

Basin Sustainability Alliance’s Submission on the 2016 Underground Water Impact Report (UWIR) for the Surat CMA.

1. What is the Basin Sustainability Alliance:

The Basin Sustainability Alliance (BSA) was established in 2010, to represent the interests and concerns of landholders and rural communities who were being subjected to the unprecedented scale and pace of Unconventional Gas Mining (Coal Seam Gas and potentially tight gas and shale gas) development in South-West Queensland.

BSA’s charter is to advocate for the sustainable use and management of land and water resources in the Condamine Basin for future generations – in particular highlighting the risk that the Unconventional Gas Mining (Coal Seam Gas development) poses to the Great Artesian Basin and other groundwater aquifers which provide livestock and domestic water supplies.

The BSA, which has over 100 members, is comprised of farmers, graziers, business people and townspeople in south- western Queensland's Condamine Basin, as well as scientists who have a strong interest in supporting the BSA’s “key focus”.

The BSA is grateful for the opportunity to provide a written submission to OGIA on the 2016 Underground Water Impact Report for the Surat Cumulative Management Area (CMA. Our Submission will highlight a number of areas of concern to landholders who are directly impacted or will potentially be impacted by the operations of Coal Seam Gas Companies in the Surat Basin.

2. The Number of Impacted Water Bores:

The OGIA now predict that 469 bores will be impacted by CSG operations – a reduction from the 528 estimate in the 2012 UWIR. Of these 469 bores – 36 are Agricultural use, 7 are Industrial use, 3 are for Town Water Supply and 423 are used for stock & domestic use. The BSA does not accept these estimates of impacted stock & domestic water bores and respectfully suggests that the “real numbers” will be much higher. The BSA wishes to highlight that these estimates of impacted bores do not acknowledge those bores that will be impaired by gas migration from adjacent CSG extraction. This issue has recently been promulgated in a desk top analysis and literature review by consulting hydrogeologists Klohn Crippen Berger entitled “Potential effects of free gas on bore water supply from CSG development”. Significantly, this scenario and associated landholder impacts were discussed in APLNG’s regional EIS. (See Appendix A).

The UWIR 2016 has frequent references to Immediately Affected Areas (IAAs) and Long-term Affected Areas (LAAs) and the trigger threshold levels of 5.0m decline in bore water levels for consolidated aquifers and 2.0m decline in bore water levels for unconsolidated aquifers. The BSA notes with some concern that there are still no triggers for increases in bore water levels from gas or for bores being impaired by gas.

When the additional issue of gas liberation and migration is added, and until the effects of this constitute a Trigger under the Make-Good provisions, it is possible for water users to have no **available** water as well as no entitlement to Make-Good. BSA contends that the use of SWL as the “major trigger” for determining bore impairment is fraught with danger, and indeed much of the behaviour of gassy water bores is counter-intuitive. At some point, the rate of liberation of gas in water bores will become so great that a mono pump can no longer pump effectively and the hammer from the gas will also cause mechanical failure. So a bore with an increasing SWL can be rendered useless for livestock supplies due to local and migrating CSG with a static or even rising SWL. This issue needs to be recognised by OGIA and appropriate action taken to rectify it.

There are a number of landholders in the Chinchilla, Hopelands and Wandoan areas who are experiencing gas impairment of their water bores and when OGIA does recognise this as a consequence of CSG operations, BSA respectfully suggests that the number of bores impacted by CSG operations will significantly increase.

3. Volumes & Quality of Water Extracted:

The OGIA have indicated in the 2016 UWIR that water extraction forecasts from CSG operations in the Surat CMA are projected at 65,000ML/annum (currently), 100,000ML/annum (for the next 3 years) and an average of 70,000ML/annum over the period 2013-2060 equalling a total extraction of 3290 GL. The 2012 UWIR indicated a water extraction of 95,000ML/annum from 2013 – 2050 – for a total water extraction of 3515 GL. While, this small estimated reduction in water extraction of 6.5% is a positive outcome (if the estimate proves to be correct), it needs to be recognised that this extraction is for 18,000 gas wells and not the 40,000 gas wells initially proposed. The BSA is concerned that if world gas prices skyrocket - there will be additional pressure by the CSG Industry to increase its footprint and the number of gas wells with a corresponding increase in the take of groundwater. The estimated CSG take of 70,000 ML/year more than doubles the current take of GAB users which is 53,000 ML/year. The BSA is still unconvinced that this CSG take is sustainable and fears it will seriously restrict future GAB entitlements for all other users

