

The logo consists of a large tan square with rounded corners containing the text "Energy in action.™" in blue. Below this are three smaller tan squares of varying sizes, also with rounded corners, arranged in a descending staircase pattern. At the bottom right of these squares is the AGL logo, which is a blue square containing a white sun icon and the letters "AGL" in white.

Energy in
action.™

AGL

AGL UPSTREAM INVESTMENTS PTY LTD

GLOUCESTER GAS PROJECT

**April 2015 Monitoring Report:
Tiedman Irrigation Program
EPL 20358**

Reporting Period: March 2015

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	22 March 2015
MONITORING BY	Parsons Brinckerhoff, on behalf of AGL
ANALYSIS BY	ALS Laboratory, Smithfield (Work order: ES1506753)
DATE AGL OBTAINED DATA	17 April 2015
REPORT DATE	24 April 2015
REPORT PREPARED BY	Nicola Fry, Hydrogeologist

Table 1: Water quality monitoring points: Irrigation Program (as per EPL 20358)	4
Table 2: Analytes monitored and frequency (as per EPL 20358) - monitoring points 27 – 52 (water monitoring points)	6
Table 3: March 2015 water monitoring results for monitoring point 34	7
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 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.

This Monitoring Report relates to the water monitoring activities specified in Part 5, Monitoring and Recording Conditions, of the Environment Protection Licence 20358 (EPL). This report relates specifically to the monitoring surrounding the Tiedman Irrigation Program, and details:

1. Monitoring results from EPL Monitoring Point 34 at the Tiedman Irrigation Program catch dam west (CDW) following a high rainfall overflow event (22 March 2015).

As per the EPL, the Tiedmans monitoring encompasses the monitoring points at 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 report are shown in Table 3.

The monitoring point that is the subject of this report is 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 Program are presented in a baseline water monitoring report (PB, 2013a) and six-monthly compliance reports (PB, 2013a, 2013b, 2014a, 2014b, 2015).

The following sampling method was used to obtain the surface water sample:

- Grab sample using a telescopic sampler for surface water and dam water samples (from CDW).

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).

Results of the remaining water and land monitoring points in EPL 20358 will be reported following receipt of analyses in subsequent reports.

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

Table 1: Water 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 – seepage monitoring bore	402558.1	6448921.7
31	TMB05	Groundwater quality monitoring – seepage monitoring bore	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)

