In June 2010, Arrow Energy held a series of community feedback sessions to discuss the Surat Gas Project.

Questions and answers from those sessions were captured by JTA Australia and are presented in this document.

Questions varied across the six sessions. To ensure that valuable information is shared throughout the communities of the Surat Basin, these notes summarise questions and answers asked across all sessions, and are grouped under topics for easy reference. The notes are based on written records and include paraphrasing.

The Surat Gas Project community feedback sessions were held from 15 to 23 June 2010 at:
- Chinchilla 15 June 2010
- Miles 16 June 2010
- Dalby 17 June 2010
- Dalby 21 June 2010
- Cecil Plains 22 June 2010
- Goondiwindi 23 June 2010

While feedback sessions were also held in Wandoan and Millmerran, questions and answers were not captured because no formal presentations were held due to lower attendance numbers.

The Surat Gas Project is Arrow’s largest gas exploration and development program in the Surat Basin. The proposed project involves continued exploration in the Basin to identify the most economic and environmentally acceptable areas for future gas production. The areas covered by the project extend from Wandoan to Dalby and south to Millmerran and Goondiwindi where Arrow holds petroleum tenure and environmental approvals for exploration.

How to read these notes

(1) Topics are listed as:
- general queries
- environmental impact statement (EIS)
- exploration and operations
- land
- environment and water.

Questions listed under the topics were asked at one or more of the community feedback sessions. Where possible, questions relating to a specific issue have been grouped together.

(2) Questions and comments from the audience are in bold type. The unbolded responses are from Arrow’s Surat Gas Project representatives.

(3) In some cases, responses have been summarised. Where one response to a commonly-asked question was more comprehensive at one session than another, the response has been used in the interests of better understanding. In some cases, additional information is included to provide further context or explanation; this information is in brackets within text, or italicised following the answer.
Arrow will hold another round of consultation sessions in November 2010 to update the community on its progress on the various issues raised. Arrow will release further information closer to the time. If you have any further questions or comments about the project or the meeting notes, please contact the project team during working hours on:

**Freecall 1800 038 856**  
**Email:** suratgas@arrowenergy.com.au  
**Post:** Surat Gas Project, Reply Paid 81 Hamilton QLD 4007

**Commonly used acronyms**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>APPEA</td>
<td>Australian Petroleum Production and Exploration Association</td>
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<td>ATP</td>
<td>Authority to Prospect</td>
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<td>CSG</td>
<td>coal seam gas</td>
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<td>DEEDI</td>
<td>Department of Employment, Economic Development and Innovation</td>
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<tr>
<td>DERM</td>
<td>Department of Environment and Resource Management</td>
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<td>EA</td>
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<td>EIS</td>
<td>Environmental Impact Statement</td>
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<td>GAB</td>
<td>Great Artesian Basin</td>
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<td>LNG</td>
<td>liquefied natural gas</td>
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<tr>
<td>MSDS</td>
<td>Material safety data sheets</td>
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<tr>
<td>PL</td>
<td>Petroleum Lease</td>
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<tr>
<td>PSI</td>
<td>Pounds per square inch (unit of pressure)</td>
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<tr>
<td>QGC</td>
<td>Queensland Gas Company</td>
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<tr>
<td>QRC</td>
<td>Queensland Resources Council</td>
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<tr>
<td>QWC</td>
<td>Queensland Water Commission</td>
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<td>RO</td>
<td>Reverse Osmosis</td>
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<td>ToR</td>
<td>Terms of Reference</td>
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**Queensland Government Acts mentioned:**

- Petroleum and Gas (Production and Safety) Act 2004
- Mineral Resources Act 1989
- Water Act 2000
- Water Safety (Reliability and Supply) Act 2008

**Maps**

- Map 1: Exploration priority
- Map 2: Production priority
### Details of community feedback sessions

<table>
<thead>
<tr>
<th>Chinchilla community feedback session</th>
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<td><strong>Goondiwindi community feedback session</strong></td>
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<td><strong>Facilitator:</strong> Louise McCosker</td>
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<td><strong>Presenters:</strong> Al Mueller, Vice President Operating Services</td>
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<td><strong>Other speakers:</strong> Campbell McKerrow</td>
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<td><strong>Company:</strong> Arrow Energy</td>
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SUMMARISED QUESTIONS AND RESPONSES (compiled from all sessions)

**GENERAL**

1. **Do all coal seams have gas? What about open cut mining? Why don’t companies take gas out before mining?**

   Yes, all coal seams have gas. With shallow cut mining, the gas (generally lying in shallow coal seams) has already escaped over time. Underground coal mining requires the removal of the gas (for safety purposes); and gas removal/capture is likely to be encouraged if a carbon tax or emissions trading scheme eventuates.

2. **Is there a mechanical effect on the coal by taking out water and gas?**

   There will be some form of shrinkage but this won’t result in a mechanical impact on the coal. In most cases there will be zero effect at surface level.

   *Additional information: Arrow is investigating the geomechanical properties of the coal seam, including whether the removal of gas results in shrinkage and a corresponding impact at the land surface. Water removed is only a minor part of the whole seam and accounts for about 4% shrinkage; a lot will be absorbed by the above layers.*

3. **What is the depth of the coal seams?**

   The Surat Basin is huge. In the areas where Arrow operates (on the Surat Basin’s eastern edge), gas occurs from around 200m below ground level. The deepest Arrow target is about 600m.

4. **How thick are the coal seams?**

   Within the Walloon Coal Measures, there are about seven different seams of coal within 300m. Each seam is in the order of 10 to 20m thick.

5. **How long does it take for gas to build up in the coal seam again after it has been removed?**

   The supply of gas effectively finishes once it has all been pumped out.

6. **This is a stable region as far as seismic activity goes. What is the effect of an earthquake on CSG infrastructure?**

   Negligible…there are gas wells close to mines around Moura, about 1km from mine blast areas. This gives an indication of how they can withstand ground vibration.

7. **The project development area is a long narrow strip. Did Arrow design it that way?**

   The government issued the petroleum tenures that form the project development area between seven and ten years ago. Arrow didn't pick the shape; however, the petroleum tenures follow the eastern edge of the Surat Basin.

8. **Where do you intend to sell gas? You are talking about putting in a pipeline to Port Curtis?**
We already sell gas locally to power stations. Arrow proposes to construct a pipeline to Curtis Island for liquefied natural gas (LNG) export.

9. **Will the Arrow pipeline be shared with QGC and Origin?**

Each proponent will construct its own pipeline; different pipelines start in different areas. In some areas the pipes run parallel for 200 to 300km, and QGC’s pipeline joins up with us later on.

We talk to the other proponents to ensure that pipelines do not criss-cross each other. The pipelines vary in size. QGC and Origin use 42 inch pipes; and Arrow uses pipes greater than 32 inches but less than 42 inches. A common pipeline would not be big enough.

10. **If you construct a facility, do you only take gas produced by Arrow?**

Arrow intends to undertake an independent project, and currently only takes gas from Arrow’s fields. Other CSG companies have commercial gas contracts with each other.

11. **Do you propose having infrastructure workshops (depots) in communities like this or in the field?**

Arrow does not have any detailed plans yet. We have a depot in Dalby and can perhaps do something in Miles. The central hub is Dalby, but we can have small silos on sites and the Dalby office could be made bigger. Distance could be a problem.

12. **Arrow had three 200 man camps (planned) a few months ago. Is that now on the back burner?**

That proposal related to construction. We are talking about more permanent employment for production operations.

13. **Have the (above mentioned) camps gone on hold because of the takeover of Arrow (by Shell)?**

Yes. Effectively, the requirement, sizing and timing of any camps will be part of the study for the larger integrated LNG project.

*Additional information: Shell and PetroChina officially took over Arrow Energy on 23 August 2010.*

14. **You have relayed your concerns to us on key issues such as groundwater. Are you relaying those same concerns to your shareholders?**

The potential new owners, Shell and PetroChina, are in the Surat Basin for the long term. They know they can only undertake this project if it is sustainable. Arrow regularly goes through assurance reviews that identify project risks. Water and management of salt are recognised as critical issues.

15. **Arrow is in the process of a takeover by Shell. Shell’s reputation in Nigeria is abysmal. As for PetroChina, China’s workplace, health and safety standards are also terrible. If the takeover occurs, will critical standards be maintained?**

Shell does not compromise on standards. Shell and PetroChina are committed to environmentally and socially sustainable operations around the world. Shell has a top ranking in environmental and sustainability standards, and its future lies in its reputation.
16. Shell’s operations in Nigeria do not paint a pretty picture.

Many factors play a part in the environmental situation in Nigeria. It is very complicated; involving sabotage and a very tenuous situation in that country.

17. What happens with the Shell takeover? What guarantee is there that the commitments made thus far will be honoured when the takeover goes through?

The last thing that Arrow, Shell or PetroChina want to create is a huge impact and environmental burden. If the project proves not to be sustainable, development will not proceed.

18. What impact will you have on Cecil Plains? What about construction camps?

Before the Shell and PetroChina takeover proposal, Arrow was developing a mid-scale project for an LNG facility on Fisherman's Landing at Gladstone. That work was focused on Arrow's existing petroleum leases south and west of Dalby.

Under the Fisherman's Landing project, Arrow planned to construct three integrated production facilities which would have had associated construction camps. Our preference was to establish the camps at the work site, to minimise traffic on roads, etc. We need to look at these things again in light of designing a project for Shell's Curtis Island LNG project.

In terms of a longer-term workforce of drilling contractors, our preference is to use locally based companies. We have recently had four drilling rigs operating and we expect to need five or six at the peak of the project.