On page 57 of the 2016 UWIR there is a reference to “Groundwater extraction associated with P&G development has increased with the expansion of the CSG industry, although most of this water is of poor quality. “ This statement infers that because the quality of water being extracted by the CSG industry from the Walloon Coal Measures aquifer is “poor”, it is of no consequence. This is a misleading statement as 1646 (20%) of the 8226 bores in the GAB within the Surat CMA tap into the Walloon Coal Measures. The BSA acknowledges while Walloon Coal Measures water can be variable in quality, it is still an important resource as lower quality bore water can be shandied with better quality water for stock watering purposes. The BSA also contends that irrespective of its quality, once this water is lost from the Walloon Coal Measures it is lost forever.

The 2016 UWIR states that grazing is the biggest user of water from the GAB. The BSA acknowledges that the OGIA have put a lot of effort into refining its estimate of stock & domestic water use. There are 22,500 landholder’s bores in the Surat CMA (8226 in the GAB formations) and all non P&G bores accessing water from the GAB and other formations are licensed. Water licences for use other than stock & domestic have a volumetric limit of take

as a condition. A breakdown of water extraction by non P&G users for GAB aquifers and Non-GAB aquifers is presented in Table 5.1 on page 59. However, the BSA notes that there is no information provided in the 2016 UWIR about the take of water by the CSG Industry from GAB and Non GAB aquifers – noting that water is extracted by the CSG Industry from aquifers other than the Walloons Coal Measures. The BSA contends in the interests of consistency and transparency that water extraction data by the CSG Industry should be shown for all GAB and Non-GAB aquifers.

4. Water Pressure Impacts:

The BSA notes that monitoring has shown significant decreases in water pressure in the “target coal formations” as a result of CSG water extraction. There is little impact predicted for formations above or below these “target coal formations”. Data availability for the GAB formations is limited – there are only about 133 bores in the GAB formations with enough “time series water pressure data” before CSG development began (page 63) and about 66% of these bore show a decline in groundwater pressure before the commencement of CSG development. This decline in water pressure has been attributed to natural seasonal variations and/or groundwater extraction for agriculture or other non CSG purposes. The 2016 UWIR states that within the Surat CMA - water extraction from GAB aquifers has been increasing for a long time (mainly for stock & domestic and intensive livestock purposes) and it is this increase that is likely to be the most common cause of groundwater pressure declines – not the CSG operations. The BSA contends that further work on this is required – particularly before miners are granted a “statutory right to take associated water” from the Regions groundwater aquifers.

5. Connectivity of Aquifers:

The BSA acknowledges that the 2016 UWIR goes into great detail on the connectivity of Non-GAB and GAB aquifers. The UWIR outlines that connectivity between the Walloons and Condamine alluvials is low (page 44), connectivity between the Walloons and Springbok Sandstones is limited, connectivity between the Walloons and the underlying GAB units (including the Hutton Sandstones) is considered to be low (page 45). The OGIA also considers that any depressurisation of the Bandanna Formation (Bowen Basin) is unlikely to affect underlying formations. The OGIA also considers that any impacts on the Precipice Sandstones from depressurisation of the Bandanna Formation is unlikely to affect the Hutton Sandstones. Furthermore, OGIA states the > 200m drop in water levels in the Bandanna Formation around Fairview and Spring Gully has had no discernible effect on the Precipice Sandstones – to date (page 46).

The primary focus of references to aquifer connectivity in 2016 UWIR is to attempt to convince readers that there is little or no connectivity between the Walloon Coal Measures (which are being impacted by the CSG Industry) and the aquifers being accessed by landholders for stock and domestic or agriculture supplies. While the BSA acknowledges the work done by OGIA in investigating aquifer connectivity – it is not totally convinced by OGIA’s arguments in respect to the Walloons limited connectivity to other aquifers in the Surat Basin.

