

The logo consists of the text "Energy in action.™" in a blue, sans-serif font, positioned within a large, light-brown rounded rectangle. Below this rectangle are three smaller, light-brown rounded 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 features a blue square with a white sunburst icon and the letters "AGL" in white.The AGL logo is a blue square containing a white sunburst icon and the letters "AGL" in white.

AGL UPSTREAM INVESTMENTS PTY LTD

GLOUCESTER GAS PROJECT

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

Reporting Period: November 2015

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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	17 November 2015
MONITORING BY	Jacobs, on behalf of AGL
ANALYSIS BY	East West, Tamworth (Work order number: EW150936)
DATE AGL OBTAINED DATA	18 December 2015
REPORT DATE	22 December 2015
REPORT PREPARED BY	Nicola Fry, Hydrogeologist

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Introduction

AGL is proposing to build the Gloucester Gas Project (GGP) which comprises several stages of development facilitating the extraction of coal seam gas (CSG) from the Gloucester Basin. Concept plan and project approval (Part 3A Approval) for the Stage 1 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 1,000m 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.

Conditional approval was granted to AGL by the Division of Resources and Energy (DRE) in 2012 to implement a program (the Tiedman Irrigation Program) for produced water storage, blending, and irrigation activities on AGL's Tiedman property at Stratford in New South Wales (NSW). Approval was extended to 30 April 2015 by the Office of Coal Seam Gas (OCSG) on 4 July 2014; following which, AGL did not seek further extension and on 30 April 2015 the irrigation approval expired. On 6 August 2014, the NSW Environment Protection Authority (EPA) issued Environment Protection Licence (EPL) 20358 that covers the CSG exploration, assessment and production activities in the GGP (EPA, 2014).

The Tiedman Irrigation Program is divided into two areas, being Stage 1A and 1B (Figure 1):

- > Stage 1A is serviced by a lateral move irrigator which irrigated a maximum area of 18.2 ha, including 16 plots, two crop systems (annuals and perennials), and four soil treatment depths.
- > Stage 1B comprises an area of 8.6 ha (of which approximately 4ha is currently under irrigation), including four plots and a mix of annual and perennial pasture.

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

1. Monitoring results from the 6-monthly soil sampling event at the Tiedman Irrigation Program (17 November 2015).

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

The specific analytes and sample frequency are shown in Table 2. The monitoring results for this reporting period are shown in Table 3.

The monitoring points that are the subject of this report are part of the GGP soil monitoring network, as described in AGL's Soil Quality Monitoring and Management Program (FK, 2012). Soil monitoring results for the Irrigation program are presented in a baseline water monitoring report (FK, 2013a) and six-monthly compliance reports (FK, 2013b, 2014a and 2014b; and Jacobs, 2015a, and 2015b) up to May 2015.

For monitoring points 53 – 68 (Stage 1A), samples were taken manually using a hand auger at 20 cm intervals down to the base of the respective treatment depth of 120 cm or until refusal on rock, and each depth interval from each soil sample location was be sampled and analysed.

For monitoring points 69 -81 (Stage 1B), samples were taken manually using a hand auger at 20 cm intervals down to the base of the respective treatment depth of 120 cm or until refusal on rock at 20 cm, and a lateral composite sample was formed from the different sample locations from the same depth profile located in the Stage 1B area and analysed.

The soil samples were analysed by East West Enviroag Pty Ltd, Tamworth, NSW, a National Association of Testing Authorities (NATA) and the Australasian Soil and Plant Analysis Council (ASPAC) accredited laboratory.

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

Water monitoring data collected in November for the Tiedman Irrigation Program (monitoring points 27 – 52) will be published in a separate report 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