19. Comment from the audience at Cecil Plains session: earlier in the presentation you made ‘warm and fuzzy’ comments about improved medical facilities and recruiting labour from the local area. That is not as warm and fuzzy as you make out. We have adequate medical facilities already and the agricultural industry in the local area has had a critical supply of labour for the past ten years. You are going to exacerbate the problem.

20. Shouldn’t Arrow consult with communities who don’t want the development to proceed?

Yes, this is what Arrow plans to do and why we are here today.

21. Why can’t you just leave this area alone and go elsewhere?

Arrow makes plans based on the available geology. There is a huge gas resource to be explored underneath the ground.

22. Is there a mining ombudsman? If we disagree with you, can we approach an independent body?

Waanda McCarthy (based at Roma) from the Department of Mines and Energy can provide information. The Queensland Government has set up a new hotline for complaints, and any complaints will be forwarded to us. All our licences are public documents; in future we will provide copies to landholders.

Additional information: the Surat Basin Office (Deputy Mining Registrar) contact details are: (07) 4624 1512, minesCLO@dme.qld.gov.au.

The Queensland Government realises that retaining access to good quality groundwater supplies is vital for agricultural production in many areas. New laws will apply to current and
future coal seam gas (CSG) projects and will require stringent evaluation and management of impacts of water extraction from the process on bores, aquifers and springs. In addition to protecting water resources, strong rules have been issued for all aspects of CSG environmental management to protect soils, vegetation and wildlife. Projects will be required to meet these standards prior to receiving regulatory approval.

More industry-specific information about CSG and liquefied natural gas (LNG) is available from the LNG industry website. For enquiries relating to CSG, please contact the CSG and LNG hotline on 13 25 23. [Source: Department of Environment and Resource Management DERM]

23. What is the timeframe on the helicopter service?

The tender has gone out. We aim to award the contract by October and have the service available shortly thereafter. The main aim of this service is to cater for any emergencies that occur as part of CSG operations. This service will also be available to support remote communities in case of emergencies that require immediate medical care in hospital.

24. Will the helicopter service be like CareFlight?

Yes, certain companies tender for these operations. We are in the bidding selection process at the moment and expect an appointment in the third quarter. The service involves Origin, Santos, QGC and Arrow and it will be operational 365 days per year so the community will benefit.

25. Is there a minimum distance you need to be from a proposed township (Goondiwindi specifically)? And what about future town expansion?

There is no minimum distance. The distances are driven more by the impacts. There is an area near towns where block sizes become too small for activities to be practical. For a production well, we need an area of 60m by 70m. It is hard for us to know which way Goondiwindi will develop. We are having similar conversations with other rural townships where people have large paddocks they may wish to subdivide. For wells, we only need an offset of a few hundred metres but production facilities are different. If we are looking to put facilities in the immediate area, Arrow will buy land at the market value. We wouldn’t seek to put a facility on land that is suitable for subdivision.

Part of the EIS process is to assess the impacts on towns and how far sensitive receptors need to be to establish appropriate placement of wells and facilities.

26. My parents own a one acre rural residential block. They received a letter from Arrow that distressed them greatly.

Arrow will not seek to conduct any development on one acre blocks. Arrow has committed to provide another letter that explains the situation to the people (on the outskirts of Dalby) who received those letters.

Essentially, it is a statutory requirement of the EIS process to provide written notification to people who own property within the EIS area – and this was determined by local government zoning data. While Arrow will not seek to undertake any works on that land, those people need to understand that we will have to send more letters in future because of the statutory requirement.

Additional information: Arrow will try to explain the contents of statutory EIS notices more clearly in future.

27. What is the status of Arrow’s current Environmental Authority (EA) application?
The EA does not detail the scope of activities, but it does place conditions on how Arrow carries out activities. The proposed activities are included in the development plans which are submitted to the Department of Environment and Resource Management (DERM) to help government understand the potential level of impacts.

Additional information: Arrow currently has an application with DERM for the Dalby Expansion Project which proposes 300 wells.

28. How close are you to reaching the limit of your current work program in terms of production well numbers?

If you are asking whether we need an Environmental Impact Statement (EIS) to deliver gas under our existing domestic gas contracts the answer is no. A number of wells have already been drilled and will be brought online as required to expand operations. Our worst-case scenario is about 50 additional production wells before 2013. We say worst-case because some of the wells we have brought on recently have produced more than we thought they would.

29. Has Arrow considered compensating people for their time to consult?

Arrow has made that offer in the past; we want to understand how CSG and agricultural activities might work together. We may pay consulting fees to people prepared to assist us in working through these issues. Some members of the community do not wish to be paid.

30. Comment from the audience at Dalby session 1: the Coordinator-General's office has recognised the fact that community participation, e.g. in social impact planning, involves a lot of time. The department is now charging companies for all those people’s time to attend.

31. Can we obtain copies of the presentation provided at these community meetings?

The presentation will be available on the Arrow Energy website.

32. You talk about consistency. I look around this room and see few of the same faces that represented Arrow at consultation last November. Does Arrow have a large staff turnover?

The Arrow representatives attending today are largely the same group as last November. We have been successful in attracting staff and it is very important for us to retain staff. Arrow does not have high staff turnover.

33. You need a consistent contact person.

We can relate to what you are saying. We want to have a one-stop shop; that is what we are constantly working towards. A low attrition rate is the key to helping us achieve this.

34. Arrow’s current EIS is for waste storage facilities; 51% of the tenement is on intensively farmed agricultural land, and erosion and biological hazards have been marked as not a concern. The Authority to Prospect (ATP) document has very little information in terms of why impacts are not of concern.

Arrow has an EA application for ATP 683 currently with government for its domestic supplies (not an EIS). The residual risk assessment of those areas has been determined with mitigation measures put in place and those risks that are not significant are evaluated on that basis. It is certainly not that we do not care about them.
We recognise that the level of detail supplied for an EA application to government does not provide enough detail to landholders for forward planning but that is not the purpose of this document.

35. If Arrow is committed, shouldn’t the company ask for a moratorium on activities until the project impacts are understood?

Arrow’s development activities in the next few years will be fairly minimal and time will be spent to investigate concerns. Hopefully when we are back for the next round of consultation we will be able to present more answers than we can today.

36. It seems like Arrow is the only company trying to get feedback from the community. Should Arrow be more proactive toward the rest of the industry?

All CSG companies are doing similar studies. We are working with the other CSG companies to understand impacts and make sure we do this right.

37. A number of strategic government planning forums are being held in the region, addressing a broad range of development issues. We can’t say we have seen Arrow represented at any of these forums. We believe it is appropriate for Arrow to become more involved.

We are currently undertaking recruitment to build our community relations and government department. We will then be able to bring more resources to the table and get involved in these forums.

38. I want to see proper science, not you-beaut TV advertisements. You can style things how you want, but I want substance. I want real sustainability, and to see businesses that are honest. If this project is not sustainable, will your chief environmental officer stand up and say that the project should not proceed?

If research suggests that the project is not sustainable, then Shell and PetroChina would not proceed.

39. These projects focus on the extraction of CSG. Is there a natural progression (or commercial evolution) to gasification or other alternatives after the gas is extracted to use the coal for another purpose?

Arrow can’t automatically progress to some other use. We don’t have the technology or legal rights; we would need to have a mining lease for mining or coal gasification. We can’t say definitively that a mining lease won’t be granted over your property but it wouldn’t be an Arrow lease.

40. Does Arrow plan to buy out other companies in the area?

*Note: This question was asked after the presentation had finished, and taken on notice.*

Arrow has no plans in that regard at the present time.

ENVIRONMENTAL IMPACT STATEMENT (EIS)

41. Given the different land characteristics throughout the project area, why hasn’t Arrow considered doing more than one EIS?
Arrow needs to investigate all the impacts in a cumulative manner. The Queensland Government expects the whole project area to be assessed as one.

42. You have spoken about the social and economic benefits to local people. What about the disadvantages? Have you been looking at those?

Arrow is very aware that this is a project with big impacts. Right now, we don't have all the answers. The EIS process has to identify and deal with those impacts. The EIS will discuss all the positive and negative issues associated with Arrow's development.

43. Will the Terms of Reference (ToR) be adjusted to take into account the upscaling of the operations?

The ToR are for the entire project and do not need to change. The scope of studies needs to be expanded, but the ToR identifies issues that must be addressed for the whole of the project area so they will not change.

44. Will you be breaking the EIS down to land use areas? What is Arrow doing to understand the issues associated with working on different soil types?

There is a huge variety of land and soil types across the project area, and EIS work will identify these. Sources being considered are government soils mapping and policy documents (such as good quality agricultural land and the yet-to-be-finalised strategic cropping policy) as well as field surveys. The EIS will take this to a practical level, consider project activities and farming methods, and how to work on different types of land and soils.

45. Does Arrow have knowledge of soil conservation issues, and the effect of these on well site footprints?

We are expanding our knowledge in this area through the EIS process. There are also restrictions on us operating within certain distances from watercourses. Arrow is working on procedures to deal with these issues.

46. All the CSG producers, Origin Energy, Arrow, Santos, QGC, are looking at doing similar projects. What work is being done to look at the impacts of multiple projects? How is Arrow engaging with the other companies to monitor cumulative effects?

Arrow is in a good position because the other major CSG projects have their EIS documents in the public domain. When Santos began, the information on the other projects wasn't available. We will be considering the other CSG projects in the Surat Gas Project EIS assessment of cumulative effects. Also, Arrow is a member of the Australian Petroleum Production and Exploration Association (APPEA) and Queensland Resources Council (QRC). Through those forums we are jointly looking at a range of issues, such as social impact management, cultural heritage and groundwater. There are also common issue forums, and some have focused on how to improve government policy.

