in subsequent reports when the requirement for monitoring is triggered.

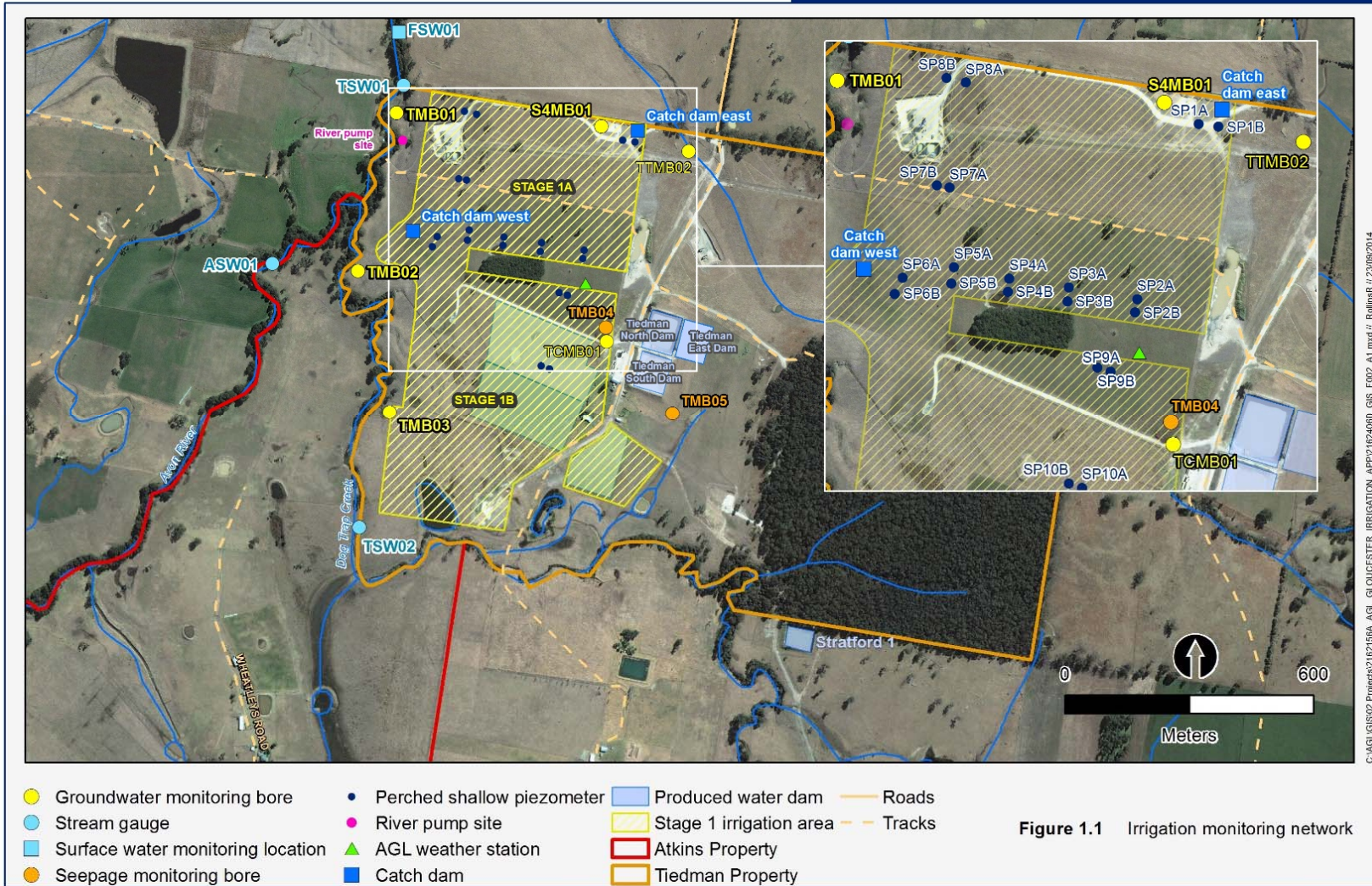
More information on the groundwater monitoring of the GGP is available on the project website: agl.com.au/Gloucester

