



The Chief Executive  
State-wide Impact Assessments  
Department of Environment and Resource Management

Attention: The EIS Co-ordinator (Surat Gas Project)  
Floor 3, 400 George Street  
BRISBANE, QLD 4000  
GPO Box 2454,  
BRISBANE, QLD 4001.

14/6/2012

Dear Sir/Madam,

**Submission on Arrow Energy Surat Gas Project Environmental Impact Statement (EIS)**

We appreciate the opportunity to make a submission on Arrow Energy's Environmental Impact Statement for the Surat Gas Project.

BSA was established in early 2010 to represent landholder, community groups and individuals with serious concerns about the unrestrained development of the coal seam gas industry across Queensland and the associated environmental, health and social impacts.

Our role is to provide a conduit between stakeholders (industry, landholders, community and government), to encourage and promote fair and proper legislative and administrative processes surrounding CSG exploration and development, and to work towards the sustainable management of rural land and water resources for future generations throughout the Great Artesian Basin.

At the heart of our charter is a desire to ensure we preserve the rural lifestyle, the existing rural social fabric and contribution of farming families to Australian society.

BSA is committed to working with government and industry to achieve a coal seam gas industry that has minimal negative environmental, economic and social impacts and preserves groundwater resources for future generations.

The following issues and concerns with the Arrow Energy Surat Gas Project EIS are raised on behalf of the many BSA members whom reside and operate successful rural businesses in the area of the Surat Gas Project.

**1.2 The Project - 1.2.1 Location**

***“Project infrastructure, including coal seam gas production wells and production facilities, will be located throughout the project development area but not in towns.”***

BSA is concerned that many towns within the project development area have fewer than 1000 people. BSA is also concerned about the distance Arrow Energy will be permitted to place gasfield infrastructure from sensitive receptors such as people’s homes.

- How close will Arrow Energy locate the various types of project infrastructure to towns, both less than and greater than 1000 people? Please define the minimum distances from each of the different project infrastructure.
- How close will Arrow Energy position the various types of project infrastructure to sensitive receptors? Please define the minimum distances from each of the different project infrastructure.

#### **1.2.4 Project Considerations**

***“detailed information is known about the impacts of developing such infrastructure, as Arrow has been developing coal seam gas reserves for over 10 years. Knowing the nature and severity of impacts associated with coal seam gas development has enabled Arrow to develop, implement and, through this EIS, refine environmental controls to manage development in the ecosystems and environments encountered throughout the project development area.”***

BSA is concerned that Arrow Energy will only have detailed information about potential impacts for areas where Arrow energy is currently operating. BSA believes that impacts from gasfield development will vary in different areas depending on underlying environmental factors and current farming practises. Arrow Energy will be uncertain of the potential impacts in areas where they haven’t yet developed across their project area and where they have little knowledge of underlying environmental factors specific to certain areas.

- All environmental values within the project area must be properly described, otherwise the proponent will be unable to conduct a proper assessment of the likely impacts they will have. Further, without identifying all environmental values, they will be unable to develop appropriate environmental controls to manage their development.

#### **4.1.3 Water Resources**

***“The majority of bores in the area draw water from the Condamine Alluvium (part of the shallow groundwater system). The water drawn from the alluvium is slightly acidic to alkaline and is generally brackish or slightly saline. Water from the Condamine Alluvium is generally utilised for crop irrigation and stock watering purposes but there is a potential for it to be used for domestic purposes.”***

BSA is concerned that Arrow energy has failed to recognise the importance of Condamine Alluvium water as a critical potable water supply to the towns Pittsworth, Millmerran, Brookstead, Southbrook, Macalister and Dalby. Water from the Condamine Alluvium is also accessed as a drinking water supply by rural landholders and it is considered to be a very important source of water for domestic and drinking purposes. BSA is concerned that by failing to recognise the importance of Condamine Alluvium as a source of drinking water, Arrow Energy is undermining both the importance of this water supply and the risk associated with its potential demise from CSG development.

- This EIS must acknowledge the Condamine Alluvium as an important domestic and drinking water supply, and in doing so must also establish the risk associated with any impact on that supply.

#### 4.1.3 Water Resources

***“Water in the coal seam groundwater system is generally slightly alkaline and is classified as ranging from highly brackish to saline. The water is generally suitable for stock watering.*”**

***Water within the deep groundwater system is generally slightly alkaline and ranges from fresh to highly brackish. The water may be used for irrigation and stock watering purposes. The deeper of these formations form part of the Great Artesian Basin that covers parts of the Northern Territory, Queensland, New South Wales and South Australia.”***

The Great Artesian Basin Resource Operations Plan (2007) identifies all of these formations as management units of the Great Artesian Basin (GAB). BSA is concerned that the proponent does not recognise the extent of the Great Artesian Basin water resource and therefore is unable to establish the risk from CSG extraction to aquifers of the GAB.

- The Water Resource section of Arrow’s EIS needs to be reworded to recognise all the formations that form the Great Artesian Basin.

#### 5.2.1 Production Wells

***“Arrow proposes to install production wells on an 800-m-grid spacing. This equates to an indicative density of one well per 65 to 135 ha (160 to 320 acres).”***

***“Wells do not need to be placed on a precise grid and may be spaced as far apart as 1,500 m depending on such constraints as environmental and social values, economics, reservoir characteristics and existing land use. As gas production ramps down, in-fill wells may be drilled between existing well locations to improve gas recovery and production.”***

BSA is concerned that whilst Arrow Energy recognises that such constraints such as environmental and social values, economics, reservoir characteristics and existing land use may influence the placement of CSG wells, Arrow Energy have not provided any detail on how such factors could constrain development. Further BSA is concerned that Arrow Energy has failed to establish environmental values to assess its limitations on development. If gasfield development is constrained then it is highly likely that in-fill practises would be constrained also.

