

AGL Responses to the Parsons Brinckerhoff and Garry Willgoose (Peer Review) Recommendations

Introduction

The two PB recommendations and Peer Reviewer recommendations #2, #3, #5, #6, and #7 are associated with short to medium term exploration activities to determine if a gas resource exists in this area. Peer Reviewer recommendations #4 and #8 are longer term requirements associated with any investigations/assessment required for planning approval.

PB Recommendation #1 – AGL has accepted this recommendation and in addition is reinstalling loggers in the three monitoring bores at the BM03 site (see PB Scope) – work to commence next week (29 March +)

PB Recommendation #2 - AGL has accepted this recommendation and in addition is planning to sample HB02 (again) and HB01 for the first time (see PB Scope) – work to commence next week (29 March +)

Peer Reviewer Recommendation #1 – AGL is working towards the gas flow testing of both HB01 and HB02 commencing in April (subject to AGL comments/acceptance of recommendations #2 to #7 below)

Peer Reviewer Recommendation #2 – Agreed – PB have developed a suitable protocol to monitor water level behaviour in the gas wells and the monitoring well network

Peer Reviewer Recommendation #3 – Agreed – this is effectively PB recommendations #1 and #2

Peer Reviewer Recommendation #4 – Noted – a nearby (open) small diameter monitoring bore into the Blakefield CS would compromise the proposed flow testing and local gas resource. Also the proposed flow test (multiple gas wells with variable pumping rates) is unsuitable to determine aquifer parameters such as storativity (requires a single well test and the rate needs to be kept reasonably constant). AGL will investigate whether a suitable bore (eg. a grouted vibrating wire piezometer) could be established in the medium to long term at a suitable location, and another pumping test is possible.

Peer Reviewer Recommendation #5 – Agreed (will be included in the protocol mentioned in Recommendation #2)

Peer Reviewer Recommendation #6 – Agreed provided that the wellhead can be modified to access instantaneous pressure/water level data at each of the gas wellheads (will be included in the protocols mentioned in Recommendation #2)

Peer Reviewer Recommendation #7 – Agreed – this is commercial-in-confidence information that could be released subject to a confidentially agreement being signed that the flow and pressure data is for technical review only and cannot be shared with any third party (including students, consultants, members of the BCCC, and the general public)

Peer Reviewer Recommendation #8 – Noted – there are no plans to construct another gas well in the vicinity of the Broke property at this time that would allow hydraulic testing of the gas reservoir (before and after fraccing). AGL will evaluate opportunities at other exploration sites.

PB Ongoing Monitoring Scope

- **Final (wet) water quality sampling** (March 2010) - This water sampling event is required before mid/end-March to provide information after substantial rainfall recharge across the area in recent months. It is a final event to follow on from the previous groundwater sampling undertaken during the baseline monitoring period in 2009. Water quality measurements will be undertaken at all AGL monitoring bores with water samples to be collected and analysed for the chemical suite, as per previous sample rounds. No isotope analyses are to be conducted.
- **Quarterly water levels** (6 events – late 2009 through to December 2010) – ongoing water level monitoring of all AGL monitoring bores at site BM01 and reinstallation of loggers in the monitoring bores at site BM03. Water level monitoring will be undertaken at the Broke site at two-three monthly intervals during the year, ending in December 2010. Manual water level measurements will be collected at each of the monitoring bores for each event. Dataloggers installed in each of these bores will be downloaded at the same time. The water level measurements have already been collected in November 2009 and January 2010. Subsequent water level measurements will be collected in March 2010, June 2010, September 2010 and December 2010. Manual water level measurements will also be collected each visit in the other AGL monitoring bores (at site BM02).

Consideration will be given to monthly downloads of dataloggers during any flow testing program on HB01 and HB02.

- **Water sampling gas wells** (April 2010) – PB proposes that samples be collected from gas wells HB01 and HB02 during flow tests that are scheduled to commence April 2010. Samples will be collected within the first month of operation from the well head at each location. This provides a water sample for the deeper coal seams (HB01) and a repeat water sample for the Blakefield Coal seam (HB02). The samples will be analysed for a standard chemical suite (major anions/cations, dissolved metals, nutrients and methane) to characterise the water quality of the coal seam aquifers exposed in each well.
- **Reporting** (June 2010 and December 2010) – PB propose the provision of two, six monthly reports. The first report (June 2010) will provide factual information of the field work carried out in the March/April water quality sampling programs, and water level measurements to date (November to June). There will be some discussion of the water quality trends (with respect to the 2009 events), and if the flow testing is under way, then initial trends and data sets will be described.

The second report will provide water level data from July to December with a commentary of general water level trends and observations (including the final trends from the flow testing event and the recovery period).

In the December report, consideration will be given to continuing the baseline monitoring program into 2011.

Proposed Groundwater Monitoring and Review Protocol – 2010 Flow Testing Program

The proposed monitoring and review protocol for the upcoming gas flow testing program is similar to the protocol adopted for the pumping test in October 2009. The following steps are proposed:

1) PB will maintain dataloggers at the 7 monitoring bores at the BM01 site (4) and BM03 site (3) (plus one barologger) until the end of 2010. Dataloggers will be downloaded quarterly leading up to (and following) the flow testing program and monthly during the flow testing program. AGL will install a datalogger/s near the pump in each of gas wells HB01 and HB02 prior to the commencement of flow testing and determine if instantaneous pressure/water level data is able to be downloaded at each of the wellheads.

2) PB will QA the data set from each monitoring bore (and gas wells if able to be accessed) and add it to the historical data set. If any unusual water level trends (declines of more than 0.5m in any month in any monitoring bore), PB will advise AGL immediately and undertake a check of site operational issues. Loggers will be checked within 5 working days to determine if the water level trend is real and ongoing.

3) In the unlikely event that the trend is real and ongoing then PB will advise AGL and provide the Peer Reviewer with the available data and PB's assessment of the event. PB, AGL and the Peer Reviewer will meet within 10 working days to discuss/interpret/resolve trends and to determine an appropriate action plan. The Chair of the BCCC will be advised of the proposed action plan and (depending on the severity of the incident) action may occur between BCCC meetings – actions could be quite varied and may include:

- Continuing water pumping to ascertain the extent of the issue,
- Curtailing water pumping.

Information on the issue, trends and actions agreed by PB, AGL and the Peer Reviewer would be tabled at the next BCCC.

4) Prior to the start of the flow testing, PB will install a salinity logger in the discharge line to the water disposal tanks at each of the sites.

Salinity trends will be monitored monthly and discussed within AGL, PB and the peer reviewer. In the unlikely event of something out of the ordinary is observed (such as salinity level declines of more than 250 EC per month), the parties will meet to discuss/interpret/resolve trends and to determine an appropriate action plan.

5) Members of the BCCC and the peer reviewer will be invited to see the flow testing program at a suitable/convenient time.

6) AGL, as part of their gas reservoir modelling, can predict the behaviour of water and gas flows over a large area. The model will assist in answering some questions relating to the hydrogeology of the coal seam and gas/water interactions. Additional groundwater modelling is not considered necessary at this time. This information will be shared with PB, the peer reviewer and the BCCC after the completion of the flow testing program.

7) In the final report, a comparison will be made between the pre test and post test condition of the gas reservoir and overlying aquifers (both water levels and water quality).

NOTE - This Draft monitoring and review protocol is subject to further advice and acceptance by the Peer Reviewer, Professor Garry Willgoose.