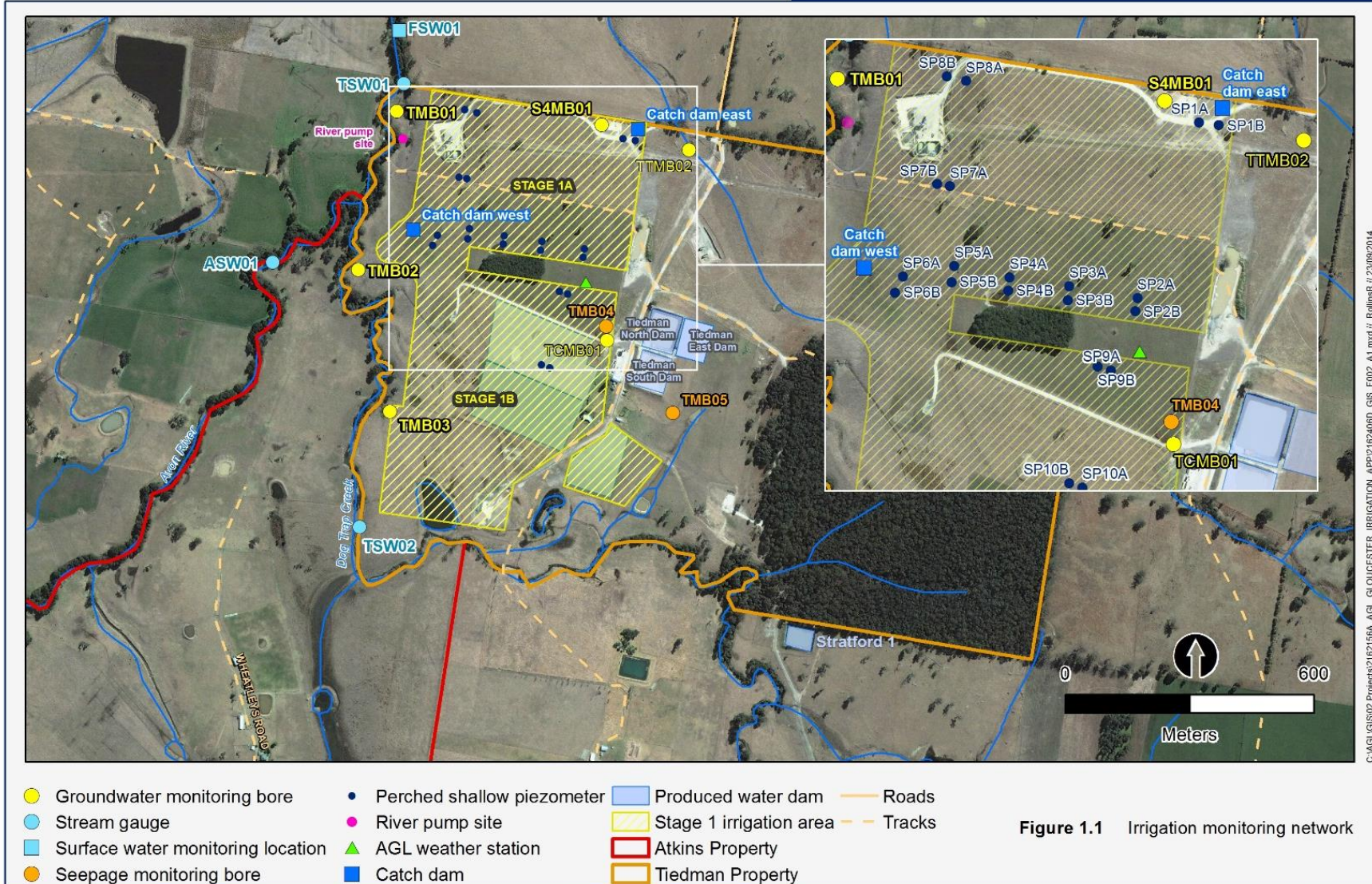


Figure 1.1 Irrigation monitoring network

C:\AGL\GIS02\Projects\162156A_AGL_GLOUCESTER_IRRIGATION_APP\21624060_GIS_F002_A1.mxd // RollinR // 23/09/2014

Water monitoring results

Table 3: March 2015 water monitoring results for monitoring point 34

		Monitoring points	34
		Location	CDW
		Sampled date	22/03/2015 ^a
		Date AGL obtained data	17/04/2015
Analyte	Units of measure	Limit of reporting	
Aluminium	mg/L	0.01	0.40
Ammonia	mg/L	0.01	0.09
Arsenic	mg/L	0.001	0.002
Barium	mg/L	0.001	0.021
Beryllium	mg/L	0.001	<0.001
Boron	mg/L	0.05	0.06
Cadmium	mg/L	0.0001	<0.0001
Calcium	mg/L	1	9
Chromium	mg/L	0.001	<0.001
Cobalt	mg/L	0.001	<0.001
Copper	mg/L	0.001	0.006
Dissolved oxygen ^b	mg/L	0.01	na
Electrical conductivity	µS/cm	1	363
Iron	mg/L	0.05	0.34
Lead	mg/L	0.001	<0.001
Magnesium	mg/L	1	4
Manganese	mg/L	0.001	0.007
Mercury	mg/L	0.0001	<0.0001
Molybdenum	mg/L	0.001	0.001
Nickel	mg/L	0.001	0.002
Nitrate	mg/L	0.01	4.67
pH ^c	pH	0.01	7.38
Phosphorus	mg/L	0.01	2.42
Potassium	mg/L	1	14
Redox potential ^b	mV	0.1	na
Selenium	mg/L	0.01	<0.01
Silica	mg/L	0.1	18.5
Sodium	mg/L	1	53
Strontium (dissolved)	mg/L	0.001	0.043
Sulfate	mg/L	1	35
Total alkalinity	mg/L	1	74
Total dissolved solids	mg/L	10	469
Total suspended solids	mg/L	5	131 ^d
Uranium	mg/L	0.001	<0.001
Vanadium	mg/L	0.01	<0.01
Zinc	mg/L	0.005	0.046

^a Overflow event

^b unable to be collected by calibrated flow meter in the field at the time of sampling

^c unable to be collected by calibrated flow meter in the field at the time of sampling; result shown was laboratory analysed, although holding time was exceeded

^d Exceedence of 100 percentile concentration limit for total suspended solids (50 mg/L). Exceedence reported to the EPA on 17th April 2015.

na - not analysed





References

AGL, 2012a. Water Management Plan for the Tiedman Irrigation Program AGL. Available online: <http://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Plans%20and%20Proposals/2013/May/AGL%20WMP%20Tiedman%20Irrigation%20V1%203%20140512%20Final%20Compiled%20LowRes.pdf>

AGL, 2012b. Soil Quality Monitoring and Management Program. Available online: <http://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Plans%20and%20Proposals/2013/May/Gloucester%20Soil%20Management.pdf>

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>

Parsons Brinckerhoff (PB) 2013a. Gloucester Gas Project – Tiedman Irrigation Trial Baseline Water Monitoring Program. Report dated January 2013, 2162406D PR_6306. Available online: http://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Plans%20and%20Proposals/2013/May/Gloucester%20Irrigation_PR.pdf

Parsons Brinckerhoff (PB) 2013b. Tiedman Irrigation Trial – August 2013 Water Compliance Report, Gloucester Gas Project. Report dated August 2013, 2162406F-WAT-RTP-7408 RevC. http://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20Community%20News/Gloucester/Community%20Updates/2013/September/2162406F%20WAT%20RPT%207408%20FINAL_LowRes.pdf

Parsons Brinckerhoff (PB) 2014a. Tiedman Irrigation Program – Water Compliance Report for the Period 1 July to 31 December 2013, Gloucester Gas Project. Report dated January 2014, 2162406F-WAT-RPT-7674 RevB. Available online: http://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/CSG%20and%20the%20Environment/Gloucester/Assessments%20and%20Reports/2014/20140131_Tiedman%20Irrigation%20Program%20%20%20Water%20Compliance%20Report.pdf

Parsons Brinckerhoff (PB) 2014b. Tiedman Irrigation Program – Water Compliance Report for the Period 1 January to 4 July 2014, Gloucester Gas Project. Report dated August 2014, 2162406F-WAT-RPT-7674 001 RevD. Available online: http://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/Gloucester%20Document%20Repository/Irrigation%20Program/20140828_Tiedman%20Irrigation%20Program%20%20%20Water%20Compliance%20Report.pdf

Parsons Brinckerhoff (PB) 2015. Tiedman Irrigation Program - Water Compliance Report for the Period 5 July to 31 December 2014. Report dated February 2015, 2268517A-WAT-RPT-001 RevC. Available online: http://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/Gloucester%20Document%20Repository/Irrigation%20Program/20150226_Tiedman%20Irrigation%20Program%20%20%20Water%20Compliance%20Report.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>