- The proponent should be asked provide a detailed understanding of how certain factors would constrain the installation of gas wells, giving consideration to environmental and social values, economics, reservoir characteristics and existing land use.
- If environmental, social and existing land use factors constraint well spacing then in-filling must be prohibited in these areas.

#### 5.5.1 Production wells

***“The short-term construction footprint for each production well is approximately 0.5 ha, equating to a total footprint of about 3,750 ha for the 7,500 planned wells. It is important to note the construction footprint will significantly reduce following construction with an estimated 0.01 ha (10m x 10m) per well required for operations. The total operational footprint for the 7,500 wells is estimated to be only 75 ha.”***

Arrow falsely claims that the total footprint of the 7500 wells will be 3750 ha reducing to 75ha once construction has finished. This is misleading as the proponent maintains a right of way (ROW) over the area of the construction footprint for the life of the production well. Sites will have to be revisited with “work over rigs” on a regular basis to service and repair the pumps, well and motors. This work will require the same size site as for development which means a farmer will lose access to the larger area (75m X 75m) on a regular basis; this may not be of such concern in the grazing industry but would cause major production impacts on intensively farmed irrigation and dryland cropping area.

- What will be the maximum construction footprint required for well head construction?
- What is the definition of a Right of Way (ROW) in the context of Arrow’s gasfield development?
- For “Right of Way” access, does the proponent have higher priority than the landholder at all times?

#### 5.5.1 Site Preparation

***“Wells constructed on intensively farmed land will have surface tanks rather than pits for drilling fluids.”***

BSA is concerned that Arrow Energy will use surface tanks on intensively farmed land for drilling fluids and use pits on all other lands.

- What is the definition of “intensively farmed land”?
- Will the use of surface tanks impede or divert overland water flow?
- If the use of surface tanks is seen as a way to minimise impact and reduce contamination, why will Arrow not use surface tanks for drilling fluids on all other lands?

### 5.5.2 Gas and Water Gathering Systems

The EIS lacks detail and understanding on how to construct pipelines on an intensively farmed area so that food production is not negatively impacted and soil erosion increased.

- The Proponent should provide evidence that they can construct pipelines on an intensively farmed area so that food production is not negatively impacted and soil erosion increased.

Despite reference to the possibility of using solar panels for power supply to gas wells, it appears that Arrow have a commercial preference to using overhead power transmission and distribution lines for power supply to wells. BSA is concerned that Arrow have not considered what the impact of overhead power lines on a 800m-1500m grid would have on agriculture, specifically on the operations of the landowner.

- Arrow Energy must provide a detailed explanation of the impact of overhead power lines on all types of agriculture in the project area
- Arrow Energy must be forced to prioritise the use of methods of power supply that minimise impact ahead of commercial preference.

### 5.5.2 Gas and Water Gathering Systems - 3. Hydro-testing

***“Gathering pipelines are integrity tested by hydro-testing or pneumatic pressure testing prior to commissioning. Pipelines are filled with water and subjected to higher than normal operational pressures. Water used for hydro-testing will be diverted to holding dams for re-use or treatment and/or discharge. Water quality will be tested prior to release.”***

BSA is concerned that, in order for the proponent to hydro-test gathering lines for integrity, nearby holding ponds will be required to accept the water used for hydro-testing.

- Will dams of any kind be constructed on Good Quality Agricultural Land?

- Given that associated CSG water sterilises soils with a clay content greater than 30%, it is imperative that any water discharged must be appropriate for the receiving environment.

#### **5.5.2 Gas and Water Gathering Systems - 4. Progressive rehabilitation**

***“Marker posts, marker tape, trace wire and ‘as-built’ surveys will be used to identify the location of the buried gathering lines.”***

BSA is concerned that maker posts, marker tape, and trace wire will significantly impact on intensive cropping land use.

- Arrow Energy must provide a detailed explanation of the impact from the use of such markers on intensive cropping land.
- Arrow Energy must be forced to prioritise the use of markers that minimise impact.

#### **5.5.6 High Pressure Gas Pipelines**

The EIS fails to identify how pipelines will be installed across the flood plains and not cause erosion or subsidence issues. Accidents and erosion as a result of pipeline subsidence are a real concern to farmers.

- The Proponent should provide evidence that they can construct/operate pipelines on an intensively farmed area so that soil erosion and subsidence do not occur.

#### **5.6.2 Gas and Water Gathering Pipelines**

- **Regular Inspections**

***“Regular inspections will be conducted along the gathering line routes to observe and manage vegetation, subsidence, erosion and to ensure appropriate bushfire protection.”***

- Arrow should define the frequency of regular inspections.

- **Maintenance of Valves, Vents and Drains**

***“Valves periodically require inspection and maintenance to ensure effective and safe operation. Water pipelines contain high-point vents to release accumulated gas and low-point drains to allow the accumulated water to drain. Inspection and maintenance of the vents and valves are required to maintain flow.”***

BSA understands that high point vents and drains have been problematic for other CSG companies operating in the Surat Basin in the past.

- Arrow energy should provide details of these infrastructure – size/ area they take up, the frequency of placement of high point vents and low point drains on pipelines

- What happens to the venting gas and water released from the vent/drain points?
- What measures are in place to insure that the vented gas and drained water do not cause environmental harm?
- Do the venting/drain points have any detection/alarm systems to determine if there is excessive gas venting/water draining from these points? That is, if something goes wrong?