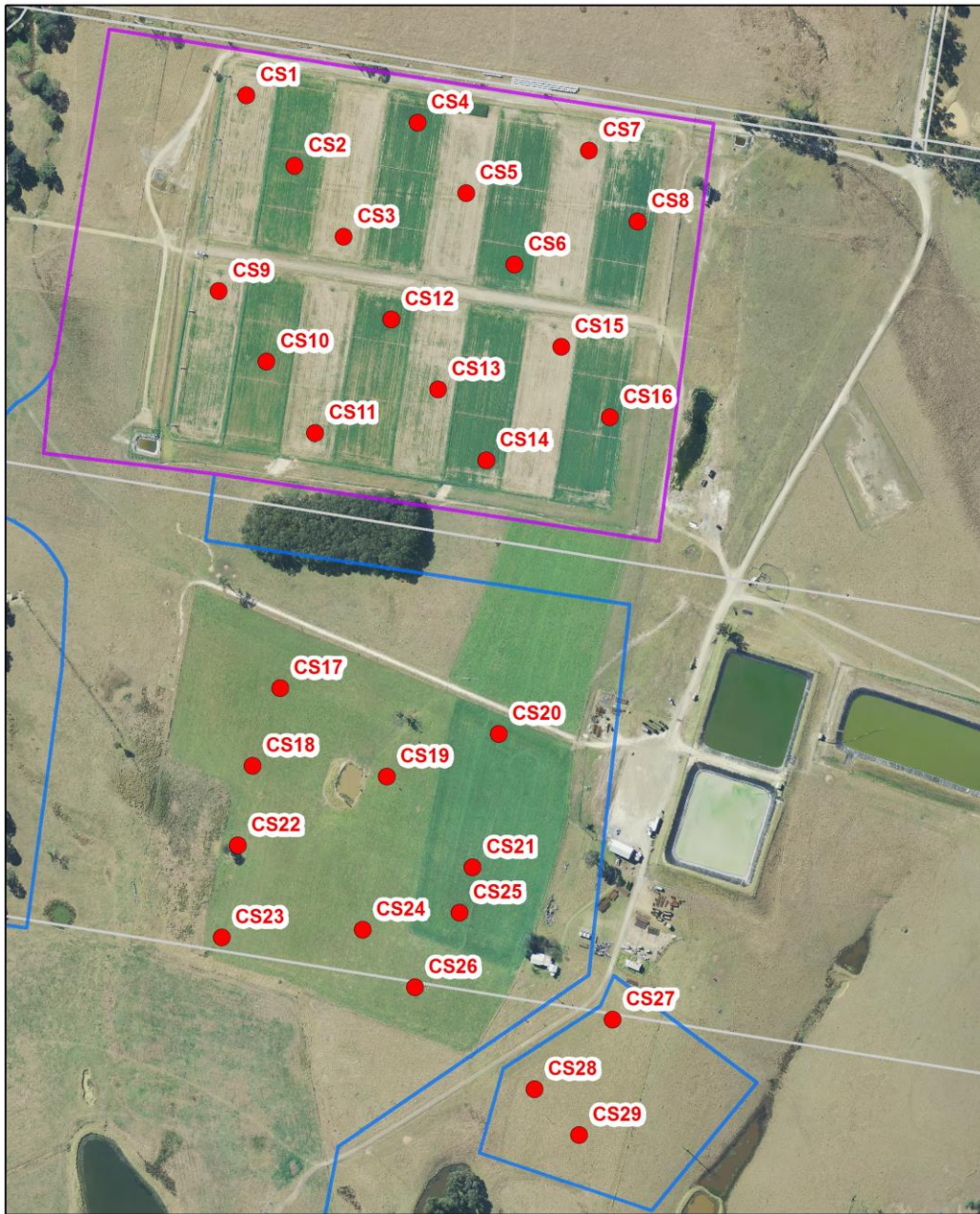


Table 1: Soil monitoring points, Irrigation Program (as per EPL 20358)