6. Spring Impacts:

The 2016 UWIR acknowledges that springs in the Surat CMA have cultural and/or ecological values (page 99). Potentially affected springs are those that have a predicted impact of > 0.2m drawdown. While the 2016 UWIR outlines information on a “spring impact mitigation strategy”, it states on page 100 that “springs in the Surat CMA are not known to be fed by formations targeted for CSG development”. However, new mapping in the Surat CMA has identified 87 spring complexes (with 387 spring vents) and 40 watercourse springs with 16 springs (containing 61 spring vents) and 19 watercourse springs potentially affected by CSG operations. This information appears to be somewhat contradictory.

OGIA suggests that its research indicates that most of these springs are supported by local flow systems and they are not connected to CSG impacted aquifers. OGIA indicates that monitoring data collected to date outlines “no impacts from P&G water extraction have been observed” – so there isn’t an issue!!! However, OGIA will continue to monitor 11 springs complexes and 3 watercourse springs which have been identified as “high or moderate risk springs” (page 107). The 2012 UWIR identified 5 springs complexes where pressure impacts were predicted at > 0.2metres. At two (2) of these sites - a relocation of stock & domestic bores has mitigated the risk. For the other three (3) sites (Lucky Last, Springrock Creek & Yebna) more investigations were needed. The outcomes of these investigations has resulted in Lucky Last spring no longer being considered to be at risk and SANTOS are doing further work on the impacts on Springrock Creek and Yebna springs. OGIA report the “need for targeted action by tenure holders” will be reassessed in the next update of the UWIR (page 110). With 4 years of investigation into these springs already elapsed and potentially another 4 years of investigation to be undertaken - the BSA is still unsure that the Queensland Government is really committed to spring protection and would intervene to halt adjacent CSG production if that what was required to protect spring complexes.

7. Monitoring Activities:

The 2016 UWIR reports that the Water Monitoring System (WMS) is being implemented by the petroleum tenure holders. By the end of 2015, 491 of the 618 monitoring points were either operational or under construction. The OGIA propose to have 675 monitoring points and approximately 70% will be at locations where CSG impacts on groundwater levels are predicted to be > 5 metres. The distribution of monitoring points will be - 100 in the Springboks, 277 in the Walloons, 86 in the Huttons and 55 in the Precipice Sandstones. CSG operators are required to provide monthly water extraction data reports on CSG wells and 6 monthly reports on monitoring points to OGIA. The BSA commends OGIA on the approach being taken to establish an appropriate monitoring network – in the BSA’s view there can never be enough monitoring points and the more the better. The BSA commends the DNRM initiative of CSG Net as a means of involving landholders in significantly increasing the monitoring network at minimal cost to Government.

8. The New Surat CMA Groundwater Model:

The BSA notes in the UWIR 2016, that OGIA have devoted significant resources into the development of a new groundwater flow model to predict changes in water pressures or flow and cumulative impacts in the Surat CMA. The OGIA reported that in excess of 138,000 ModFlow model runs were undertaken in the development of this new model and that the new model has 32 layers to represent the full Great Artesian Basin sequence of aquifers as well as the alluvial formations in the Surat & Bowen Basins. OGIA also outlines that the new model uses 6 layers to model changes for the Walloons high permeability thin coal seams

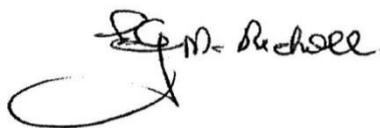
which are separated by thicker low permeability units. This is expected to provide better predictability of aquifer behaviours. While the OGIA points out that the model predicts “regional impacts” and not water pressure or water level variations at a “local scale”, Mr Randall Cox has publicly stated (ABC Radio - 12/4) that the UWIR 2016 would help landholders discuss make-good with companies.