#### **5.6.4 Coal Seam Gas Water and Brine Management -Coal Seam Gas Water Management Options -Substitution of Allocations**

***“Arrow’s preferred approach is to beneficially use coal seam gas water by substituting existing water allocations in the area, i.e., the volumes of groundwater and surface water currently extracted by third parties in accordance with existing allocations will be replaced with coal seam gas water provided by Arrow. The strategy proposes substitution of water allocations for the duration of the project, until production of coal seam gas water ceases.”***

BSA believes that CSG water must be treated to a standard so it can be used ***in the area of extraction*** to mitigate losses from the Condamine Alluvium to the Walloon Coal Measures and from other affected aquifers. BSA accepts that this may be achieved by re-injection of treated water or substitution for existing use, so long as both practices are proven safe and pose no long term impact. CSG water must be treated as a community asset and the community must have the right to say what happens to it.

BSA is concerned that unless it is properly regulated the substitution of allocations method may cause an inequitable water redistribution of water- whereby those impacted from CSG extraction do not benefit from the practice of substitution of allocation/reinjection.

- Arrow Energy must define what is meant by substituting existing water “in the area”. Does this refer to “in the area where the gas is extracted”?

BSA is concerned that Arrow Energy have been unable to quantify the amount of water they will extract through induced flow from the Condamine Alluvium in the intensively farmed areas of their Surat Gas Project Area. BSA is therefore concerned that Arrow Energy may not have the capacity to dispose of water through substitution of allocation.

- How much water is Arrow Energy expected to extract from the Condamine Alluvium as induced flow from extracting gas from the Walloon Coal Measures?
- How will water substituted for allocations be accounted for?

- If Arrow Energy is also looking to substitute river licences, how will this substituted water be provided? Will it be directly piped to the receiving licence holder or will it be discharged to a river/creek system?
- To aid water disposal, will water licence holders be forced to take treated CSG water from Arrow Energy in lieu of taking existing surface or groundwater allocations?

***“It is expected that the third-party users will accept responsibility (legally and practically) for the impacts of their use of the water.”***

BSA is concerned that Arrow Energy has passed on the risk of the use of the treated water to the third party, however, the risk of the use of that water is dependent on its appropriate treatment by Arrow Energy.

- Arrow Energy should describe in detail how they intend to supply a continuous and quality product to third party users so as to be able to pass on the risk of its use.

#### **Injection**

***“Arrow conducted an injection feasibility study in 2010 and is preparing environmental authority applications to conduct shallow and deep aquifer injection trials. The purpose of the trials is to identify the volumes and rates of water that Arrow can sustainably inject.”***

BSA is concerned that Arrow Energy has not yet trialled reinjection and that trials by other CSG proponents have found reinjection to be problematic-both in terms of finding an aquifer to take large volumes of water without clogging or causing aquifer damage and in terms of matching the water quality in the receiving aquifer.

#### **Disposal to Watercourses**

***“Disposal to watercourses will be considered in the event that beneficial uses of coal seam gas water are temporarily unavailable or the demand for water decreases and alternative disposal options are required...”***

#### **Ocean Outfall**

***“Disposal of coal seam gas water to the sea via an ocean outfall pipeline is recognised as a feasible option, however it is not the preferred option. In the event that preferred coal seam gas water management options do not eventuate, the feasibility of an ocean outfall, as an emergency or alternative disposal option for coal seam gas water, will be evaluated.”***

BSA is concerned that Arrow Energy will use “disposal to watercourses” as their main water management option given that reinjection is still not proven on wide- scale and substitution of allocations is only a proposal at this stage. Disposal to



watercourses removes water from the area of extraction and does not mitigate long term water impacts.

- Arrow Energy should be heavily discouraged (through conditioning or risk management obligations) from using disposal to watercourses and ocean outfall as methods of water disposal.
- BSA is of the strong opinion that the Surat Gas Project must not be given approval to proceed until a clear plan for coal seam gas water disposal has been determined which prioritises both the use of water in the area the gas is extracted and the need to mitigate long-term impacts. As yet the options put forward by Arrow either are not proven or fail to achieve this.

### **Beneficial Uses of Coal Seam Gas Water**

#### **Agriculture**

##### **Irrigation Trials**

***“Arrow holds a specific beneficial-use approval for an irrigation trial on Arrow’s Thetan property. Further specific beneficial use applications are being considered. These trials will occur on land classified as good quality agricultural land.*”**

***It is Arrow’s intention over the next three to five years to develop a ‘showcase’ farming operation using treated coal seam gas water as a substitute for water drawn from aquifers.”***

BSA is concerned that the ‘showcase’ farming operation developed on Thetan over the next 3-5 years using treated CSG water as a substitute for water allocation will not provide an indication of long-term water or land resource impacts in the region from the Surat Gas Project.

##### **Selective Salt Precipitation**

***“Arrow is consulting commercial enterprises to investigate viable opportunities for the beneficial use of brine. As part of this process, Arrow will commission selective salt precipitation trials to:***

- ***Understand the chemical composition of the brine.***
- ***Identify methods to enhance precipitation of the brine.***
- ***Identify viable chemical processes to transform the brine into commercial products.***

BSA is concerned that Arrow Energy do not have answers for salt management. BSA believes that brine/salt must be removed from the surface environment, ideally dried to so that can be used in other industries.