EPA ID no.	AGL ID	Location (Irrigation Area)	Type of monitoring point	Easting	Northing
53	CS1	Stage 1A	Soil quality	402197.4	6449446.6
54	CS2	Stage 1A	Soil quality	402238.8	6449386.7
55	CS3	Stage 1A	Soil quality	402280.6	6449326.7
56	CS4	Stage 1A	Soil quality	402343.7	6449423.3
57	CS5	Stage 1A	Soil quality	402385.2	6449363.4
58	CS6	Stage 1A	Soil quality	402426.6	6449302.9
59	CS7	Stage 1A	Soil quality	402490.2	6449399.8
60	CS8	Stage 1A	Soil quality	402531.7	6449339.6
61	CS9	Stage 1A	Soil quality	402173.9	6449280.2
62	CS10	Stage 1A	Soil quality	402214.8	6449220.5
63	CS11	Stage 1A	Soil quality	402256.4	6449160.1
64	CS12	Stage 1A	Soil quality	402321.4	6449256.5
65	CS13	Stage 1A	Soil quality	402361.5	6449197.0
66	CS14	Stage 1A	Soil quality	402402.4	6449136.6
67	CS15	Stage 1A	Soil quality	402466.6	6449233.2
68	CS16	Stage 1A	Soil quality	402508.1	6449173.2
69	CS17	Stage 1B	Soil quality	402226.4	6448943.4
70	CS18	Stage 1B	Soil quality	402202.8	6448877.5
71	CS19	Stage 1B	Soil quality	402317.4	6448868.3
72	CS20	Stage 1B	Soil quality	402413.1	6448904.5
73	CS21	Stage 1B	Soil quality	402390.9	6448791.5
74	CS23	Stage 1B	Soil quality	402176.6	6448732.1
75	CS22	Stage 1B	Soil quality	402190.3	6448810.1
76	CS24	Stage 1B	Soil quality	402297.1	6448738.4
77	CS25	Stage 1B	Soil quality	402379.8	6448753.0
78	CS26	Stage 1B	Soil quality	402341.7	6448689.7
79	CS27	Stage 1B	Soil quality	402510.5	6448662.0
80	CS28	Stage 1B	Soil quality	402443.7	6448603.1
81	CS29	Stage 1B	Soil quality	402481.8	6448564.1

Coordinate reference system: Map Grid of Australia 1994, Zone 56

Gloucester Gas Project – Tiedman Irrigation Program Soil Monitoring Sites



	Author: Upstream Gas	<p>Kilometres 0 0.05 0.1</p> <p>Scale 1:3,000 @A3</p> <p>Geocentric Datum of Australia 1994</p>	<p>Legend</p> <ul style="list-style-type: none"> ● Soil Monitoring Sites □ Property Boundaries □ Irrigation Areas ■ Stage 1A ■ Stage 1B 	
	Date: 02/02/2015			
	Ref: 3190r1			

Disclaimer: While AGL has taken great care and attention to ensure the accuracy of the data represented on this map, no liability shall be accepted for any errors or omissions. No part of this map may be reproduced without prior permission of AGL.

Sources: AGL Energy Limited, MapData Sciences, SKM

Figure 1: Location of soil monitoring points: Irrigation Program (as per EPL 20358)

Table 2: Analytes monitored and frequency (as per EPL 20358) – monitoring points 53 – 81 (soil monitoring points)

Analyte	Units of measure	Monitoring points		Monitoring points	
		53 - 68		69 - 81	
		Frequency	sampling method	Frequency	sampling method
Aluminium	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Available phosphorus	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Boron	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Calcium	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Cation Exchange Capacity	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Chloride	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Copper	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Electrical conductivity	microsiemens per metre	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Exchangeable sodium percentage	percent	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Iron	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Magnesium	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Manganese	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Nitrogen (nitrate)	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Organic carbon	percent	Every 6 months	Special Method 2	Every 6 months	Special Method 6
pH	pH	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Phosphorus	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Potassium	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Sodium	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Soil texture	Visible	Every 6 months	In situ	Every 6 months	In situ
Sulfate	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6
Zinc	milligrams per kilogram	Every 6 months	Special Method 2	Every 6 months	Special Method 6

Notes:

- > Special Method 2 – Samples will be taken at 20 cm intervals down to the base of the respective treatment depth of 120 cm (or until refusal on rock). For each of the four treatments, each depth interval from each soil sample location will be sampled and analysed.
- > Special Method 6 - Samples will be taken at 20 cm intervals down to the base of the respective treatment depth of 120 cm (or until refusal on rock). A lateral composite sample will be formed from the different sample locations from the same depth profile located in the Stage 1B area and analysed.
- > Depth increments (cm below ground):
 - » 0 – 20
 - » 20 – 40
 - » 40 – 60
 - » 60 – 80
 - » 80 – 100
 - » 100 – 120

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