47. How many EISs have not received approval from government?

Some have not been approved. Others have been approved, but were so heavily conditioned by government that projects have never gone ahead. Extensive mitigation measures and conditions can be costly to implement and this can result in projects becoming uneconomic.

48. I am concerned by the use of the word 'should' in the EIS document. This sort of language does not make a person confident.
If you are referring to the draft Terms of Reference for the Surat Gas Project, this is a document that is owned by DERM and sets out the scope the EIS needs to look at. The EIS document produced by Arrow will rarely use the word ‘should’.

**EXPLORATION AND OPERATIONS**

49. Does Arrow plan to explore east of the defined project area?

Arrow will only explore or develop where we have tenure; this is certainly not to the immediate east of the project area.

50. A commitment was made that Arrow will not drill north of the Warrego (Highway); however the presentation indicated that the area had already been drilled.

Arrow has not conducted much exploration in the area indicated on the exploration priority map (see map 1). In other areas, including our existing operations around Dalby, Arrow has been exploring for the last ten years and already has considerable information. The areas shown in orange on the production map (see map 2) indicate Arrow’s production priority based on current information.

Additional information: the colour of the exploration and production priority zones was altered after the initial community session at Chinchilla to ensure greater clarity and differentiation of the areas.

51. With regard to your exploration and production maps (in the presentation), why are you drilling in areas when they are not an exploration priority?

We do not need to explore in areas where we have production data or have done exploration work because a lot of data already exists. The development work will initially spread out from the existing area west of Dalby.

52. The maps are quite confusing. Surely you have more detailed maps?

The maps in the presentation are representative only. More detailed maps are available here today and our staff can talk about them to you.

53. Do you know where you seek to develop next (i.e. after the initial proposed development west of Dalby and to the north between Chinchilla and Wandoan)? Can Arrow make a commitment that at the next round of meetings, you will say where you are going next?

We do not have specific plans for the next stage in the Surat Gas Project area. Being open and transparent is our only sustainable way of moving forward and we are very committed to this. Plans are being developed continually; we have shared some already and hope in the next four to five months we can be more concrete with our development plans. We can commit to sharing our plans with you as the information becomes available, but keep in mind that certain plans will change over time for various reasons.

54. Arrow conducted a pilot well program at Dundee. Could you please advise what you have in mind for the Dundee site?

The Dundee area is one of the areas that Arrow has been exploring. At present, Arrow hasn’t received all the appraisal data back from the pilot well program. Without that data, it is not possible to answer all the community’s questions about the site. However, Dundee doesn’t feature in Arrow’s initial development area plans and has been dropped down the priority list.
55. What was the initial proposal for Dundee?

The appraisal work included strat (stratification) drilling, core hole drilling, a pilot of five wells and pumping to produce gas. Land agents have visited the landholder.

Additional information: the existing dam has been decommissioned and will be rehabilitated. The existing pilot wells will be closed. The planned second pilot has been suspended until a more suitable site is located. The planned expansion to the existing dam will not be carried out.

56. A recent newspaper article (Queensland Country Life 23/03/10, p3) shows a high concentration of wells. How close are wells placed to one another?

Well spacing depends on whether it is the exploration or production phase. For the exploration phase, wells are usually spaced kilometres apart. We then typically undertake a pilot well appraisal. Five pilot wells are tightly spaced in a diamond shape. We aim to pump the wells and obtain gas quickly to minimise the impact of the pilot. If we get a good show of gas from the pilot wells, then we seek to develop further. If the gas rate is disappointing, then we may reconsider whether to develop the area.

57. If a pilot is successful, how many more wells would you expect?

It is usually 160 acres per well (about 800m between each well). This varies by property depending on its size and constraints such as sensitive receptors. On average we aim for a grid spacing of 1km by 1km.

58. How many pilot programs are you proposing to put in ATP 683? How long do you expect a pilot to last?

Five pilots (five groups of about five wells each) are proposed for the area. A pilot can run for two years, depending on whether you find things you didn't expect to find. One purpose of the pilot is to rule out whether there are unique characteristics in an area that affect how you design a project.

59. What is the status of the pilot planned in the area east of Cecil Plains?

Arrow has suspended that pilot well program. We need to resolve a number of challenges before doing a pilot in that location. We are looking for a more suitable location, and an alternative site for that dam.

However, Arrow does need to do pilot programs. Exploration works involve understanding (1) if you have coal; (2) if you have gas; (3) whether you can produce that gas. The last stage (the pilot well stage) involves a higher level of impact than the first two stages. For a pilot, we typically drill five wells on tight spacing. We do that so the water in the central well can be pumped off quite quickly and we can get an idea about production rates. We need to do pilot wells in order to gather data to produce our development plans. We will be drilling pilot wells across the exploration area.

60. You are talking about a significant amount of water in that area for a two year program. Why pump so much water? Is there technology available to draw gas without water?

There is currently no technology to extract the gas without pumping water. The water pressure keeps the gas stuck to the faces of the coal. We have to unstick the gas. The technology of production is to reduce the pressure by pumping the water off the coal, and then gas production starts. The amount of water required to be pumped out drops significantly once the pressure is reduced.
61. What is the life expectancy of an average well?

Not every well is the same. The coal lenses (i.e. it thins and thickens) in and out and there are other subsurface features that affect individual well performance. Current modelling suggests an average well will drain gas from the area it services in 15 years. We typically think a well life is in the 12 to 15 year range.

62. What is the lifespan of the project?

Gas sales contracts are likely to be for a period of 25 to 40 years or more. When production from the initial wells declines, new wells are drilled to replace them.

63. Grassdale is pumping now. What is its life expectancy?

The expected production life of wells at Grassdale is of the order of 15 years.

64. Is it possible to congregate the wells on public land and use curves and horizontal drilling to minimise the impact?

We have trialled a horizontal well and it may be a good alternative solution. We are looking into it.

65. What if gas leaks from a well? We have heard horror stories.

Polypipe is buried 750 to 1,200mm and can be farmed over the top. By law, the polypipe must be underground, and steel transmission is used to the wellhead. Arrow aims to reduce the impact on the land by combining gathering lines in some access tracks to wells on boundaries of the property.

66. Will telemetry indicate whether a well is leaking gas, or do you check?

Telemetry lets us know if the well is operating. However, we have a monitoring system to check for leaking gas. We actually use soapy water, which helps detect leaks smaller than those identified by a gas detector. Checking for gas leaks is a standard maintenance activity.

67. What measures are in place to stop the gas from escaping outside the casing?

There is a continuous string of casing. The casing can hold 1500 psi (pounds per square inch) of pressure. It is very strong and cemented with a tube all the way to the surface. The top of the well is normally set with 200m of concrete through which the gas cannot migrate. We recently surveyed 300 production wells and there are no leaks. This work was under the supervision of the safety unit at DEEDI.

When we cement a well, we push the cement into the well under pressure. It needs to be pushed down the full length of the casing until we get returns at the surface through the annular gap between the drilled hole and the casing. We put down 150% of the volume of concrete required to make up for any irregularities because when we drill wells the holes aren’t perfectly cylindrical.

68. I am aware of some work you have done recently regarding gas leaks. Have there been other leaks?

When we recently surveyed all our wells we found very small leaks on some of the seals (not the well itself). Leaks were so small that we could not detect them with a gas detector so we
used soapy water. Checking for gas leaks is a standard maintenance activity. The leaks were all repaired on the spot or shortly afterwards.

69. How do you separate the water and gas in the well? Is there a hazardous area around the well outside the contained well site?

At the moment, wells are designed to separate water and gas down the hole. That captures most of the water coming up with the gas. Then we have an additional separator on the water stream which removes the residual gas. The hazardous area is contained within the secured well compound.

70. How are the aquifers sealed off when you drill wells? How do you ensure wells are isolated from formations other than the coal seam? What are the specifications of the concrete casing, and will you provide us with the specifications?

We want to remove water from the coal seam. We don't want water seeping into the well from above (because it affects gas flow up the well). We use steel casing and cement to ensure water from other formations doesn't enter the well. The cement we use is more like grout.

We cement from the bottom, by first pumping the cement inside the casing and forcing it up to the surface through the annular gap between the drill hole and the casing. To check the integrity, thickness and quality of the seal, we use a special tool. We can provide the cement specification.

71. Can wells collapse? Who monitors how Arrow constructs wells?

The only time a well would collapse is prior to installing the steel casing. As to monitoring construction, there is a requirement to submit a well proposal (including the cementing program) to government. We notify the government (Queensland Mines and Energy) of the well proposal. We then advise them when we complete it. In terms of training drillers, there have been some problems with this in the past; however, a training system has been introduced, with a formal process to attain accreditation. What has happened in the past is not a guide to the future.

72. So the government gets a report from you to say you have complied?

The government has a spot audit approach. Representatives from different government departments have come to inspect different aspects of our activities.

73. What percentage of the wells does the government test?

There is a lot of drilling undertaken. The government doesn't have the resources to monitor and inspect every well. It has to ensure that our equipment and processes meet industry standards. We put well proposals into government and lodge completion reports. There is a physical practicality to how much the government can do.

74. Can you guarantee that the casing stays in place?

We have a process to check the cement for integrity. The average thickness of the cement casing is a few inches, and centralisers are fitted to the casing to hold it in the centre. However, it is important to remember that the casing also acts ‘in height’. From a height perspective, the casing is a couple of hundred metres thick. The technology is very robust. In terms of what can go wrong...not a lot in the same sense as the well in the Gulf of Mexico. If there are any issues with well stability, the well can be shut in.
75. In earlier discussions, cement grouting distances were quoted at ¾ inch either side (of the casing). The suggestion now is two inches. Is there a casing structural standard?

There is no casing standard; the appropriate casing is chosen to fit the coal size. However, wells are designed to the American Petroleum Institute standard.