### **5.6.9 Operational Security and Safety - Site Security**

- **Production Wells**

***“Completed well sites will be fenced to prevent access. The height of the fence will be dependent upon the location and risk of unauthorised access.”***

Fencing well sites (as with overhead power and markers) may impact intensive cropping land use. BSA does not believe the impacts of fencing wells have been appropriately considered by the proponent.

- Arrow Energy should provide detail of the likely impact of fenced well sites to intensive cropping land use.

#### **5.7.10 Financial Assurance**

- The financial assurance must not be calculated by Arrow, but by an independent body. It must reflect the environmental risk from Arrow’s activities and must be of a size that the cost to repair environmental damage will be fully covered by the company and not the state government.

#### **Chapter 7. Impact Assessment Method - 7.1 Environmental and Social Values**

***“The identification, ground truthing and mapping of sensitive receptors within the project development area is integral to the assessment of a number of the environmental and social aspects. Topographic maps, aerial photographs, satellite imagery, local knowledge, and information from stakeholder consultations were all used to identify sensitive receptor locations. Sensitive receptor locations were ‘ground-truthed’ in targeted areas to inform early development of the project GIS and to allow ‘calibration’ of assumptions that had made purely on the basis of desktop observations. Sensitive receptors are illustrated in Figures 7.2a, b and c.”***

BSA is concerned that Arrow Energy have not identified all sensitive receptors in Figures 7.2a, b and c. , meaning that they would not been able to appropriately assess a number of environmental and social aspects of the Surat Gas Project.

- Arrow Energy should redo their sensitive receptors mapping and have the new map verified through community consultation.
- Further, Arrow Energy should redo any environmental and social assessments which relied on the identification of sensitive receptors.

#### **8. Environmental Framework - 8.1 Objective of the Environmental Framework**

***“The principal objective of the environmental framework is to protect the environmental values of the project development area and to identify appropriate environmental management controls for project activities having regard to the constraints imposed by the environmental values.”***

#### **8.2 Environmental Values**

***“The sensitivity or vulnerability of an environmental value to change provides an indication of the level of constraint it poses to the development of coal seam gas infrastructure. Environmental values were identified by technical specialists who made an assessment of the sensitivity of the identified environmental values and proposed environmental management controls to address the potential impacts on the values. The assessment was informed by detailed desktop studies and targeted field surveys.”***

BSA is concerned that if Arrow Energy has failed to identify environmental values (eg groundwater values, sensitive receptors, agricultural practises, land use etc as discussed in responses earlier) then the Environmental Framework they have developed will not protect those environmental values and the environmental controls that Arrow has developed for project activities will not be appropriate to the constraints imposed by the environmental values.

In failing to identify all environmental values, Arrow Energy has not given proper regard to Chapter 1 Section 4 of the Environmental Protection Act which states that:

- (1) the protection of Queensland’s environment is to be achieved by an integrated management program that is consistent with ecologically sustainable development.
- (2) The program is cyclical and involves the following phases—
  - (a) phase 1—establishing the state of the environment and defining environmental objectives;
  - (b) phase 2—developing effective environmental strategies;
  - (c) phase 3—implementing environmental strategies and integrating them into efficient resource management;
  - (d) phase 4—ensuring accountability of environmental strategies.
- (3) The relationship between each of the phases is shown in the figure appearing at the end of this Act.
- (4) Phase 1 is achieved by—
  - (a) researching the state of the environment, including essential ecological processes; and
  - (b) deciding environmental values to be protected or achieved by consulting industry, government departments and the community.
- (5) Phase 2 is achieved by—
  - (a) developing environmental protection policies that, among other things—
    - (i) decide environmental indicators; and
    - (ii) establish ambient and emission standards for contaminants; and
    - (iii) require waste management, including waste prevention and minimisation; and
    - (iv) advise on management practices; and
  - (b) promoting environmental responsibility and involvement within the community.
- (6) Phase 3 is achieved by
  - (a) integrating environmental values into land use planning and management of natural resources; and

(b) ensuring all reasonable and practicable measures are taken to protect environmental values from all sources of environmental harm; and

(c) monitoring the impact of the release of contaminants into the environment; and

(d) requiring persons who cause environmental harm to pay costs and penalties for the harm.

(7) Phase 4 is achieved by

(a) reviewing the results of human activities on the environment; and

(b) evaluating the efficiency and effectiveness of environmental strategies; and

(c) reporting publicly on the state of the environment.

- All environmental values in the project development area must be properly described.
- When all environmental values have been properly identified, the environmental impact assessments need to be rewritten.

## 8.5 Environmental Management Framework

***“Mitigation measures presented as commitments in this EIS will be incorporated in standard operating procedures.*”**

***“Arrow has already developed and implemented a standard operating procedure for site and route selection, which uses the output of constraints analysis.”***

BSA was unable to find the standard operating procedure mentioned by Arrow Energy in the EIS.

- Arrow energy should publicly disclose all standard operating procedures for review.

## Chapter 10. Greenhouse Gas Emissions

BSA finds it unacceptable that Arrow Energy has not addressed the fugitive emissions of coal seam gas to atmosphere by means other than project infrastructure. In May 2012, methane was detected bubbling to the surface in a 5km stretch of the Condamine River in close proximity to QGC and Origin gasfield developments. BSA is concerned that this phenomenon has not been seen to this extent in the area. BSA is concerned that nearby gasfield dewatering may have reduced pressure under the river to exacerbate pre-existing natural connections between the Walloon Coal Measures and the Condamine River, allowing increased fugitive gas emissions to both water and land surface.

