

ARROW ENERGY UPDATE COMMUNITY INFORMATION SESSION 8 JUNE 2020

Introduction

In April 2020, Arrow sanctioned the commencement of the first phase of its Surat Gas Project in southern Queensland, with construction set to begin later in 2020. The first phase will include drilling more than 600 wells to bring around 300 terajoules per day of gas to market over 27 years.

In place of our usual town halls in our local communities, members of the Arrow team presented an update via live webinar (an online presentation) and were available to answer questions at the end of the presentation.

These notes reflect the questions received and their answers. While the notes include some paraphrasing and summarising, every effort has been made to preserve the integrity of the discussions.

Event details:

Live webinar (online)	Monday 8 June 2020 3.30-4.30pm	Presentation, questions and answers
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A copy of the presentation is available on the Arrow website: www.arrowenergy.com.au

How to read these notes

Questions and comments from the audience are in bold type, with the responses from Arrow staff in below. In some cases, responses have been summarised. In others, additional information is included to provide further context or explanation. This information is italicised following the answer.

If you have questions or comments about the project or these meeting notes, please contact the project team during working hours on:

Freecall: 1800 038 856

email: info@arrowenergy.com.au

Acronyms

CSG – coal seam gas
ATP – authority to prospect
PL – Petroleum lease
SGP – Surat Gas Project
EIS – environmental impact statement
IFL – intensively farmed land
AWP – area wide planning
CCA – conduct and compensation agreement
HDPE – high-density polyethylene
IAA – immediately affected area
WMMP – water monitoring and management plan
QGC – Queensland Gas Company
UWIR – Underground Water Impact Report
OGIA – Office of Groundwater and Impact Assessment

Legislation

Petroleum and Gas Act 2004 (P&G Act)

Date:	08/06/2020
Time:	3.30pm to 4.30pm
Venue:	Live Webinar
Arrow Energy presenters:	Guy Young – General Manager Surat Opportunities Chris Wicks – Senior Development Planner IFL Simon Gossmann – Groundwater Manager Jason King – General Manager Contracting Procurement & Logistics Brydie Hedges – Community Engagement Manager Gary Lees – Access Manager Surat David Wigginton – Produced Water Manager
Facilitator:	Leisa Elder – Vice President, External Relations and Tenure Management, Arrow Energy

1. Please explain the process involved in subterranean directional drilling and what protections will be employed to ensure that aquifers are not impacted. Can you also describe the nature of the aquifers & aquitards that you will drill through?

The top section of a deviated well is generally drilled vertically through the Condamine Alluvium (*the overlying aquifer*).

Arrow employs zonal isolation which is necessary for environmental and production performance reasons.

Environmentally, Arrow ensures groundwater aquifers are not contaminated by produced fluids and production isolation is important to ensure the coal seam is dewatered as effectively as possible.

Arrow's environmental restrictions require monitoring of the well by qualified geologists during drilling to ensure correct well construction. Production wells are designed and constructed using concrete casing through aquifers other than the coal seam to prevent the transfer of water and gas between strata.

The aquifers that Arrow drill through include the Condamine Alluvium - in the eastern portion of Arrow tenure. Arrow recognises that the Condamine Alluvium is a very permeable, good quality aquifer which produces groundwater in large quantities.

Towards the west or deeper in the drilling sequence is the Westbourne formation, which is considered an aquitard.

Arrow may drill through Springbok Sandstone which is sporadically considered an aquifer. In some locations it supports groundwater extraction and in other cases it's not considered a productive aquifer.

Arrow drills into the Walloon Coal Measures to produce gas, which is isolated by casing and pressure cemented.

Arrow does not currently use horizontal (in-seam) drilling techniques in the Surat Basin. It's more viable in the Bowen Basin, which has coal seams that are up to ten meters thick that are more regionally continuous. In the Surat, the seams are much thinner and discontinuous, so our wells target multiple, smaller seams. We do use deviated bores in the Surat Basin, allowing us to cluster our wellheads in groups on single well pads to reduce our impact on

farmland and farming operations. By deviating the bores as they descend, we can reach the same area of coal seam from a single surface point that would otherwise require multiple vertical wells with their own well pads. These deviated bores reach can vary in degrees from 70 – 82 degrees from the vertical depending on the geology and go down through the thin Surat Basin coal seams rather than running inside them for any distance.