76. Where are you getting your expertise in concreting? Can you guarantee that none of the wells will leak?

Local companies supply the concrete to the specification that Arrow determines. To get cement into the well, there are a number of products and equipment specifically designed for that process. We can provide further details on that process and the specifications used.

77. You mentioned licensed drillers. Where do you find them and what quality assurance is there on people doing work? What is the licensing process?

The Australian Drilling Industry Training Committee provides training to the industry. In terms of numbers of drillers required, it is possible to break this down. It normally takes a week to drill a well. We may have six or so drilling rigs operating. We already have four rigs operating in the area, so it is not a huge increase in numbers. Arrow does not want its drillers to do a bad job. We have a vested interest in ensuring good quality wells are constructed from a financial, social and environmental point of view.

78. Will you use fraccing?

Arrow has not fracced in the Surat Basin and has no plans to do so for the Surat Gas Project. The permeability of the coal means we don't need to frac. There are areas in the Surat Basin (outside the project area) where the coal is very deep, where we may have to think about fraccing in the long-term future.

Additional information: fraccing is a process that involves pumping water down a well at pressures high enough to fracture the coal in a radius of up to 100m or so around the well. Once the fractures are created, they are held open by sand which is pumped down the well.

The decision to ‘frac’ a well is made before drilling commences as it requires additional considerations in well construction and procedures. The main points of difference are that the well is fully cased from top to bottom, and then the casing is perforated at the specific intervals where the frac is to be conducted. Once the perforation is complete, the fraccing process is conducted. The fracced zones are limited to coal seams, and are designed and controlled so they are limited to coal seams only and do not extend either above or below the coal seam.

Fraccing can only work where there is significant ground pressure so is not conducted at coal seam depths less than about 300m. It is important to note that fraccing is not used in all instances. For example, in Arrow’s Surat Basin fields the production wells currently do not need to be fracced.

79. We were informed that fraccing is used for CSG. When used in the United States, the chemicals were found up to five states away.

Some gas extraction processes do require fraccing. We do import some products for fraccing in the Bowen Basin (where fraccing is being trialled) e.g. mostly vegetable gums and detergents. We do not use the chemicals you may have heard about for shale gas in the US which needs to be fracced to get the gas out. The coal seams we use do not require it.
80. What independent body monitors the chemicals used during fraccing?

Fraccing is not relevant to the Surat Gas Project but in Queensland DERM regulates it.

81. Will Arrow make available material safety data sheets (MSDS) for the chemicals the company uses on properties?

An MSDS sets out the details of a chemical and its correct use, as well as how to respond in an emergency. Yes, we can share that information with you. In terms of chemicals used, the fraccing process uses vegetable gums and detergent, and drilling uses potassium chloride to stop clay swelling but very few chemicals are used in the CSG extraction process.

82. Are there chemicals used in other CSG production processes?

When we drill production wells, we extract coal seam water which may contain other components; however, it is mostly salts that naturally occur in the coal seams. There are few heavy metals. The only other chemicals we use in our operations are in the water treatment facilities, and oil for gas compression.

83. With Arrow not using nasty fraccing chemicals, would Arrow like to support us in calling for a ban on nasty chemicals? Would you provide industry support on that? There are a lot of chemical supply trucks around Dalby these days – they must be going to CSG companies.

The chemicals may be used for a variety of reasons (and industries), not just fraccing. We recognise the issue of particular chemicals in fraccing as a serious concern. We are happy to work to find a way to allay those fears.

84. Is there any way to do fraccing without using so much water?

While we do not plan to frac in the Surat Gas Project area, there is currently no technology to extract gas without pumping water.

85. Arrow pumps the water out for the gas to flow. Is the gas under pressure or does it also need pumping?

Arrow only needs to pump the water out. Because the CSG reservoir is under pressure, once the water is removed the gas flows out on its own accord.

86. How many wells have you sealed up so far? How many have collapsed?

We have 300 wells in production at the moment. The earliest commenced in 2005, and we expect most to run for 15 years. We haven’t had any wells collapse.

87. How can a person get a proposed pipeline easement changed? If a pipeline is proposed to go past a person’s house, how can a landholder get the route moved, for example by a couple of kilometres?

It can be a challenge to move a pipeline a couple of kilometres. Typically, pipelines can be moved by a couple of hundred metres.

It is important to note that Arrow doesn’t seek easements for gathering lines (low pressure high density polyethylene pipes that connect production wells). Gathering lines are addressed through compensation agreements. We do seek easements for export or transmission pipelines (buried high pressure steel pipelines) that take gas from compression facilities to market.
There is more flexibility with the construction of gathering lines. They can be designed to fit around land constraints. Transmission pipelines have less flexibility as they can’t have tight-radius bends; they need to have gradual bends. The key drivers for their placement are safety and cost. In bush country, we generally take pipelines in the straightest possible line. However, in more highly cultivated areas we would seek to go along the edges of roads, vegetation barriers, etc.

**LAND**

88. Is there a way for Arrow to provide landholders with information more quickly?
Uncertainty about the company’s plans makes life very difficult for landholders.

One of the reasons Arrow is here today is to provide more information about the company’s plans. This includes locations where Arrow will be busy and where we will not be exploring or developing for some time.

89. How is it possible for Arrow Energy and QGC to have rights on the same landholder’s property?

The government awards petroleum tenures (Authority to Prospect (ATPs) and Petroleum Leases (PLs)) along latitudes and longitudes, not by property boundaries. In some cases, it is possible for these boundaries to run down the middle of a person’s property, which is why two companies might want to enter the same property.

*Note: A commitment was made by Arrow to follow up with the landholder with a map of the Arrow and QGC tenements.*

90. Have you considered compensation?

Yes, we have to compensate landholders for any impact our operations have on their land, the effect of our facilities, and impact on productivity and land value based on specific land use.

91. How are you arriving at those factors?

We use valuers in regard to the value of cropping activities and we work with landholders to agree on a compensation level. The level is tailored to each landholder. The government is currently putting in place a standardised approach across the industry which we see as positive in providing a base level of guaranteed revenue as compensation.


Future access agreements won’t have confidentiality clauses in them. The government’s new standard form for compensation agreements will help ensure consistency of the legal agreements across the companies operating in the Surat Basin.

Although the confidentiality clause will be removed from the industry standard, this does not mean the amount of compensation will be the same for everyone; rather the clauses in the agreement will be consistent across the industry.

We agree that landholders who cooperate with Arrow early should not get a lesser deal than those less interested in cooperating. We have an example of a landholder in the Bowen Basin who reached agreement with Arrow early. When we subsequently changed our compensation
payment structure, we went back to him and paid compensation according to the new principles because that was fair.

93. You said that the terms and conditions of the agreements will be the same, but the individual compensation will be appropriate?

Yes, there are many different combinations of land valuation that we need to look at, but the terms and conditions and values on impacts would be the same.

94. You can’t just look at compensation for that piece of land. There is dust, livestock etc.

We do not just look at the 10m x 10m piece of land needed for the well site. We look at loss of cropping, lifestyle and so forth. We feed back access conditions from landholders, where trucks travel, public holidays, hours of business and the general ‘hassle factor’. We try to minimise time on the land and work in an agreed way with the landholder. Monitoring wells is a lot less intense. Once the well is drilled, we can reduce impact on the landholder by using telemetry. From our office we can remotely access wells and monitor functioning. Arrow only visits a well to service it or if a difficulty is identified.

95. The project impacts on many people within our community. Will we be compensated for the loss of value of our farms?

If you have a question about your particular circumstances, Arrow's land team is here and can talk to you specifically.

96. It sounds like it is in people’s interests to have an up-to-date property valuation.

Yes, it is certainly important to get current property valuations to have reasonable discussions around compensation.

97. In your compensation agreements, do you consider landholder plans for the future that can no longer be done because of incompatibility with CSG activities?

The further the plans lie in the future, the more difficult it is to determine if the plans will actually reach fruition. When our activities reach production stage, the first question we have to ask is what your plans are for the property. If you have advanced plans, then we have to take these into account. We have to work with you to determine what the appropriate parameters are.

98. How would you compensate the loss of groundwater supply for feedlots?

We will have to address these issues over time. We can supply water to feedlots. We should have a robust groundwater model, and based on that we will have to make a decision on whether or not we will proceed with the project.

99. What monetary provisions has Arrow made? Have you set aside a sum of money in case you have to compensate people under the make good provisions? Will Shell and PetroChina be subject to the same provisions?

Shell and PetroChina are two of the largest companies in the world. They will be responsible and will have to comply with the same government regulations that Arrow does now. We are not aware of a sum of money being set aside, however the solvency of the company depends on managing potential impacts very closely, and not creating a substantial legal liability.

100. Will compensation provisions be joint (between Arrow, Shell and PetroChina) or separate responsibilities to make good?
The company would be Arrow Energy, owned by Shell and PetroChina, and compensation would be the joint responsibility of all parties.

101. There is a lot said about compensating people for CSG activities on properties. You have also said that you may buy land. What about the neighbour who is one property removed, who doesn't share the money but may still be impacted? How far out do you have to go to address impacts?

We have a responsibility to compensate as far as we have an impact, whether there are wells on the property or not (e.g. noise impacts, groundwater make good obligations). Just to clarify, we principally buy properties for the purpose of constructing a facility and to create a buffer zone between facilities and residences.

102. If you are not operating on a person's property which is not located on Arrow's petroleum tenure, yet it is impacted by your activities, such as an impact on the water table and drop in water bores, is the landholder compensated for the impact?

Yes, it is possible that such activities will be included.

103. There is a fundamental difference between the business interests of the agricultural industry and CSG industry. Can you confirm whether you pay compensation for agricultural production losses caused by loss of access to groundwater?