- Arrow Energy should redo their Greenhouse Gas Emissions assessment, giving regard to all fugitive emissions of coal seam gas to atmosphere.
- Arrow Energy should identify any areas in its Surat Gas Project Area where the coal measures are shallow, gassy and naturally leaking.

- Around greater population densities in the Surat Gas Project Area, the administering authority should restrict gasfield development where the coal measures are shallow, gassy and naturally leaking

## Chapter 12. Geology, Landform and Soils

### 12.2.2 Contaminated Land

***“All land upon which Arrow may conduct project activities could be listed on either the Environmental Management Register (EMR) or the Contaminated Land Register (CLR).***

***• A number of Arrow project activities will be notifiable in their own right and land parcels upon which Arrow conducts project activities may accordingly be required to be listed on the EMR.”***

### 12.4

There is no mention in this section of potential soil contamination from leaking or ruptured pipelines or well leaks.

- Arrow Energy should provide detail of what safeguards they have in place to ensure pipelines will not leak or rupture and gas wells will not leak.
- Arrow energy should provide detail on how it would remedy soil contamination if leakage occurs from pipelines or wells.

#### 12.4.3 Decommissioning

***“During decommissioning, the following impacts on the geological, landform and soils values from the various project activities could occur:***

- ***Reprofiling of microrelief leading to patchy exposure of sodic and saline subsoils from inversion of the soil profile during backfill of materials during rehabilitation***
- ***Importing materials for rehabilitation purposes, particularly in areas of GQAL, affecting agriculture production.***

BSA is concerned that decommissioning by Arrow Energy will affect agricultural production.

- Arrow Energy should provide detail as to the extent that agricultural production will be affected.
- The administering authority should appropriately condition the project so that decommissioning does not result in the loss of agricultural production

Also within this section, there is no consideration in this section to impacts from subsidence caused by deteriorating pipelines.

- Arrow Energy should provide detail of what safeguards they have in place to ensure pipelines will not deteriorate.

- Arrow energy should provide detail on how it would remedy subsidence in the event that it is caused from deteriorating pipelines.

#### **12.4.4 Issues Specifically Associated with Contaminated Land -Potential to Cause Land Contamination through Project Activities**

***“Various aspects of the proposed project activities have the potential to result in land contamination and there is currently no notifiable activity addressing coal seam gas development generally.”***

BSA is very concerned that “various aspects of the proposed project activities have the potential to result in land contamination” as listing of a property on the EMR or CLR has potential negative impacts on land values, capacity to operate, and quality assurance and certification statuses for food and fibre production. Specifically, Arrow Energy conducting their activities on a landholders land could result in the landholder’s land being listed on the CLR or EMR, thereby rendering the landholder’s business unviable with the inability to sell out.

- Arrow Energy should list what aspects of their project activities have the potential to result in land contamination, clearly defining the trigger for the contamination.
- Arrow Energy should locate aspects of their project activities that have the potential to contaminate land to their own land.
- What is the third party affects from neighbouring land on the CLR?
- Arrow Energy should examine in detail the impact of land being placed on the CLR- to landowners, communities, food and fibre production.

#### **12.6 Avoidance, Mitigation and Management Measures**

##### **12.6.1 General Measures**

***“The following general avoidance, mitigation and management measures will be implemented for all activities:***

- ***Design infrastructure located in cracking clays to withstand the differential shrink-swell ground movement. [C042]”***

BSA is interested to know how Arrow Energy will design infrastructure to withstand the differential shrink-swell ground movement.

- Arrow Energy should provide evidence that it has the engineering and financial capacity to design infrastructure (in a timely manner) to withstand this differential shrink-swell ground movement.

##### **12.6.2 Land Degradation**

***“The following general avoidance, mitigation and management measures will be implemented for all activities that have the potential to cause land degradation:***

A plan should be developed before approval is granted, not after the event. Disappointingly this section appears to pay no regard to the Strategic Cropping Land Legislation.

- This section should be revised to take the SCL legislation into account.
- There is a need to incorporate into emergency response plan controlled discharge of CSG water. Release of untreated CSG water should not be allowed on SCL as it will cause permanent alienation or diminished profitability.

**• *Avoid disrupting overland natural flow paths and, where avoidance is not practicable, maintain connectivity of flow in watercourses. [C053]***

BSA does not accept that where “avoidance is not practicable”, Arrow Energy is permitted to disrupt overland flow paths so long as they “maintain connectivity of flow in watercourses”. Water will find the easiest path, and that path will be via connectivity of flow in watercourses. The last part of Arrow Energy’s statement appears baseless. It is also against current environmental conditioning for the proponent for their Dalby Expansion project.

- Has Arrow Energy mapped the connectivity of flow in water courses in the Surat Gas Project Area, and if so can Arrow Energy provide the administering authority and the public, with a baseline of this map?
- If Arrow Energy’s activities cannot avoid altering overland natural flow paths, then those activities should be prohibited in areas of overland flow.

**“• *Locate pipelines to avoid or minimise impact on irrigation flow or current farming practices. If the ROW must cross actively farmed arable land, ensure soil cover above the pipeline is deep enough to allow normal cultivation practices to resume. [C047]***

BSA is concerned that pipeline placement and ROW’s may unreasonably interfere with farming activities both in the short term and into the future. For that reason BSA suggests that Arrow Energy should change the above statement to :

- *Locate pipelines to avoid or minimise impact on irrigation flow or current or future farming practices. If the ROW must cross ~~actively farmed~~ arable land, ensure soil cover above the pipeline is deep enough to allow ~~normal~~ cultivation practices to resume.*

### Chapter 13 – Agriculture

When explain Strategic Cropping Land, Arrow Energy states...