Table 1: Groundwater quality monitoring points: Irrigation Program (as per EPL 20358)

EPA ID no.	Monitoring Point	Type of monitoring point	Easting (m)	Northing (m)
27	TND	Produced water storage dam	Tiedman property	
28	TSD	Produced water storage dam	Tiedman property	
29	TED	Produced water storage dam	Tiedman property	
30	TMB04	Groundwater quality monitoring	402558.1	6448921.7
31	TMB05	Groundwater quality monitoring	402650.1	6448725.3
33	CDE	Surface water quality monitoring – catch dam east	Tiedman property	
34	CDW	Surface water quality monitoring – catch dam west	Tiedman property	
35	FSW01	Surface water quality monitoring	402001	6449646
36	ASW01	Surface water quality monitoring	401711.09	6449092.2
37	TSW01	Surface water quality monitoring	401993.98	6449416.7
38	TSW02	Surface water quality monitoring	401922.1	6448740.9
39	TMB01	Groundwater quality monitoring	401996.98	6449419.7
40	TMB02	Groundwater quality monitoring	401905.11	6449100.6
41	TMB03	Groundwater quality monitoring	401969.53	6448755
42	S4MB01	Groundwater quality monitoring	402581.88	6449409.7
43	TCMB01	Groundwater quality monitoring	402501.7	6448899
44	TTMB02	Groundwater quality monitoring	402699	6449358
45	SP1B	Soil water quality monitoring	402570.3	6449381.3
46	SP2B	Soil water quality monitoring	402444.2	6449100.1
47	SP4B	Soil water quality monitoring	402252	6449131.3
48	SP6B	Soil water quality monitoring	402103.5	6449178.6
49	SP7B	Soil water quality monitoring	402144.8	6449292.1
50	SP8B	Soil water quality monitoring	402159.1	6449454.8
51	SP9B	Soil water quality monitoring	402387.5	6449016.9
52	SP10B	Soil water quality monitoring	402344.2	6448840.6

Coordinate reference system: Map Grid of Australia 1994

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



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Table 2: Analytes monitored and frequency (as per EPL 20358): monitoring points 27 – 35

Analyte	Units of measure	Monitoring points									
		27, 29		28		30, 31		33, 34		35	
		Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method
Aluminium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Ammonia	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Arsenic	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Barium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Beryllium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Bicarbonate	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample				
Boron	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Cadmium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Calcium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Chloride	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample				
Chromium	milligrams per litre							Each overflow event	Grab sample	Quarterly	Grab sample
Cobalt	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Copper	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Dissolved oxygen	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Electrical conductivity	microsiemens per centimetre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Daily	Continuously	Quarterly	Grab sample

Analyte	Units of measure	Monitoring points									
		27,29		28		30,31		33,34		35	
		Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method
Iron	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Lead	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Lithium	milligrams per litre									Quarterly	Grab sample
Magnesium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Manganese	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Mercury	milligrams per litre							Each overflow event	Grab sample	Quarterly	Grab sample
Molybdenum	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Nickel	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Nitrate	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Nitrite	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample				
pH	pH	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Phosphorus (total)	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Potassium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Reactive Phosphorus	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample				
Redox potential	millivolts	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample

Analyte	Units of measure	Monitoring points									
		27,29		28		30,31		33,34		35	
		Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method
Selenium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Silica	milligrams per litre							Each overflow event	Grab sample	Quarterly	Grab sample
Silver	milligrams per litre									Quarterly	Grab sample
Sodium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Sodium Adsorption Ratio	sodium adsorption ratio			Quarterly	Special Method 4						
Standing water level	meters (Australian Height Datum)					Special Frequency 1	Special Method 1				
Strontium (dissolved)	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Sulfate	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Tin	milligrams per litre									Quarterly	Grab sample
Total alkalinity	milligrams per litre							Each overflow event	Grab sample	Quarterly	Grab sample
Total dissolved solids	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Total organic carbon	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample				
Total suspended solids	milligrams per litre							Each overflow event	Grab sample	Quarterly	Grab sample
Uranium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample
Vanadium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample

Analyte	Units of measure	Monitoring points									
		27,29		28		30,31		33,34		35	
		Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method
Zinc	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Special Frequency 1	Grab sample	Each overflow event	Grab sample	Quarterly	Grab sample

Notes:

Special Frequency 1 – Quarterly if inflow within 12 hours of purging dry.

Special Method 1 – Manual dip; Special Method 4 – by calculation

Shaded grey - not required to be analysed

Table 3: Analytes monitored and frequency (as per EPL 20358): monitoring points 36 – 52

Analyte	Units of measure	Monitoring points							
		36,37,38		39,40,41,42		43,44		45,46,47,48,49,50,51,52	
		Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method
Aluminium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Ammonia	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Arsenic	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Barium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Beryllium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Bicarbonate	milligrams per litre								
Boron	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Cadmium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Calcium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Chloride	milligrams per litre								
Chromium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Cobalt	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample

Analyte	Units of measure	Monitoring points							
		36,37,38		39,40,41,42		43,44		45,46,47,48,49,50,51,52	
		Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method
Copper	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Dissolved oxygen	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Electrical conductivity	microsiemens per centimetre	Daily	Continuously	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Iron	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Lead	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Lithium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Magnesium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Manganese	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Mercury	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Molybdenum	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Nickel	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Nitrate	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Nitrite	milligrams per litre								
pH	pH	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Phosphorus (total)	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Potassium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Reactive Phosphorus	milligrams per litre								
Redox potential	millivolts	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Selenium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Silica	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Silver	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Sodium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample

Analyte	Units of measure	Monitoring points							
		36,37,38		39,40,41,42		43,44		45,46,47,48,49,50,51,52	
		Frequency	sampling method	Frequency	sampling method	Frequency	sampling method	Frequency	sampling method
Sodium Adsorption Ratio	sodium adsorption ratio								
Standing water level	metres (Australian Height Datum)			Special Frequency 2	level sensor and continuous logger	Quarterly	level sensor and continuous logger	Quarterly	Grab sample
Strontium (dissolved)	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Sulfate	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Tin	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Total alkalinity	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Total dissolved solids	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Total organic carbon	milligrams per litre								
Total suspended solids	milligrams per litre	Quarterly	Grab sample						
Uranium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Vanadium	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample
Zinc	milligrams per litre	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample	Quarterly	Grab sample

Notes:

Special Frequency 2 – Every 24 hours

Shaded grey - not required to be analysed

Groundwater and surface water monitoring results

Table 4: August 2014 Water monitoring results for monitoring points 27 – 38

			Monitoring points	27	28	29	30	31	33	34	35	36	37	38
			Location	TND	TSD	TED	TMB04	TMB05	CDE	CDW	FSW01	ASW01	TSW01	TSW02 ^a
			Sampled date	19/08/14	19/08/14	19/08/14	20/08/14	19/08/14	28/08/14 ^c	28/08/14 ^c	19/08/14	20/08/14	19/08/14	19/08/14
			Date AGL obtained data	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	05/09/14	05/09/14	10/09/14	10/09/14	10/09/14	10/09/14
Analyte	Units of measure	Limit of reporting												
Aluminium	milligrams per litre	0.01	0.26	0.32	0.63	0.05	1.6	2.03	0.26	<0.01	<0.01	0.02	0.22	
Ammonia	milligrams per litre	0.01	0.02	0.05	0.04	0.04	0.24	0.04	0.06	0.06	<0.01	0.03	1.84	
Arsenic	milligrams per litre	0.001	0.008	0.005	0.002	<0.001	<0.001	<0.001	0.002	<0.001	0.001	0.001	<0.001	
Barium	milligrams per litre	0.001	0.411	0.146	0.056	0.061	0.071	0.036	0.03	0.058	0.043	0.051	0.080	
Beryllium	milligrams per litre	0.001	<0.001	<0.001	<0.001	<0.001	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Bicarbonate	milligrams per litre	1	660	233	246	149	<1							
Boron	milligrams per litre	0.05	0.59	0.15	0.24	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.14	0.06	
Cadmium	milligrams per litre	0.0001	<0.0001	0.0002	<0.0001	0.0008	0.0036	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0005	
Calcium	milligrams per litre	1	2	7	3	86	55	2	10	14	13	13	95	
Chloride	milligrams per litre	1	893	265	257	2,030	2,520							
Chromium	milligrams per litre	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	0.005	
Cobalt	milligrams per litre	0.001	<0.001	0.001	<0.001	0.077	0.329	<0.001	<0.001	<0.001	<0.001	<0.001	0.079	
Copper	milligrams per litre	0.001	0.006	0.005	0.002	0.006	0.03	0.004	0.006	<0.001	<0.001	<0.001	0.003	
Dissolved oxygen	milligrams per litre	0.01	4.38	7.27	9.61	1.18	5.22	15.31	18.18	8.1	8.98	7.13	8.42	

			Monitoring points	27	28	29	30	31	33	34	35	36	37	38
			Location	TND	TSD	TED	TMB04	TMB05	CDE	CDW	FSW01	ASW01	TSW01	TSW02 ^a
			Sampled date	19/08/14	19/08/14	19/08/14	20/08/14	19/08/14	28/08/14 ^c	28/08/14 ^c	19/08/14	20/08/14	19/08/14	19/08/14
			Date AGL obtained data	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	05/09/14	05/09/14	10/09/14	10/09/14	10/09/14	10/09/14
Analyte	Units of measure	Limit of reporting												
Electrical conductivity	µS/cm	1	5,550	1,570	1,630	7,030	7,690	158	356	420	498	569	2,440	
Iron	milligrams per litre	0.05	0.23	0.46	1.13	1.83	5	0.84	0.37	0.3	0.09	0.17	0.38	
Lead	milligrams per litre	0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Lithium	milligrams per litre	0.001								0.002	0.002	0.002	0.011	
Magnesium	milligrams per litre	1	1	3	2	222	288	2	5	8	10	11	77	
Manganese	milligrams per litre	0.001	0.077	0.003	0.009	8.84	17.4	0.01	0.004	0.106	0.03	0.057	6.85	
Mercury	milligrams per litre	0.0001						<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Molybdenum	milligrams per litre	0.001	0.022	0.021	0.006	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	
Nickel	milligrams per litre	0.001	0.002	0.005	0.001	0.036	0.165	0.001	0.001	0.001	<0.001	<0.001	0.010	
Nitrate	milligrams per litre	0.01	<0.01	0.02	<0.01	0.13	0.16	0.05	0.21	0.48	<0.01	<0.01	0.87	
Nitrite	milligrams per litre	0.01	<0.01	<0.01	<0.01	<0.01	<0.01							
pH	pH	0.01	9.60	8.39	9.33	6.16	4.21	7.36	7.74	6.88	7.57	7.81	5.86	
Phosphorus (total)	milligrams per litre	0.01	1.48	1.44	0.82	0.11	0.03	0.75	1.53	0.17	0.02	0.03	0.35	
Potassium	milligrams per litre	1	309	88	58	22	18	9	15	7	6	7	32	
Reactive Phosphorus	milligrams per litre	0.01	<0.01	<0.01	<0.01	<0.01	<0.01							