The answer to your question has two parts. We have two statutory responsibilities. One is to compensate for our activities; that is absolute. The second part is if our activities affect your bore. We are responsible for making good on this impact. That does not automatically mean that the solution is to provide financial compensation.

104. We want a guarantee that Arrow won't go to the Land Court if we refuse the company entry to intensively farmed agricultural land.

We will not go to the Land Court of Queensland for our first entry on intensively farmed agricultural land. We will not start the process off in the Land Court. Arrow wants technical rather than legal solutions.

105. I asked the following question at Dalby last week but didn't get a satisfactory answer. If Arrow fails to come to an agreement with a landholder, will you go to the Land Court to obtain access to intensively farmed land?

What I was trying to explain last week was that Arrow currently does not have all the information and answers the company needs in order to satisfy itself of what it needs to do to develop that land (i.e. gas reservoir data and measures to manage surface impacts). Arrow won't be using the Land Court as a way to commence development on intensively farmed agricultural land. If we go to the court, we have to demonstrate that we have negotiated reasonably and in good faith.

CSG operators don't have compulsory acquisition rights. Arrow will seek to enter intensively farmed agricultural land when there is general consensus that we can manage people's concerns. At the moment, there is general consensus that we can't. Arrow has gone to the Land Court before, however that was after a substantial period trying to negotiate. It is worth clarifying that we don't expect to need to access intensively farmed agricultural land till around 2023.

The map in the presentation indicates where we expect to operate between 2013 and 2023 on current information. We expect the green areas to be developed after that. We haven't got that
plan worked out yet. We hope to have more information in six months when we come back for more community consultation.

106. If you choose to access farms, will you be in contact with law enforcement agencies to gain access?

No, Arrow does not intend to force entry onto properties.

107. What do you mean by your commitment ‘you won’t go on intensively farmed agricultural land until you can get it right’?

We mean that we will not seek to work on intensively farmed agricultural land until we can repeatedly and consistently manage the issues that might result from working on that type of land. We are drawing a line on the map until we have established how to deal with those issues and can manage impacts on a broad scale.

108. Are you stating that you won’t be drilling over the alluvium before 2023?

The commitment we have made is that we won’t go on intensively farmed areas until we have satisfactorily addressed concerns.

109. How have you come up with the definition of ‘intensively farmed agricultural land’? Is it an Arrow or government term?

It is Arrow's description. The Strategic Cropping Policy (currently under development by the Queensland Government) will feed into it, but right now we are using our eyes and ears to make that decision. We have not done a formal survey yet to establish a 'line' or definite areas, and the map in our presentation is a representation.

110. What is the point of doing exploration wells on intensively farmed agricultural land if you don't plan to go on the land?

We need to explore to improve information on the permeability of the coal seams. This information will guide Arrow on whether it should develop in the areas or not, and could also provide background on the groundwater regime.

Part of what we are talking about today is ‘how’ we might develop on that land, subject to managing the impacts that people are concerned about. Our challenge over the next couple of years is to figure out how we can develop on that land.

111. What gas exploration will be done on intensively farmed agricultural land? Your map suggests those areas will not be an exploration priority.

There is plenty of exploration area (marked in yellow on map) that comprises scrub or grazing land. Some exploration wells will need to be drilled on intensively farmed agricultural land.

112. You have stated that you do not intend to enter intensively farmed land until issues are properly addressed. I don't think you can address my concern. What will be your response to individual landowners who don't agree with your activities?

The compensation process is voluntary and requires an agreement to proceed. If we found ourselves in the position of having addressed 95% of people’s concerns (for example), then we might seek to commence development. We don’t have the answers yet, and Arrow’s owners are intent on getting answers before we proceed. There will be many more community sessions before we reach the project’s financial investment decision (nominally 2013), and then we will have a number of years of operation before we seek entry to intensively farmed areas.
113. You may find that 95% of people still oppose your activities. Then what will you do?

We have a lot of time, and work to be done, before we are in a position to make that decision.

114. The CSG industry will be significant if developed, and we know that CSG in Queensland is a massive resource. We also know that there are four major companies who propose LNG projects. On the balance of probabilities, not all of them will get up. Arrow has come today and made some small commitments. There has certainly been some progress, yet you have talked around intensively farmed land. However, I put to you as a ‘big picture’ question, why on earth would the communities of Queensland want CSG development to occur on the 1 to 2% of strategic cropping land that we have in the state, when clearly the gas resource is available from other parts of the state? You still want to test drill on intensive cropping land; I say save that money and monitor the Condamine alluvium. You are not being ‘fair dinkum’.

We have made a commitment today not to conduct development activity on intensively farmed land until the community concerns that have come out of the conversations we have had with the community are satisfied. This includes pilot wells. That means we will work out those plans before we propose development on that land. However, literature cannot beat hard evidence; and some testing is required on intensively farmed areas so we can satisfactorily answer those questions.

115. What is the depth of the pipeline (or gathering line)? Seven hundred millimetres under the surface is insufficient for blacksoil.

In grazing country, this depth is often around 750mm. In black soil country, there are a number of reasons to install pipes deeper. Firstly, there is the stability of the earth around the pipe. Secondly, there is the safety of the pipe with loads from farm machinery over the top. Thirdly, the depth has to allow for potential cultivation. All of the requirements are more than 700mm.

116. Comment from the audience at Cecil Plains: it is heartening to see the research so far from Arrow. This is certainly a change from previous experiences. I acknowledge that CSG could potentially be a good industry. There is lots of concern about our black soil country. By world standards, the quality of our black soil is at the very, very top. My gut feeling is that our prime agricultural land should be left completely alone for the production of food and fibre for generations to come.

117. It is fairly obvious that a large percentage of the people here today are concerned about Arrow undertaking activities on black soil (in Cecil Plains area). Is Arrow experiencing the same level of resistance elsewhere in the project area?

Communities that have a similar make-up have the same types of concerns. There are also areas where people see CSG activities as a useful supplement to farm income.

118. I am an owner of an organic farm. Where would you put a well on a farm like that?

That is a good question. We understand it is not easy and may not be possible. That is why we want to see over the next few years whether it is possible or not. We recognise your concern and we are working hard to see if it is possible.

119. There are properties where both CSG producers and coal miners want entry. You indicated CSG wells are spaced about one well for every 160 acres (one well per square kilometre). I had a coal miner come on and drill 12 holes in 250 acres. Why are boundaries through the middle of a block instead of along road easements? What kind of deals do CSG companies make with the mining companies over tenements?
The tenements for CSG and mining are laid down by the Queensland Government. The boundaries are determined by what the government releases; companies don’t have a choice about that or how it relates to the land. This is why coal mining and CSG tenement boundaries cut across the middle of some properties (boundaries relate to latitude and longitude rather than property boundaries).

CSG companies operate under the Petroleum and Gas (Production and Safety) Act 2004 and the coal miners (and coal gasification companies) operate under the Mineral Resources Act 1989. We have to reach a ‘coordination agreement’ with the coal miners/coal gasification companies where we have an overlap – the coordination agreements are generally about safety. As to the number and spacing of wells, the coal companies in the Surat Basin drill shallow drill holes, while our wells are usually drilled much deeper. In the Surat Basin, we are investigating the Walloon Coal Measures.

120. Do I have a right to refuse access to you? I have been told by mining companies since 2000 that I have no rights?

Arrow prefers access by agreement, and new land access arrangements are coming into place. Entry by force is not the way we want to operate. (Arrow’s preference is to develop working relationships with landholders and gain voluntary access agreements which involve fair compensation.)

Mining companies are not required by law to pay compensation for exploration unless asked for by the landholder. However, gas companies have always had, and will continue, to pay compensation for exploration activities.

121. Drilling was carried out in a neighbour’s paddock within 100m of his house. He had no say and they used floodlights.

That’s not how Arrow wants to operate. We will go as far away from a home as possible and we are committed to doing that. Indirectly impacted landholders will also be considered. We will ensure we meet and discuss with neighbours and bring them up to speed as well.

122. How close can you construct wells to people’s residences?

There is a range of criteria that we need to consider. For safety, it can be as close as five metres. However, that is not an acceptable approach. There are also noise and air emission considerations. Around Tipton, that caused a noise complaint because the prevailing winds take noise in the direction of the house. We have fitted lower noise equipment which solved the problem. In that case, the well is about 200m from the house.

123. So you can legally put a well within a few hundred metres of a house?

Legally, yes. However, Arrow has made a commitment that next time we are out here for consultation we will have an absolute answer as to what the minimum distance from residences will be. If a landholder is not supportive of the proposed placement, we would accommodate those concerns.

Additional information: industry has since agreed to a minimum distance of 250m between a residence and a well.

124. A neighbour has three wells and a compressor station near his house.
Noise is associated with generators so we try to position them away from a homestead. Arrow uses hospital grade generators and silencers to produce as little noise as possible. We are very aware of this issue.

125. **Why can’t Arrow stick to council or railway properties instead of coming onto farming land?**

This really depends on what is available. In some areas landholders are quite happy for gas production. The task for us is to understand how we can co-exist with different land uses.

126. **On the map (for ATP 683) which shows where you are going to explore, why did you only show a certain number of houses?**

We are required to use the map and wording preferred by DEEDI. We sent out a broad map but acknowledge that it was difficult for people to understand the location of activities. In future, we will send additional information and more detailed mapping to relevant people.

127. **I have had dealings with Surat Gas Pipeline Pty Ltd, which is a subsidiary of Arrow. I have had discussions with Arrow management about the behaviour of Arrow staff and contractors on my property. I had a case recently where I believe Arrow field staff lied to me about access and vehicles entering my property. I don’t believe what you say.**

If you have had a bad experience, this is not acceptable; we apologise for that. No-one is pretending that mistakes haven’t been made. Arrow is absolutely committed to improving its systems and putting in place rules and regulations to ensure better practice moving forward.