***“The policy framework document (DERM, 2010i) defines the types of activities that might temporarily affect strategic cropping land as ‘relevant development’ and defines this term as follows:***

***Development that will temporarily diminish productivity of strategic cropping land or will permanently alienate the land. This includes urbanisation and mining, but excludes some agriculture and State infrastructure. There are two key types of relevant development:***

- 1. Development that causes temporary diminished productivity—where development that impacts upon the soil resource and/or prevents cropping activity, but where the land can be fully restored following cessation of the use.***
- 2. Development that will permanently alienate strategic cropping land including where:***
  - a. a development will endure for 50 years or more, and prevents cropping during that time or in the future (e.g. urban development); or***
  - b. a land use where a legal impediment prevents the land from being used for cropping for 50 years or more (e.g. permanent forest plantations with a covenant securing carbon rights); or***
  - c. a development that causes long-lasting impacts that prevents or reduces cropping capability such as subsidence, changes to the soil structure or contamination (e.g. minerals extraction); or***
  - d. a development likely to cause a land-use conflict or where reconfiguration of lots result in fragmentation and small lot sizes that would impact on the productivity of strategic cropping land. An example of development likely to cause conflict is high density urban development.***

***“The Surat Gas Project has the potential to trigger relevant development types 1 and 2c, with wells, gathering systems and pipelines being type 1 developments and production facilities being type 2c developments. The success of project planning and implementation will be the ultimate determinant of the type of development triggered by the proposed project activities.***

From the above, BSA is concerned that Arrow Energy state that wells, gathering systems and pipelines will be Type 1 developments when BSA expects they could easily classify as Type 2c. Ultimately the classification of development type will come down to capacity to restore existing land use capability.

Also, it would appear that Arrow Energy will not place any holding ponds on SCL unless it can be fully rehabilitated back to existing land use capability.

- Arrow Energy should provide clarification as to whether holding ponds of any description will be developed both GQAL and on SCL, and if so where, of what size, purpose and the rehabilitation method



- Arrow Energy should provide a detailed analysis of each of its project infrastructure planned for SCL and provide the corresponding development type and rehabilitation methods which satisfy the development type.

### 13.3.5 – 13.4.6

The EIS gives little confidence that Arrow understands intensive agriculture, especially irrigation. We fear that if the EIS were approved in its current form agricultural production would be impacted especially as there are no minimum right to farm requirements identified.

- Arrow Energy should provide evidence that it understand intensive agriculture, specifically irrigation.

#### 13.4.3 Farm Workability

***“Changes to the layout of farming properties caused by the introduction of coal seam gas infrastructure can disrupt operations, leading to increased capital and operating costs.***

***This is particularly evident in surface irrigation where modifications to irrigation channels, head ditches and tail drains can reduce the efficiency of delivery and distribution of water throughout the farm. Similarly, shortening of lateral booms and centre-pivot irrigators may require additional irrigators (e.g., big gun sprays) to irrigate the land inaccessible by the booms or centre pivots.***

***Development of coal seam gas infrastructure may also limit the ability of farmers to change farm plans to incorporate proposed capital improvements to the property and to account for new technologies and farming techniques.”***

BSA considers that the potential impacts on farm workability will be specific to individual landowners and may warrant legal consideration of Section 804 of the Petroleum and Gas (Production and Safety) Act 2004.

#### 13.4.7 Extent of disturbances to GQAL and SCL

49% of the land impacted by Arrow’s activities will be SCL, Arrow have not demonstrated how they will develop a gas field on the flood plain and not increase the erosion risk or impact on production.

- Arrow Energy should demonstrate how its activities will not increase the erosion risk or impact on production.

#### 13.6.2 Reduced Productivity and Increased Costs

The term “where practical” concerns us it could lead to arguments between Arrow and the Land holder. Mitigating environmental, economic and social impacts must be a priority and not weakened by being left to a “where possible “ approach.

- Remove the term “where practical”.

### 13.6.5 Increased Cost of Farm Management

- Intensive farm land must be in the same category as other intensive industries listed.

## Chapter 14 – Groundwater

### 14.2 Assessment Methods - 14.2.1 Desktop Study

***“The desktop study has assessed the data contained within the DERM and Queensland water entitlements registration databases. It is recognised that the data in these government databases is incomplete. The bores contained in the government databases are limited to those that are licensed. The number of data points regarding groundwater levels, quality and stratigraphy from the different bores is highly variable, ranging from representative to inadequate. Certain inaccuracies are expected; and, where data appears to be anomalous, it has been excluded from the dataset and from any subsequent interpretation or discussion. However, the available data is considered sufficient to allow an initial-level assessment of the baseline hydrogeological characteristics of aquifers within the project development area.”***

BSA is concerned that Arrow Energy found the DERM database to contain both incomplete data and data anomalies to the point that it had to exclude that data, yet the available data was sufficient to provide initial baseline hydrogeological characteristics of aquifers within the project development area.

Further, BSA is aware of a 2011 USQ Research Proposal “Water, Agriculture and Mining: Regional Development Outcomes for Groundwater in the Condamine Alluvial and Surat Basin Aquifers” which identified the need for improvement in regional knowledge base regarding groundwater resources of the Condamine Alluvium and shallow GAB aquifers throughout the Surat Basin. This research project looked to provide independent and credible field evaluated monitoring data to enable assessment of aquifer characteristics and the impacts of agricultural, CSG and mining operations on the security of regional groundwater resources. Specifically, the project was to look at:

- quantifying connectivity between the Condamine Alluvial and shallow underlying aquifers
- improve the knowledge base regarding inter-aquifer leakage and contamination issues associated with CSG bore installation and operation and other mining activities

- measuring vertical and lateral transmission rates and aquifer storage and yield parameters within GAB aquifers and aquitards above the Walloon Coal Measures
- Development of appropriate groundwater monitoring tools and knowledge management interfaces

As of June 2012, the USQ Research Proposal has not commenced and hence the knowledge gaps which it was to address have not been filled.