Arrow adheres to the strict requirements outlined in the code of practice for the construction and abandonment of coal seam gas wells and petroleum wells. In Queensland, this is overseen by the Petroleum and Gas Inspectorate of the Department of Natural Resources, Mines and Energy (DNRME).

The well design and construction of a gas well is critical for ensuring well integrity and is therefore a staged process. It is broken into several parts in recognition of the different formations that are drilled through on the way to the target depth.

The expected life of a well pad from production to end-of-life rehabilitation is approximately 20 years. Monitoring and maintenance are required to preserve the condition of the well and its equipment for the entirety of its useful life.

2. Can Arrow detail how the salt waste (the crystallised brine) will be dealt with and how will it be stored?

As outlined in Arrow's Environmental Impact Statement (EIS), the salt brine may be crystallised and safely stored in a landfill. Arrow is still looking for other opportunities where salt can be beneficially used. There are still a number of years to find an alternative arrangement rather than storage in a purpose-built landfill.

The Surat Gas Project EIS is an environmental impact assessment which covers Arrow's Surat Basin development that is underpinned by our 27+ year gas sales agreement with the Shell-operated QCLNG joint venture. The EIS document identifies potential adverse and beneficial impacts; what Arrow must do to protect environmental, social and economic values; environmental management measures, and that Arrow consulted with communities and stakeholders.

The EIS describes a much greater project than is now being pursued by the company.

3. What happens to the land after the project is finished; do you guys leave it alone or do you dig up?

All above ground infrastructure is removed, e.g. well pads are rehabilitated, and wells are sealed with concrete and cut off (plugged and abandoned).

Below ground infrastructure is made safe and left in situ e.g. HDPE (poly) pipe is left in the ground after all the surface infrastructure is removed.

4. In the first question, you spoke about water in Condamine Alluvium. Our concern is about water bore losses from Walloon Coal bores. Please tell us how 'make good' works if

Hutton bores are not suitable and Precipice bores are very deep and may not have good flow rates. Where does Arrow intend to get good water to replace these bores?

'Make good' is a statutory process under the Queensland Water Act. Every three years the Queensland Office of Ground Water and Impact Assessment (OGIA) prepares a report named the Underground Water Impact Report (UWIR) for the Surat Basin which collates all information provided by CSG companies including wells drilled, monitoring bore results, also volumes of CSG water produced and planning to produce.

OGIA use this information to update their existing ground water model for the Surat Basin. This model predicts areas of at least 5 metres of groundwater draw down in the next 3 years, called the immediately affected area (IAA) which may be different for each aquifer.

At the moment, most of the immediate impacts are predicted in the Walloon Coal Measures and some are predicted in Springbok Sandstone.

The report also produces a long-term view of the same area for 5 metres of expected draw down at any time for all bores in the immediately affected area.

A responsible tenure holder is assigned by the office. If the tenure holder is Arrow, we are required to undertake a more detailed assessment of the specifics of the bore including what aquifer it is drilled into, the rate of the water produced, what the predicted draw down is and whether that draw down will result in that bore no longer being able to provide the same quantity or quality of water it currently can. In that instance Arrow must negotiate a 'make good' agreement of that bore based on the specifics of that bore including how much water it's able to produce.

For stock and domestic bores Arrow generally views (in the vast majority) they will be able to be replaced with a Hutton bore, a bore drilled to a deeper formation which is not predicted to be impacted the same as the Walloon Coal Measures. The specifics of the negotiation will need to be considered as well as the exact flow rate of the bore.

Arrow is confident and have completed several 'make good' agreements where stock and domestic bores have been replaced from the Walloon Coal Measures into the Hutton. Arrow would then negotiate compensation for drilling the new bore or if the individual bore owner would prefer, compensation is provided instead of bore replacement.