128. **Without evaporation ponds, I am concerned about the amount of infrastructure and pipelines now required. With the beneficial use of coal seam water and CSG activities, there will be a greater network of pipelines in the region. Each pipeline will have an easement. The easement allows your people to travel across the properties without any washdown process. This can lead to weed transfer from one property to another, and within properties. There is an uncontrolled movement of traffic.**

The decision to beneficially use water rather than construct evaporation ponds does potentially introduce more pipelines. However, the only pipelines that will have easements are high-pressure, buried steel gas pipelines. Gathering lines, which are the majority of the lines, are covered under compensation agreements with landholders. Under those agreements, Arrow will agree access requirements with landholders. We do not expect unfettered access and fully expect that we will be doing vehicle washdowns and managing biological agents. This will be built into the formal agreement between Arrow and landholders.

129. **I have a property near Tipton Bridge. How long until drilling occurs here?**

We are happy to discuss individual land questions with detailed maps afterwards. We do not currently plan to drill east of the Condamine River near Tipton before 2033.

130. **Comment from the audience at Cecil Plains: you have already affected 100% of the resale value of properties.**

131. **Why do Arrow tenements and areas have different company numbers?**

Arrow has acquired a number of its petroleum tenures from smaller companies. There is a range of company names out there for this reason.

132. **What is the situation with plugging wells if they are not successful? Can they be converted to water bores?**
If we drill an exploration well and we don’t want to convert it to a monitoring bore, then we will pour cement down the hole, cut off the cap several feet underground, then rehabilitate the land surface. In terms of converting an exploration well to a water bore, this could be done quite easily a few years ago. The government has changed this now. It can still be done but exploration wells have to be re-certified to comply with water bore drilling standards (despite CSG wells having higher construction criteria). Landholders would also need to apply for a water allocation licence.

133. Would Arrow put in the time to help landholders convert unwanted wells to water bores?

Because of the change in legislation, Arrow hasn’t done this to date. If it is doable, we are happy to talk to landholders about it. Importantly, we talk about water matters separately to landholder compensation for CSG activities.

134. I spoke to Blue Energy about converting an exploration well to a water bore and they indicated the well could not be converted because it did not meet the correct design width requirements.

Exploration holes normally have a 4.5 inch diameter, which is industry standard. We understand water bores usually have 6 inch casing? (We would have to confirm that number). Conversion therefore could be a problem. It is a matter that landholders and Arrow would need to discuss upfront; it would be too late once the hole was drilled. If it were a pilot well, safety issues need to be considered such as the flow of gas in the well.

ENVIRONMENT AND WATER

135. How much water per day will be produced from CSG operations?

Wells can vary quite a bit. Water production is greatest at the beginning of the well life, then it tapers off quickly as the water nearest the well is pumped out. Typically there are initially about 1,000 to 1,500 barrels per day before this tapers off quickly to around 300 to 500 barrels per day (one barrel equals approximately 160 litres, so about 160,000 to 240,000 litres per day down to around 48,000 to 80,000 litres per day). Normal production is in the tens of thousands of litres per day.

136. How much water is produced relative to the gas?

In one field, where we are currently selling around 12 terajoules/day of gas, we are producing around two megalitres of water across the whole gas field.

137. How much water does a pilot well program produce?

The amount of water produced is part of the data that we seek to collect from the pilot program. The quantity could initially be in the order of 1,000 barrels per day per well (less than one megalitre per day per pilot), which will taper off quickly.

138. Is CSG around 600m deep (800 to 2,500 feet)?

Yes, it is deep to the west of the project area. On the eastern side, the depth is around 150 to 250m and the western sections are around 650m.

139. What is the shallowest aquifer that Arrow has drilled?
Around 250m.

140. Have you done work to identify the different aquifers and their water quality?

Yes, we have and it will be part of the groundwater assessment study in the EIS.

141. Will the number of wells being drilled in the area make every aquifer the same? Will it cause a mix of the good and bad aquifers?

This is certainly not what we expect to happen. Part of the groundwater management study is to determine the likelihood of this.

142. What about faults? Is there a risk of cross-contamination of the Artesian and the coal seam?

The Surat Basin is generally benign and free of faults compared with the Bowen Basin. However, we take this on board and seek to understand any faults. Part of the EIS is to understand connectivity.

143. Some bores are within the same depth and you will be draining enormous amounts of water from them.

We have information on about 1,900 bores within the area and about 160 wells in the Walloon Coal Measures. These wells have been producing gas since the 1960s. There will be significant impact on those bores, and we will work closely with landholders. Shallower bores should not be significantly affected.

144. Can you personally guarantee that development will not affect drinking water supplies?

We cannot say yes or no until the investigations have been done.

145. How long will it take for the water to move through the different groundwater aquifers? We draw stock water from an aquifer above the coal seam. We want a guarantee that you will not have an impact.

We want to understand the rate of any interconnectivity as soon as we can. Right now, we cannot guarantee there will be no impact, but we take on board your concerns.

146. You are removing significant quantities of groundwater from the coal measures. Will the land sink or collapse when the water is removed?

The coal seams that are being targeted are quite deep. However, we are looking at whether there is potential for subsidence.

Additional information: Arrow is investigating the geomechanical properties of the coal seam, including any shrinking or impacts at the land surface from the removal of gas. The water removed is only a minor part of the whole seam and accounts for about 4% shrinkage; a lot will be absorbed by the overlying layers.

147. Will there be some compensation?

There are make good provisions, and we would have to meet these.
148. I have heard that the make good provisions for groundwater bore impacts don’t include water quality.

The make good provisions will address quantity and quality for existing and future bore users.

149. You talk about the make good obligations, and one of the options is the alternative supply of water. Water entitlements from other aquifers have already reached their limit. What happens if there is no water entitlement to source water from elsewhere? Has Arrow tried to secure water rights from other aquifers in the event they have to make good?

We have not secured water rights elsewhere. We do not have an answer today as to where an alternative water supply could come from. However, we will have that answer by the time we reach the financial investment decision on the project (targeted for 2013). We have started to talk to government about what the alternatives are to the Walloon Coal Measures.

150. How many of the Arrow staff present today live in the local area? Arrow, you need to understand how this works. You are operating in our backyards. I have evaporation ponds over the fence, 300m from my house. I have a coal mine that lies along two boundaries of my property. I want to know how this is going to be fixed after you leave. How can you possibly put the land back to the way it was? There are generations to come; how can you possibly make good? You are already having a significant impact on the lives of people here. These impacts are already happening.

Through our decommissioning process, we have to bring the land back as close as possible to its original state before operations commenced. This is a condition placed on us by government. We hope that the gas industry, run properly, can have less impact than mining. That does not answer the personal and emotional issues that you raise; Arrow genuinely wishes to do what it can to minimise impacts. Others in the audience likely want to express the sentiments you have raised. Thank you for being so forthright and sharing these concerns.

151. I know of an exploration well that Arrow has put down and it has taken you two years to fix, plug and abandon it.

Note: Arrow followed up with the attendee with details of the well in question.

152. I am worried because the make good obligations are going to be impossible for landholders because we will have to prove you are having an impact on our bores. You can say impacts aren’t from CSG and then where will we be?

We don’t think it will work that way. Landholders will need to advise the Queensland Water Commission (QWC) or Arrow if there is a material change to the productivity of their bores. Arrow will need to investigate. A lot of information will be known. This will include results of our modelling (and QWC modelling) that will indicate where groundwater impacts may be occurring or are predicted to occur. As part of this process, we would seek details of landholder bores which they usually keep.

153. While we could debate the timeframe, there may be a major impact on the Condamine alluvium. What if this aquifer is still affected generations down the track – who is responsible?

The company will be responsible. If there is a huge financial liability associated with the project, we wouldn’t make a decision to proceed.

154. What happens if you have impacts on neighbouring bores to those on which you are operating?
Groundwater monitoring programs must extend outside the immediate area in which we are operating. As far as impacts go, each of the CSG proponents is responsible for preparing underground water impact reports.

Modelling by various proponents will contribute to the government’s cumulative groundwater model. The cumulative model will help resolve the issue of multiple companies who may be responsible.

155. There are numerous reports indicating that the Walloon Coal Measures are part of the Great Artesian Basin (GAB). In an earlier conversation, you said that the Walloon Coal Measures were not part of the GAB. We have difficulty believing you are being open and frank. If you have information, then give it to us please.

The Surat Basin is a very large area. Depending upon where you are, the Walloon Coal Measures are not strictly part of the GAB from a geological perspective. We are happy to provide information about the GAB.

*Additional information: while the GAB is comprised of the Eromanga, Surat and Carpentaria Basins, and parts of the Bowen and Galilee (including all geological formations in those basins such as the Walloon Coal Measures), Arrow’s statements are based on defining the main aquifers of the GAB.*

This is also discussed in technical papers published by the Great Artesian Basin Coordinating Committee, found at [http://www.gabcc.org.au/public/content/ViewCategory.aspx?id=41](http://www.gabcc.org.au/public/content/ViewCategory.aspx?id=41). Figure 15 of the GAB Resource Study 1 provides background to the Great Artesian Basin and the key GAB aquifer units. These aquifers are the major sandstone units that are porous and permeable, and hold water, whereas the coal measures are confining beds that store but do not transmit significant amounts of water.

The issue of hydraulic connection between sources of groundwater and the main aquifers is a complex hydrogeological matter, subject to the scientific uncertainties that go with trying to understand these processes in both a temporal and spatial sense. We fully understand the importance of demonstrating a clear understanding of the hydrogeology of the GAB as it relates to our proposed project area, and this will form a key part of our studies, and engagement with relevant and concerned groups such as the Basin Sustainability Alliance, as well as government.