- Given the excluded problematic data from DERM, and given also that the USQ Research Proposal to improve regional knowledge on groundwater resources, specifically the Condamine Alluvium has not occurred, how was Arrow Energy been able to determine that the available data was sufficient to establish initial level baseline hydrogeological characteristics of all aquifers in the project development area?
- Has the administrating authority been able to verify the suitability of the data used by Arrow?

#### 14.2.2 Numerical Groundwater Model

***“A detailed conceptual and regional numerical groundwater model of the study area was developed by Schlumberger Water Services (Australia) Pty Ltd to predict potential impacts on the environment and other groundwater users”.***

BSA is concerned that given the lack of knowledge about the Condamine Alluvium and other aquifers of the GAB highlighted by the USQ Research Proposal, the model developed will contain interpolated data about important hydrogeological characteristics which may/may not have relevance to underlying formations, making model predictions problematic.

- What variations were used in the different hydrogeological characteristics of aquifers across the Surat Gas project area?
- How is Arrow Energy able to ground-truth hydrogeological characteristics of aquifers?
- How will Arrow Energy incorporate real time data into their modelling?

#### 14.2.2 Numerical Groundwater Model - Predictive Groundwater Extraction Scenarios

***“For the purposes of the numerical groundwater model, predicted coal seam gas groundwater extraction rates used to define Arrow’s conceptual design were used to simulate groundwater drawdown over a 30 year project production life span and 20 years of recovery after cessation of gas extraction activities.”***

**Appendix G – Groundwater Impact Assessment - 6.4.4 Beneficial Uses of Coal Seam Gas Water**

***“The impact assessment assumes that the legislative framework to enable the substitution component of Arrow’s water management strategy will be in place, and that Arrow will be able to deliver coal seam gas water (generally in treated form) to third party users, particularly irrigators, as a substitute for groundwater that would otherwise be drawn from aquifers and waterways.”***

#### **5.6.4 Coal Seam Gas Water and Brine Management - Coal Seam Gas Water Management Options**

***“Arrow’s preferred approach is to beneficially use coal seam gas water by substituting existing water allocations in the area, i.e., the volumes of groundwater and surface water currently extracted by third parties in accordance with existing allocations will be replaced with coal seam gas water provided by Arrow. The strategy proposes substitution of water allocations for the duration of the project, until production of coal seam gas water ceases.”***

#### **14.4 Issues and Potential Impacts**

***“The significance of potential impacts on the groundwater values has been assessed using the sensitivity of the value and the magnitude of the potential impact (as described in Chapter 7, Impact Assessment Method). Coal seam gas water will be extracted from the Walloon Coal Measures, so direct impacts on the groundwater levels in this aquifer cannot be avoided. In addition to direct impacts on the Walloon Coal Measures from depressurisation, there are potential indirect impacts on surrounding groundwater systems as a result of coal seam gas water extraction.***

***Other than coal seam gas water extraction, other activities conducted by Arrow that have the potential to affect groundwater include drilling, storage of saline water, and storage of chemicals and fuels. Potential impacts on the groundwater values from associated project activities include:***

- ***Reduced flows to groundwater-dependent ecosystems and areas of cultural and spiritual***
- ***importance fed by groundwater from the Walloon Coal Measures and adjacent aquifers.***
- ***Reduced groundwater supply to existing or future groundwater users accessing groundwater***
- ***from the Walloon Coal Measures and adjacent aquifers.***
- ***Diminished groundwater quality, caused by: – Surface activities related to the storage of chemicals and fuels and the storage, treatment and transfer of coal seam gas water. – Subsurface activities related to aquifer depressurisation, drilling of production wells and monitoring bores, and the installation of buried infrastructure.***
- ***Diminished rainwater infiltration, reduced aquifer recharge and altered groundwater flow patterns.***
- ***Land subsidence affecting surface water flow regimes and landforms.”***

One of the difficulties for BSA in considering the merits of substituting existing water allocations, is that Arrow Energy provides no evidence that substituting allocations will mitigate long term impacts of CSG development on aquifers in the Surat Basin Project Area. Arrow Energy implies that a one-for-one megalitre licence offset/substitution will mitigate damage. However, dewatering the Walloon Coal Measures will cause a change in pressure differential insuring an ongoing draw of water from non-target aquifers long after dewatering ceases. After which time, treated CSG water will not be available for mitigation as dewatering will not be occurring.

Further, BSA is aware that the quality of groundwater is characterised by its physical, chemical and biological parameters acting together. A change in any parameter will more than likely bring about change in the others. Changing the pressure differential by dewatering will alter the physical parameter associated with groundwater quality. Additionally as dewatering occurs, water in both the Walloon Coal Measures and underlying and overlying aquifers, will be drawn laterally and water will be mixed potentially affecting water quality.

BSA also understands that reverse osmosis treatment of water is costly. BSA is concerned that Arrow Energy will not assume the RO cost for treating water unless it has to.