5. What is happening with maintenance and upgrade program of the Daandine-Nandi Road? It is in terrible condition now; it is unlikely to survive all this development you have planned.

Arrow understands the road is continuing to decline.

There has been some recent work done on the road by the Department of Transport and Main Roads (DTMR) which obviously isn't lasting with the current traffic.

At this stage Arrow is still working with DTMR with the view to seal portions of the road.

There have been recent geotechnical activities to inform that work which is underway.

In addition to Arrow's ongoing discussions with DTMR regarding Daandine-Nandi Road, Arrow are working with DTMR and Western Downs Regional Council (WDRC) to develop an agreement to manage and mitigate Arrow's impact on roads across the region.

As part of this agreement process, Arrow has undertaken site inspections of a number of roads in the Kupunn area with WDRC in March.

The agreement will identify which local roads will be sealed or upgraded. Any decision to seal roads are ultimately a decision for the prevailing road authority.

At a minimum, Arrow will maintain roads to a level that ensures the safety of all road users, including re-profiling and re-sheeting as necessary.

6. How will the drilling fluids be disposed of from drilling wells? Will they be mixed buried and covered on the lease pad?

The intention is to mix and bury fluids (*drill cuttings*) on the lease pad.

The fluids themselves are recycled throughout the drilling process and then removed from site.

The advantage of this is that it reduces the number of truckloads of water required and it also allows for the reuse of cuttings on the lease further restricting truck movements.

Reuse of material on-site is discussed during the land access process to determine whether landholders are agreeable to it or not.

The fluids and cuttings are separated on site using screens and centrifugal processes.

7. What advice would you give a landholder who is planning to drill a new water bore in the area?

If the question is with respect to a 'make good' agreement with Arrow, advice would be to read the bore assessment that Arrow has undertaken to understand the capacity of the existing bore and the capacity of any new bore that might be required.

As part of a 'make good' negotiation process, Arrow will generally commence the process by sharing the bore assessment and offering to explain aspects of the report.

Arrow would then seek to negotiate terms for an agreement and key components of what 'make good' would look like. This could potentially include redrilling a bore.

It's important the landholder understands what options are available in the area they're in and to obtain the quantity and quality of water that their existing bore was able to produce. They could speak with drillers or hydro geologists who have expert local knowledge who can best advise them on what a 'make good' measure might look like.

If the question is with respect to a bore that's not covered by a 'make good' agreement, a completely new Walloon Coal Measure bore, it's important that landholders are aware that new bores drilled after the first UWIR was published, are treated differently to bores that already existed at the time the first UWIR publication.

Bore owners may not have the same rights to 'make good' if they drill a new bore in potentially impacted area now compared to bore owners who have had a bore in place for some time.

8. Please provide more detail on the Area Wide Planning process and how landholders have found it

Area Wide Planning (AWP) is a process where Arrow engages landholders, usually about two years ahead of planned development.

The main objective is to collect any constraints landholders may have on their property including things like, overland flow, planned development on their property.

If there is proposed infrastructure, the landholder would have the opportunity to discuss the location of that infrastructure, where it might have the least impact on their property. Arrow combine this information with other constraints including access to the underground gas reserves & environmental requirements.

Arrow works cooperatively with landholders to find alternative locations for proposed infrastructure where possible.

9. Our farm sits over Arrow tenement and also impacted by the Linc Energy contamination. Will there be any construction on our property one day?

Petroleum Lease 253 (PL253) which sits over that area was granted to Arrow in February 2019.

Under PL253 we have the ability to commercialise gas from existing pilot wells, but it doesn't permit any further CSG wells in that area.

Arrow is currently undertaking water sampling from eight water monitoring wells which we drilled late last year/early this year.

The purpose of the monitoring is to better understand groundwater levels and movement in the area.

Along with other data the results of that will be used to validate the Arrow groundwater model and further understand groundwater movement in the area.

The results will allow Arrow to apply for an amendment to the Environmental Authority for PL253 to enable further CSG production on the tenure in the future.