156. You have said you will not go on intensively farmed agricultural land for production but what about entry for exploration activities? Why don’t you address the GAB and aquifer interconnectivity questions before putting down test wells on intensively farmed agricultural land?

There are a number of exploration stages. We may need to undertake a few exploration wells because we need to determine if there is a gas resource present. We also have to gather data to better understand the groundwater and aquifers, such as alluvial thickness, whether the Walloon Coal Measures is part of the Great Artesian Basin in that location, and what is happening geologically beneath the ground. However, we will not undertake any pilot testing on intensively farmed agricultural land until we understand how to undertake activities to minimise impact on this type of land.

157. The Great Artesian Basin has been in decline since the 1880s. What do you think will happen to the sustainability of farmers if we lose all the water?

We don’t know that answer at this time. We need to model, monitor and look for any early signs of impact.
158. Under the Great Artesian Basin Resource Plan, water from the Walloon Coal Measures is not available and the aquifer is considered part of the Great Artesian Basin. We are very unhappy that CSG operations are exempt under the plan. The industry is going to suck water out of the aquifer. The only place for that water is back in the ground where it came from. What work is Arrow doing with reinjection? We will only support the CSG industry if it does not have long-term environmental issues.

Arrow is presently seeking approval to undertake a reinjection trial and is negotiating the conditions for approval with DERM. Arrow would like to see reinjection as part of the solution for managing water. However, there are issues around the timing of reinjection.

Because we have to remove water to depressurise the coal seam and allow gas to flow, we cannot put water back in the Walloon Coal Measures immediately. We would need to consider timing of reinjection and how to store the water in the interim until the aquifer is available. Arrow is also looking at alternative aquifers that we can reinject into permanently. We need to undertake further investigations, and the government is in the process of setting standards.

159. As a farmer in the area, I had to shrink our water entitlement. The government says to assume connectivity. What gives you the right to take large quantities of water without long term research? We are considering generational issues, whereas CSG is a 20 to 30 year industry. Where is the compensation for generations down the track? Many irrigators' bores are already losing water. Why drill more?

As an industry, we don't want to create an impact. We can inform you of the processes that we have in place. We will be undertaking extensive groundwater monitoring of the area. We will be researching interconnectivity, and options for reinjection of water. It is very difficult to do a lot of research without drilling holes to understand the geology.

We are looking in detail at our project and our particular impacts, and we are gathering a variety of information that will be part of the EIS. We have said previously that if significant impacts are shown, we might not develop in some areas. If studies show that the project is not sustainable, then Shell would not develop the area. Shell would not want to create a huge financial burden on the company.

160. How can Arrow, in the space of three years (between now and 2013), determine what will happen in the next twenty years?

We will model the expected behaviour of the aquifers and adapt plans for monitoring accordingly. It is important to ensure we have the appropriate checks and balances in place. We need early detection systems and appropriate response mechanisms.

161. We need a licence to take water as do all allocated water users. How is Arrow able to take water if operating under the same rules as landholders?

The Petroleum and Gas Act gives industry the right to take water 'in the process of extracting CSG', and that authority remains in place. To produce gas, we have to remove water. We don't want the water; it already costs us and we don't want more. We operate under the same rules as landholders in terms of water quality.

162. The Surat Basin is a huge area and the aquifers are all connected. You are already having an impact, so why have more?

The monitoring we are undertaking for our existing gas fields has not shown an impact on other aquifers (besides the Walloon Coal Measures) to date. We are doing more studies and monitoring activities to understand the relationship between the aquifers.
163. Is Arrow saying the company has seen no groundwater impacts since production commenced in 2005?

In terms of the results we have, Arrow's current activities have not had an impact as Arrow has not removed enough water. Independent studies by DERMA are also showing the same thing. Of course, we need to understand what may happen in the future, hence the monitoring.

164. You stated that should significant damage to the groundwater levels occur, you would shut down wells. What does that mean?

It is very early days for us to know precisely. We are still collecting information for our groundwater model, and we are working with other CSG companies to understand the cumulative impacts on a regional scale.

Companies are providing lots of resources to work with government to make sure that information will be available to the public and that appropriate research is conducted. If there is evidence for potentially significant damage, we would stop dewatering. We fully accept that we need to be cautious in how we move forward, and we need to manage that.

165. How are we supposed to know when you are having a significant impact?

The Queensland Government is putting new processes in place. The QWC will have regulatory responsibilities and will prepare a cumulative model of groundwater across the region. Information will be placed on the QWC website and will be accessible to everyone. Arrow will make information available and will be working with various people to make sure they understand what is going on.

166. While good in principle, I have a lack of confidence in the make good provisions for groundwater. The requirement will be to prove the impact is from the CSG industry. Some of the statements in the information you have provided are general and, to me, don’t add up. I would like more information.

The information we have provided today is general by intent because it is a framework being finalised by government and industry. It provides an indication of the ‘rules’ to deal with a case, rather than a specific decision. We haven’t yet been faced with a case study where we have had an impact. People concerned that the company is having an impact on their properties have contacted Arrow; some of those properties lie over 20km from where Arrow operates. The onus of proof won't necessarily lie with the landholder. We will be combining our modelling information with information about how your bores are performing. The process we hope to achieve is to work closely together with landholders to monitor and assess supply before any significant impacts. If anyone claims they have less supply, we will have a standard form (which will be produced by the government) requesting information and advice that we need to investigate the case. DERM and the QWC will be involved. Investigation costs are unlikely to be borne by the landholder.

167. You mentioned that you have groundwater monitoring bores in the area, but you haven’t yet completed an underground water impact report? What impacts are you having in the aquifers above the coal seams (Walloon Coal Measures)?

Current monitoring is not demonstrating an impact to aquifers above or below the coal seam. The impact is restricted to the Walloon Coal Measures.

168. Has Arrow lodged any underground water impact reports as required under the Petroleum and Gas Act?
Arrow has not yet submitted an underground water impact report. We have been working with DERM on this for the last 18 months. The Act states that we must lodge the reports; however, it does not deal with what needs to be included or the process for lodging these reports. The new QWC will have responsibility to regulate reporting in future. We do have information that will feed into the report, and we have to update the government in July as to our progress.

We do report the quantities of water we presently pump to the Department of Employment, Economic Development and Innovation (DEEDI) which they publish. We submit six monthly reports to DEEDI for every well that we have; the reports detail the amount and quality of water we are producing.

169. Did you do any groundwater baseline data collection before you drilled your current wells? Do you know what the groundwater was like before you commenced operations in the area in 2005?

We are going through the process of establishing the baseline now. We have a bore inventory from 2007, and we have historical details from a number of government bores in the area. There is a lot of information out there. We are currently doing more baseline work in areas where we plan to operate and for make good provisions around material impacts on landholders.

170. What does the groundwater assessment study mean? When will it be available and what assurances are there that it is independent?

Coffey Environments is the independent sub-consultant conducting the EIS baseline assessment now. We hope to have that information in the public domain during the first half of next year, as part of the EIS. The release of the EIS will be advertised.

171. Do you believe the trigger levels for groundwater drawdown the government has set are sufficient?

We believe the trigger levels are irrelevant. They act as a warning to trigger closer monitoring and consultation with a landholder. Impact could occur prior to, or after, the trigger being reached, depending on the type of aquifer. The CSG industry, in discussions with government, proposed more specific trigger levels on an aquifer-by-aquifer basis. The government did not wish to take that approach. Trigger levels show the potential for impact and highlight the need to monitor; they do not indicate an impact itself.

172. We commend Arrow on its policy of openness and acknowledgement of past wrongs. Does Arrow commit to publicly revealing water reports?

Yes, we will share well data about our water production. We don't think that is private information.

Arrow is working with industry, government and the QWC for online interaction. One avenue through which the public will have access to information is the QWC. We understand they will place reports online. Arrow does not have its own system in place yet but we are committed to making the information available and will speak to individual landholders if our modelling shows there could be an impact on their bores.

173. What is the quality of the water coming up? How transparent is the water quality monitoring process?

Both water levels and water quality are part of the groundwater monitoring process. Arrow is very open about what is contained in the water. It is predominately carbonates and salt. Arrow has already supplied water samples to DERM for testing and is awaiting results.
The CSG production process is not new technology in many respects, and farmers have been pumping from gas seams for hundreds of years. People may have seen the *60 Minutes* report that showed a water bore producing gas. That water bore was taking water from the Walloon Coal Measures, which is the same aquifer Arrow is targeting for gas; and the quality of the water is the same. Essentially, the water bore had pumped water for long enough that it had started to produce gas.

174. The farmer on that program (*60 Minutes*) was getting more gas than water from his bore. How will Arrow make good?

That farmer’s bore is on Arrow’s petroleum tenure, but it is about 20km from our nearest well. We have visited that bore. It is essentially a gas well; the owner has drilled a water bore into a gas seam. The bore is cased but not cemented. Like normal farm bores, it doesn’t have a wellhead. However, because the farmer has been using it for some time, he has drawn enough water out of the bore to create a gas well. It is exactly the same principle we use. Gas has been coming out of water bores prior to the CSG industry. That bore is about 180m deep, which is the same level as the shallow Walloon Coal Measures.

175. We have concerns about changes in water quality long term. Is the water tested initially and monitored? Are there baseline studies?

Yes, this forms part of the EIS and technical studies are carried out on surface and groundwater quality. With respect to making water test results available to landholders, that can be done.

176. We are pleased to hear that the government supports reinjection trials and the setting of standards. That is a positive step for the industry.

We share your concerns and we would like to see this move forward quickly.