- Arrow Energy should be made to provide detailed evidence on how it has determined that a one-for-one megalitre substitution of groundwater and surface water entitlement for treated CSG water will mitigate long term affects in the Condamine Alluvium aquifers of the Surat Gas Project Area.
- Arrow Energy should provide evidence on how it will mitigate long term impacts on groundwater drawdown in all other aquifers of the Surat Gas project Area.
- Arrow Energy should provide a detailed analysis showing it has the capacity “to make-good” impacts on groundwater aquifers for perpetuity.
- Arrow Energy should provide detail of how it has considered the impacts on groundwater quality from its proposed dewatering activities.
- Given that DERM has listed the use of untreated CSG water in its CSG Water Management Policy, the administering authority should insist that the proponent provide evidence of how such use will not have a detrimental impact on the environment, before approving such use.

#### **14.6 Mitigation, Monitoring and Management Measures**

***“Potential impacts on groundwater systems in the project development area will be managed through a hierarchy of mitigation, monitoring and management options that form the basis for an adaptive management framework. The hierarchy of groundwater mitigation, monitoring and management options is linked to Arrow’s coal seam gas water management strategy (Attachment 9, Coal Seam Gas***

***Water Management Strategy), specifically substitution of groundwater allocations and injection.***

***The management of potential impacts to groundwater that are related to land contamination as a result of disturbance of existing contaminated land or the potential to cause land contamination through project activities is discussed in Chapter 12, Geology, Landform and Soils.”***

BSA is pleased that Arrow Energy accepts that Adaptive Management will provide the basis for mitigation, monitoring and management options of groundwater impacts. BSA is aware that Section 312E of the Environment Protection Act (2004) (as copied below) specifically provides the mechanism for the administering authority to amend environmental authority conditioning. BSA understands that the triggers for adaptive management under the EP Act and were recently strengthened to include findings of the Underground Water Impact Management Report. However, BSA is concerned that for the administering authority to amend an Environmental Authority, it must have knowledge that something within the project has altered or was not represented correctly at the time of conditioning in the first place.

- Has the proponent considered the likely implications of a changing Environmental Authority conditioning to the economics of the Surat Gas Project?
- What are the reporting requirements to ascertain if Section 312E is triggered or otherwise, and how is this information validated by the administering authority?
- Is there a link between environmental performance and tenure renewals?

### **S312E Environmental Protection Act**

(1) The administering authority may amend an environmental authority (chapter 5A activities) at any time if

(a) it considers the amendment is necessary or desirable because of a matter mentioned in subsection (2); and

(b) the procedure under division 2 has been followed or the holder has agreed in writing to the amendment.

(2) For subsection (1)(a), the matter is any of the following

(a) a contravention of this Act by the holder;

(b) the environmental authority was issued because of a materially false or misleading certificate, declaration or representation, made either orally or in writing;

(c) the administering authority has, under part 7, directed or required the holder to change or replenish financial assurance for the environmental authority and the holder has not complied with the direction or requirement;

(d) the environmental authority was issued on the basis of a miscalculation of

- (i) the environmental values affected or likely to be affected, by a relevant chapter 5A activity for the environmental authority; or
- (ii) the quantity or quality of contaminant authorised to be released into the environment; or
- (iii) the effects of the release of a quantity or quality of contaminant authorised to be released into the environment;
- (e) a change in the way in which, or the place where, contaminants are, or are likely to be, released into the environment;
- (f) the approval of an environmental protection policy or the approval of the amendment of an environmental protection policy;
- (g) an environmental audit or report, or an audit statement given under this chapter;
- (h) an environmental audit or report given under chapter 7;
- (i) a final rehabilitation report;
- (j) an annual return required under this Act;
- (k) a significant change in the way in which, or the extent to which, a relevant chapter 5A activity is being carried out;
- (l) the amendment is necessary to prevent environmental harm not already authorised under the environmental authority;
- (m) an amendment is proposed under an amendment application;
- (n) a report made by or for, or approved by, a recognised entity if the report is relevant to the environmental authority or an activity carried out under it;
- (o) a revised (CSG) EM plan;
- (p) another circumstance prescribed under a regulation.

#### **14.6.3 Design and Planning**

***“The following mitigation, monitoring and management measures have been developed to address the potential impacts on groundwater values during the design and planning phase of the project:”***

BSA considers a lack of CSG well integrity as a critical risk factor to causing impact on groundwater from CSG activity. Whilst there was reference to standards around the handling of hazardous materials etc, BSA was unable to locate in this section where Arrow Energy refers to the adherence to codes of practise and standards for well drilling and construction

- Arrow Energy should specify the codes of practises and standards it will impose for CSG well drilling and construction.
- Arrow Energy should detail how the integrity of the wells will not be compromised over time with respect to production wells, plugged and abandoned wells, steel casings and cement plugs.

#### **Chapter15 Surface Water**

### 15.3 Existing Environment and Environmental Values

The Jimbour Plain is part of the Condamine Catchment which runs through the project area. Overland flows across the flood plain have enormous impacts on agriculture and the entire catchment system, not just an erosion issue but also an environmental and financial value to rural industries.

- The environmental value of overland flow water must be identified and properly described, and the appropriate impact assessment must be undertaken and mitigation strategies proposed to minimise harm.

### Conclusion

BSA strongly believes that Arrow Energy's Surat Gas Project EIS has not provided enough detail to allay community's concerns, specifically with respect to land and water impacts. BSA is concerned that Arrow has not demonstrated that they fully understand the risks to the Condamine alluvium or the fertile soils of the flood plain.

The members and community represented by BSA hold grave fears for their future if the EIS is approved in its current form. In many sections of the EIS, there is a need for greater knowledge of potential impacts from CSG and Arrow's development plans.

Yours sincerely



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