The BSA acknowledges that substantial P&G industry levy funds have been invested in creating the new OIGA groundwater model. While Version 2 of the OGIA’s hydrology model is a much improved regional model for the monumental task of predicting regional groundwater impacts across 300,000 sq klms out to 2070, evidence is emerging that it is not as accurate as it needs to be on a local scale (say 400 sq klms). The real issue here is that the OGIA Version 2 model might be of improved use in informing a landholder whether their bore is in the LTAA or the IAA over the next 3 years, but it’s predicted water level drop and over what time span, could be at significant variance with a more detailed local model. This is why landholders will need professional and independent assistance to resolve “make good negotiations” requiring replacement water for lost water. The new Version 2 model certainly didn’t predict what has recently happened in the Hopelands area with impacted water bores. Hence - BSA respectfully suggests that OGIA needs to recognise the limitations of the Version 2 model and exercise extreme care in the way it is being promoted.

9. Final Comments:

The BSA acknowledges that the 2016 UWIR is a comprehensive document that primarily appears to be focussed on defending the Queensland Government’s policy position on the management of P&G impacts on the water resources in the Surat CMA. On a number of occasions the 2016 UWIR suggests that non CSG use of groundwater is having a far greater impact on the Region’s groundwater resources, than the CSG Industry. It is also suggesting that the CSG Industry is having little or no impact of the Natural Springs in the area.

The 2016 UWIR is guided by Chapter 3 of the *Water Act 2000* which provides for the management of the impacts on underground water caused by the exercise of “statutory” underground water rights by petroleum tenure holders. This provides a framework for determining which landholder’s bores may be impacted by P&G operations and a mitigation strategy (even though it is flawed) for petroleum tenure holders to deal with impacted bores. The BSA notes with some level of apprehension – that neither Chapter 3 of the *Water Act 2000* or the 2016 UWIR has any responsibility for the sustainable management of the groundwater resources of the Surat CMA and tellingly avoids critical analysis of the impact of redirecting hundreds of impaired bores into the Hutton aquifer from “make good” negotiations – this is a disappointing outcome.



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27th April, 2016.

Appendix A: Subject: APLNG EIS - gas migration, gassy bores reference

Chapter 10: Groundwater Flow, page 35, see subheading *Potential implications for gas migration*

See highlighted section:

Gases, including methane, are present in the subsurface in one or more of the following conditions:

- Adsorbed to the matrix material
- Dissolved phase or
- Free phase.

The gas phase is directly related to pressure and temperature conditions in the subsurface and is also influenced by the porewater salinity and the presence of other gases. In the undisturbed coal seams, methane is predominantly in the adsorbed phase. Depressurisation of the coal seams by pumping groundwater and reducing the hydraulic head allows the adsorbed gases in coal seams to desorb and migrate to the CSG production well. Extraction of the gas occurs almost exclusively in the free phase. The primary driving forces of a free gas are pressure and buoyancy. That is, gas moves from high pressure areas to low pressure areas, and it will tend to rise in the water column due to buoyancy effects. The majority of free and dissolved gas in the zone affected by CSG depressurisation (i.e. the cone of depression) will move towards the production wells. However, at some distance from the edge of the gas field, where the effects of depressurisation are less, the force of the buoyancy will dominate.

The gas released in this area of influence will have the potential to move in an up-dip direction away from the production zone. ***These gases might eventually make their way to shallower intervals and potentially discharge to the surface, either through wellbores or via natural geological pathways to surface seeps.*** Gas may also accumulate in overlying aquifers where there is an established pathway between the coal seams and the overlying aquifer.

The build-up of gas in a non-CSG well bore constitutes a potential health and safety risk. Pumped water bores pose a greater risk as the pressure reduction in the well may result in dissolved phase gas transitioning to the free phase. Significant gas release in operating water bores may also result in pump cavitation and subsequent pump damage or failure (Fisher 2001). Section 10.5 discusses how these impacts will be managed and mitigated. It should be noted that not only water bores accessing the Walloon Coal Measures pose a risk. Bores accessing overlying aquifers with sufficient dissolved gas concentrations do as well.

http://www.aplng.com.au/pdf/eis/Volume_2/Vol_2_Chapter10_Groundwater.pdf