177. How is monitoring of reinjection conducted? Who regulates the monitoring process?

When we apply to undertake reinjection, we provide information about the water quality and the aquifers themselves to the Queensland Government. There will be reporting requirements. The government is still resourcing up so that it can audit and monitor performance.

178. How will the community know if the water being reinjected is contaminated or not?

Generally, untreated coal seam water will be salty but not contaminated. If the water is treated, any salt or contaminants will be removed before reinjection.

179. How can you reinject water if you propose to use the water for irrigation?

There are timing restrictions around reinjection. We can’t inject water back into the coal seam while we are trying to produce gas from it. Across our petroleum tenures, there are aquifers both above and below the Walloon Coal Measures. The government has a preference for us to reinject into the alluvium. We are scoping out what good receiving aquifers might be (other than the Walloon Coal Measures). Reinjection would be an alternative to irrigation for that particular water.

180. You spoke about reinjection, and that coal seam water quality is typically around five thousand to eight thousand parts per million (ppm) of salt per megalitre of water. Where would you reinject the water?
We don’t currently have a target reservoir that could take that quality water. For any aquifer, the water will probably need to be cleaned up through reverse osmosis treatment beforehand. We are working with government and industry to produce guidelines and standards for reinjection. Any aquifer we reinject would need to have poorer quality water than the coal seam water. We need to do more exploration work to find aquifers that might be suitable. We haven’t found one yet.

181. **What is the cost balance between reinjection and irrigation?**

Reinjection of treated water is very expensive (it requires water treatment and high energy intensive costs). Hence, reinjection of untreated water is the preferred option economically. Current government thinking is not to allow reinjection without treatment. As mentioned, there are challenges with the timeframe and storage for reinjection. The same can be said for salt reinjection.

182. **What will Arrow do to make the water suitable for irrigation purposes? I understand that the water quality that comes from reverse osmosis treatment is quite pure and not suitable for water supply, river systems and irrigation?**

Yes, this water is very pure. For the Arrow irrigation project, we have been investigating various soil types and looking at various additives for the water to ensure its sustainable use. We want to do the irrigation trial in order to show how the coal seam water will perform over time.

183. **How long will it be before you can trial coal seam water for irrigation on Arrow land?**

We have submitted our development plans to DEEDI (farm plan, monitoring plan, etc). Hopefully, in three to six months we will have approval to begin the irrigation trial.

184. **The recent conditions of the Santos EIS concluded that treated water could not be used for beneficial use on good quality agricultural land.**

Regarding beneficial use approvals, the government has developed a draft ‘general’ beneficial use approval document during the past 15 months; however, the conditions of the draft keep changing. If a company seeks a general beneficial use approval, it will have to satisfy this set of conditions. That does not prevent any company applying for a specific beneficial use approval; however, the company will need to understand the impacts of the alternative proposed use.

185. **Quite some time ago, the Queensland Government was considering supplying recycled water to irrigators but this did not go ahead. How will the CSG industry be any different?**

Changes to the *Water Act 2000* will be introduced around August 2010. The Queensland Government is also looking to change the approvals around treated water and discharge into waterways in order to make the requirements similar to those for water treatment processes. The regulatory framework around supply of CSG water for beneficial use is still being developed.

186. **Underground water in the Lockyer Valley is exhausted. What is to say that won’t happen here if vast amounts of water are pumped out? Some parts of the state are desperate for water.**

We are required to find beneficial uses for coal seam water. We know water is an issue and work is being done to address this.
187. You have indicated that you will not have surface dams on black soil; this is basically Chinchilla to Dalby on the north of the Warrego Highway and on the north side of the river. If you do not have dams, how will you transport the water?

During the EIS process and over the next three years, Arrow will find answers to water transportation which are acceptable to the community.

188. You have stated that you will not be using evaporation ponds but aren’t these already in use at Grassdale?

In the early days of the CSG industry, we were allowed to use evaporation ponds. There are two evaporation ponds at Tipton (near the Grassdale feedlot), and one at Kogan.

We have converted the Daandine evaporation pond into the new Daandine water treatment scheme. We are currently undertaking an evaluation process to decide what to do with the dams at the Tipton field. A lot of water produced at Tipton goes to beneficial use (Grassdale feedlot) while the remainder currently goes to evaporation.

We have a small reverse osmosis (RO) plant up north in the Tipton field and we are trialling treatment technology and seek to establish an irrigation trial there. By July next year (2011), we must roll out a program of work to convert the remaining evaporation ponds.

189. Do the evaporation dams at Grassdale still have sprinklers?

Sprinklers to enhance evaporation were being trialled at the Grassdale pilot; however, they are no longer being used. There were a number of technical problems such as salt in the mist and they were not considered suitable. Tipton currently has no enhanced evaporation systems and is purely passive solar evaporation.

190. You said that storage dams will be lined but they are still open at the top. Whether something is an 'evaporation pond' or a 'treatment dam' is just semantics.

All dams will experience some degree of evaporation unless covered. Under new government policy, dams can no longer be constructed as evaporation ponds for the primary purpose of disposal. New legislation will mean we cannot sit water in a dam for more than 12 months.

The policy intent is not for nil evaporation, but rather to avoid having evaporation ponds concentrating salt over long periods of time. Arrow will and has used water held in storage dams for beneficial use.

191. Who provides third party quality assurance monitoring of Arrow’s dams?

We presently use an engineering firm from Toowoomba, Stafford Adamson, to audit dam stability. In the past, Arrow has had various firms involved in water monitoring (e.g. AECOM and Golders).

192. What provisions will Arrow put in place to protect brine dams in the event of a major flood?

Our dams need to be designed to withstand flood events. Dams must be third party certified.

193. You mentioned the potential of discharging water in a flood event?

We believe it is very unlikely that we would need to discharge water in a flood event. However, we need to environmentally assess this option for emergency circumstances and address the requirements with the regulator. We are talking about treated water only. For us, emergency
release is a way to balance water should extreme weather make it impossible for us to irrigate and yet for dam integrity we need to release water. We would only release water when the system is already flooding which would further dilute the released water. We also need an additional licence under the Water Safety (Reliability and Supply) Act 2008, and thorough investigation into the environmental impacts on stream water quality and supply.

194. What about structures that might affect overland flow?

We have to take these factors into account for any facilities we build, particularly dams. We have to perform a flood analysis that is incorporated into our planning.

195. Where will the salt end up? Does Arrow have any contracts for this?

As a base case, Arrow is committed to removing the salt to a regulated landfill site for waste that needs to be fully contained. The salt will be pumped off the land and onto trucks for transportation.

Arrow currently does not have agreements with anyone for the salt but we are looking into this. We also don't think that landfill is the only option and we are investigating other options such as crystallisation where there is a ready market.

196. Who will regulate water matters, the state or federal government? The Condamine alluvium is part of the Murray Darling Basin and measures being taken to address salt issues at the other end will be affected by what we do this end.

The state government has to account for any salt inputs to the Murray-Darling system. The state has an obligation to pay compensation to other downstream stakeholders they affect. The federal government does not directly regulate this process, but the Queensland Government does provide water reports to the federal government.

197. Comment from the audience at Dalby session 1: I would like to offer some feedback to Arrow. I attended the November 2009 consultation session in Chinchilla. There was a great deal of concern at the meeting. I felt that the record of the meeting that was sent out later was not representative of the level of angst, scepticism and concern of the community towards Arrow and the project. You tell us that each megalitre of water will produce five to eight million tonnes of salt; that amounts to several million tonnes of salt. You are asking for a hell of a lot of community faith. You tell us you are not going to frac at all within the Surat Gas Project area. That is a good thing; it will help ease some of the community concerns. Arrow has an enormous challenge ahead of it. The company has very low public credibility in the region and Arrow has brought that upon itself.

198. It’s difficult to find proper scientific work done on the basins or, for example, data on existing water tables. Shouldn’t this be understood first? While I acknowledge there are differences between Australia and the USA, Pennsylvania has had many legal problems over oil and CSG operations. Where is the peer-reviewed scientific evidence?

This is a fair comment. We don't have all the answers; however, the Queensland Government and companies are establishing the proper regime. We are seeking to involve people on the land. We can't wait for a major impact. If there is potential for a significant impact, we will alter or cease operations.

199. Look at the situation in the Caribbean with BP. It is a much larger company than Arrow, and it can't cap a well! We need to get the science right before people go mucking about. This is new technology, certainly for this area’s geology and infrastructure. This area depends on underground water and we need serious scientific
evidence. The Queensland Government doesn’t have the runs on the board to deal with a significant environmental disaster.

The project timeline has slowed down dramatically. Arrow will have more time to address these concerns.

200. You are not 100% sure of the impacts. How can you think to do a project that will have a long-term impact on the community in 50 years? You should not go ahead with something as important as this if you do not understand the impacts.

By the end of 2012, we aim to reach a major investment decision point. What happens at that decision point depends on the work we do in the next few years. We have time to understand those things better.

201. We all know that the government sets the rules but doesn’t necessarily ensure solutions. The environmental impacts (from the CSG industry) could be bigger than the Murray-Darling problem. There needs to be more control. Your statement about having Shell as an umbrella doesn’t give comfort.

Shell needs to make sure it gets the upstream business right so it can supply LNG. Shell is a company with a long-term outlook.

202. **Comment from the audience at Cecil Plains session:** We don’t want a lasting impact on water. Take it slowly and work out what will happen to the water. It could take hundreds of years to replenish the water. I would like to raise a point that is attached to this whole debate. Our comments are not a personal attack on Arrow staff. We have a point of difference with the job description that you have. We have a possibly larger issue with your Queensland Government business partner. It is your proposition to extract the gas. The Queensland Government provides you with the framework to do the activities. Our comments need to be equally directed toward the government in Brisbane.