			Monitoring points	27	28	29	30	31	33	34	35	36	37	38
			Location	TND	TSD	TED	TMB04	TMB05	CDE	CDW	FSW01	ASW01	TSW01	TSW02 ^a
			Sampled date	19/08/14	19/08/14	19/08/14	20/08/14	19/08/14	28/08/14 ^c	28/08/14 ^c	19/08/14	20/08/14	19/08/14	19/08/14
			Date AGL obtained data	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	05/09/14	05/09/14	10/09/14	10/09/14	10/09/14	10/09/14
Analyte	Units of measure	Limit of reporting												
Redox potential	millivolts	0.1	7.1	37.2	-67.8	86.1	234.5	3.8	2.8	-3.4	120.2	49.6	120.6	
Selenium	milligrams per litre	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silica	milligrams per litre	0.1						13.5	17.4	7.9	2.6	4.5	15.6	
Silver	milligrams per litre	0.001								<0.001	<0.001	<0.001	<0.001	
Sodium	milligrams per litre	1	1,180	318	367	1,140	1,330	18	44	76	57	77	322	
Sodium Adsorption Ratio	sodium adsorption ratio	0.01		25.24										
Standing water level	meters (Australian Height Datum)	0.01				113.50 ^b	118.51							
Strontium (dissolved)	milligrams per litre	0.001	0.479	0.181	0.103	0.708	0.683	0.028	0.072	0.254	0.236	0.244	1.18	
Sulfate	milligrams per litre	1	16	128	18	634	245	<10	19	11	11	11	440	
Tin	milligrams per litre	0.001								<0.001	<0.001	<0.001	<0.001	
Total alkalinity	milligrams per litre	1						48	113	64	79	65	3	
Total dissolved solids	milligrams per litre	10	3,100	1,070	849	3,580	3,790	103	352	302	276	290	1,400	

			Monitoring points	27	28	29	30	31	33	34	35	36	37	38
			Location	TND	TSD	TED	TMB04	TMB05	CDE	CDW	FSW01	ASW01	TSW01	TSW02 ^a
			Sampled date	19/08/14	19/08/14	19/08/14	20/08/14	19/08/14	28/08/14 ^c	28/08/14 ^c	19/08/14	20/08/14	19/08/14	19/08/14
			Date AGL obtained data	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	05/09/14	05/09/14	10/09/14	10/09/14	10/09/14	10/09/14
Analyte	Units of measure	Limit of reporting												
Total organic carbon	milligrams per litre	1	73	75	57	5	6							
Total suspended solids	milligrams per litre	5						54 ^d	90 ^d	<5	<5	<5	<5	51
Uranium	milligrams per litre	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	milligrams per litre	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	milligrams per litre	0.005	0.036	0.021	0.016	0.288	1.31	0.022	0.012	<0.005	<0.005	0.008	0.188	

Shaded grey = not required to be analysed

^a No flow at this location at the time of sampling - water quality sample taken from a small pool in the creek.

^b Standing water level at point 30 (TMB04) was recorded on 19/08/14 prior to purging in preparation for the water quality sampling event.

^c Overflow event

^d Exceedence of 100 percentile concentration limit for total suspended solids (50 mg/L). Exceedence reported to the EPA on 9th September 2014.