10. In your SGP Stage 1 CSG WMMP Subsidence Technical Memorandum, Point 3.1 talks about use of satellite images for subsidence monitoring. Paragraph 4 says 'Some areas are unsuited to the use of this method of movement interpretation. For example, ploughed fields produce variable response, and generally produce a low density of reliable interpretations. Altamira assessed the quality of each interpreted point and did not report those points of low reliability'. Please explain how that applies to the Kupunn district which is mostly 'ploughed fields'.

The quote referenced is taken from text in the SGP Stage 1 CSG WMMP Subsidence Technical Memorandum which explains that standard processing of InSAR relies on a certain degree of 'coherence' between images in order to calculate a relative change.

Where there is a lot of disturbance to ground surface through cropping, working of the land or growth of vegetation it can result in images being so different that the algorithm applied to the data to calculate ground movement doesn't work, *i.e. determines that the difference in images does not represent actual ground movement. No data is presented for locations where this occurs.*

We're currently working with the provider of that service to:

- firstly, collect data of greater frequency to reduce the areas of which there is unreliable data *i.e.*, the more data you collect the more quickly, the less time there is for a crop to grow and less chance of change between data capture
- secondly, the level of coherence of noise you're willing to accept between images so that's another thing we are looking at is to change those thresholds so we capture data over a greater area
- finally, the last thing we are looking at is capturing that image at particular times in that cropping cycle, potentially excluding times of the year when that land is being worked and cropped to try to increase the coverage of data we're able to obtain.

11. Currently some insurers are refusing Public Liability insurances on farms that have ANY CSG on their property. Will there be NO further development until this is sorted?

Arrow is aware that some farm insurers may be denying or altering public liability insurance coverage around third party infrastructure and activities on their properties.

We are currently part of a group of CSG companies, government agencies and agricultural bodies which are contacting insurers to investigate the veracity and extent of the situation and certainly the government is heavily involved in this as well, from a state perspective.

At this stage we don't have a formal position as we're working to understand the impacts and options as we don't have all the answers to what is a relatively new matter that's been raised with us.

We have had some questions previously about liability insurance on Arrow's part – Arrow's general liability policy covers legal liability for personal injury and or property damage to a third party arising from Arrow's business activities including CSG activities on the properties in which Arrow operates.

Note: the following questions were taken on notice or received after the webinar concluded.

12. Have Arrow completed a study on whether the produced water contains naturally occurring radioactive material? If not is one planned?

No direct study has been completed, however, consistent sampling and analysis of radionuclides in produced water has been completed. In more recent times, due to the frequency of non-detections in the analysis the regularity of sampling has been extended.

13. Would you please explain your policy for landholders who have an existing CCA policy that cannot now obtain farm public liability insurance from their existing insurer, due to CSG activities? Will you increase your compensation to cover additional landholder costs? What about provision for future unknown increases in landholder costs?

Arrow is part of a group of CSG companies, government agencies and agricultural bodies which is contacting insurers to investigate the veracity and extent of the situation. We are working to understand the impacts and the options.

Arrow's general liability policy covers our legal liability for personal injury and/or property damage to a third party, arising from the business activities, including CSG activities on a farmer's land.

14. Will be there jobs hired locally?

Yes, we are actively looking to develop local and indigenous businesses. Across the life of the project around 1000 jobs will result comprising some 800 construction roles and 200 ongoing operational roles.

15. Are Arrow planning to drill in the Linc Energy Exclusion Zone? How can this be done safely without mobilising more contamination?

The PL253 petroleum lease (nearby the site), granted in February 2019, permits Arrow to commercialise gas from six existing pilot wells. It does not permit any further coal seam gas wells. The former Linc Energy site (Lot 40 DY85) is excluded from PL253.

Arrow is undertaking sampling of water from eight groundwater monitoring bores at three sites in PL253 to better understand groundwater levels and water quality in the area.

The results, together with other data sources, are being used to update and validate Arrow's groundwater model and further understand groundwater movement across the area.

Arrow will use the results of this sampling to amend its Environmental Authority for PL253 to enable further CSG production on the tenure, in the future.