Table 5: August 2014 Water monitoring results for monitoring points 39 – 52

			Monitoring points	39	40	41	42	43	44	45	46	47	48	49	50	51	52
			Location	TMB01	TMB02	TMB03	S4MB01	TCMB01	TTMB02	SP1 B	SP2 B	SP4 B	SP6 B	SP7 B	SP8 B	SP9 B	SP10 B
			Sampled date	19/08/14	19/08/14	19/08/14	19/08/14	20/08/14	21/08/14	Locations dry at time of sampling – insufficient water to sample and analyse							
			Date AGL obtained data	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	na	na	na	na	na	na	na	na
Analyte	Units of measure	Limit of reporting															
Aluminium	mg/L	0.01	0.12	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	na	na	na	na	na	na	na	na
Ammonia	mg/L	0.01	0.16	0.26	0.24	1.63	1.32	0.6	na	na	na	na	na	na	na	na	na
Arsenic	mg/L	0.001	0.001	0.003	0.004	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na	na
Barium	mg/L	0.001	0.223	0.696	0.213	1.89	6.66	0.775	na	na	na	na	na	na	na	na	na
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na	na
Bicarbonate	mg/L	1															
Boron	mg/L	0.05	<0.05	<0.05	<0.05	0.14	<0.05	<0.05	na	na	na	na	na	na	na	na	na
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	na	na	na	na	na	na	na	na	na
Calcium	mg/L	1	221	134	342	272	222	162	na	na	na	na	na	na	na	na	na
Chloride	mg/L	1															
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na	na
Cobalt	mg/L	0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na	na
Copper	mg/L	0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na	na
Dissolved oxygen	mg/L	0.01	1.43	1.68	1.71	2.23	1.45	0.83	na	na	na	na	na	na	na	na	na
Electrical conductivity	µS/cm	1	8,400	4,040	6,440	4,880	3,020	2,350	na	na	na	na	na	na	na	na	na
Iron	mg/L	0.05	2.53	4.87	5.78	<0.05	1.19	2.13	na	na	na	na	na	na	na	na	na
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na	na

			Monitoring points	39	40	41	42	43	44	45	46	47	48	49	50	51	52
			Location	TMB01	TMB02	TMB03	S4MB01	TCMB01	TTMB02	SP1 B	SP2 B	SP4 B	SP6 B	SP7 B	SP8 B	SP9 B	SP10 B
			Sampled date	19/08/14	19/08/14	19/08/14	19/08/14	20/08/14	21/08/14	Locations dry at time of sampling – insufficient water to sample and analyse							
			Date AGL obtained data	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	na	na	na	na	na	na	na	na
Analyte	Units of measure	Limit of reporting															
Lithium	mg/L	0.001	0.062	0.056	0.132	0.424	0.071	0.036	na	na	na	na	na	na	na	na	na
Magnesium	mg/L	1	248	94	184	63	80	47	na	na	na	na	na	na	na	na	na
Manganese	mg/L	0.001	0.702	1.19	1.53	0.245	0.03	0.108	na	na	na	na	na	na	na	na	na
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	na	na	na	na	na	na	na	na	na
Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na	na
Nickel	mg/L	0.001	0.001	<0.001	<0.001	0.002	<0.001	0.001	na	na	na	na	na	na	na	na	na
Nitrate	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	na	na	na	na	na	na	na	na	na
Nitrite	mg/L	0.01															
pH	pH	0.01	7.45	7.1	7.29	7.86	7.53	7.58	na	na	na	na	na	na	na	na	na
Phosphorus (total)	mg/L	0.01	0.11	0.06	0.04	0.07	0.02	0.35	na	na	na	na	na	na	na	na	na
Potassium	mg/L	1	3	3	4	7	5	4	na	na	na	na	na	na	na	na	na
Reactive Phosphorus	mg/L	0.01															
Redox potential	mV	0.1	-60.1	-0.3	-18.3	-197.9	-124.5	-61.6	na	na	na	na	na	na	na	na	na
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	na	na	na	na	na	na	na	na	na
Silica	mg/L	0.1	39.2	38.2	34.5	30.6	26.2	32.9	na	na	na	na	na	na	na	na	na
Silver	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na	na
Sodium	mg/L	1	1,380	644	888	785	382	220	na	na	na	na	na	na	na	na	na

			Monitoring points	39	40	41	42	43	44	45	46	47	48	49	50	51	52
			Location	TMB01	TMB02	TMB03	S4MB01	TCMB01	TTMB02	SP1 B	SP2 B	SP4 B	SP6 B	SP7 B	SP8 B	SP9 B	SP10 B
			Sampled date	19/08/14	19/08/14	19/08/14	19/08/14	20/08/14	21/08/14	Locations dry at time of sampling – insufficient water to sample and analyse							
			Date AGL obtained data	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	10/09/14	na	na	na	na	na	na	na	na
Analyte	Units of measure	Limit of reporting															
Sodium Adsorption Ratio	sodium adsorption ratio	0.001															
Standing water level	mAHD	0.01	102.05	102.21	103.26	112.97	113.84	114.0	dry	dry	dry	dry	dry	dry	dry	dry	dry
Strontium (dissolved)	mg/L	0.001	5.29	2.64	6.93	18.7	12.4	2.72	na	na	na	na	na	na	na	na	na
Sulfate	mg/L	1	79	46	158	27	<1	52	na	na	na	na	na	na	na	na	na
Tin	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	na	na	na	na	na	na	na	na	na
Total alkalinity	mg/L	1	521	173	417	451	319	329	na	na	na	na	na	na	na	na	na
Total dissolved solids	mg/L	10	4,860	2,350	3,520	2,850	1,940	1,400	na	na	na	na	na	na	na	na	na
Total organic carbon	mg/L	1															
Total suspended solids	mg/L	5															
Uranium	mg/L	0.001	0.004	<0.001	0.003	0.002	<0.001	<0.001	na	na	na	na	na	na	na	na	na
Vanadium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	na	na	na	na	na	na	na	na	na
Zinc	mg/L	0.005	0.037	0.01	0.007	0.005	0.03	0.051	na	na	na	na	na	na	na	na	na

Shaded grey = not required to be analysed

na = not analysed

Table 6: Continuous electrical conductivity monitoring results for monitoring points 33,34,36,37,38 for the period 6 August 2014 – 20 August 2014

Monitoring point	33	34	36	37	38
Location	CDE	CDW	ASW01	TSW01	TSW02
Data type	Electrical conductivity				
Units	µS/cm				
Date data downloaded	20/08/14	20/08/14	20/08/14	20/08/14	20/08/14
Date data supplied to AGL	24/09/14	24/09/14	24/09/14	24/09/14	24/09/14
Monitoring frequency required by EPL 20358	Daily	Daily	Daily	Daily	Daily
Actual monitoring frequency	Every 6 hours	Every 6 hours	Every 1 hour	Every 1 hour	Every 15 minutes
No. of times measured during monitoring period	60	60	1387	1406	1404
Min. value	0	10	288	360	0*
Mean value	1111	1411	345	385	0*
Median value	1284	1665	343	386	0*
Max. value	1578	1790	427	409	0*

* TSW02 (point 38) was dry for the period of monitoring

Table 7: Continuous water level monitoring results for monitoring points 39 - 44 for the period 6 August 2014 – 20 August 2014

Monitoring point	39	40	41	42	43	44
Location	TMB01	TMB02	TMB03	S4MB01	TCMB01	TTMB02
Data type	Standing water level					
Units	mAHD					
Date data downloaded	19/08/14	19/08/14	19/08/14	20/08/14*	20/08/14*	20/08/14
Date data supplied to AGL	24/09/14	24/09/14	24/09/14	*	*	24/09/14
Monitoring frequency required by EPL 20358	Every 24 hours	Every 24 hours	Every 24 hours	Every 24 hours	Quarterly	Quarterly
Actual monitoring frequency	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	56	55	55	*	*	58
Min. value	102.04	102.21	103.26	*	*	113.96
Mean value	102.07	102.25	103.30	*	*	113.98
Median value	102.07	102.26	103.30	*	*	113.98
Max. value	102.09	102.28	103.32	*	*	114.00

* S4MB01 and TCMB01 (points 42 and 43): loggers failed to connect at time of download – returned to manufacturer for data retrieval and service.

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