Surat Gas Project
Community information sessions 30 April – 10 May 2012

Introduction

In late April and early May 2012 Arrow Energy (Arrow) held a series of community information sessions to provide an update on the Surat Gas Project, and to communicate the findings of, and the proposed strategies for, the associated Environmental Impact Statement (EIS). Questions and answers from those sessions were captured by JTA Australia and are presented in this document.

The purpose of these meeting notes is to reflect the questions asked and answers provided during the community meetings. While the notes include some paraphrasing and summarising; every effort has been made to preserve the integrity of the discussions.

Questions varied across the seven sessions. To ensure that valuable information is shared amongst the communities of the Surat Basin, these notes contain questions and answers asked across all sessions.

The Surat Gas Project community information sessions were held from 30 April to 10 May 2012 at:

- Millmerran, 30 April
- Cecil Plains, 1 May
- Chinchilla, 2 May
- Dalby, 3 May
- Miles 8 May
- Wandoan, 9 May
- Goondiwindi, 10 May

Copies of the presentations given at the April/May community information sessions are available on the Arrow Energy website at www.arrowenergy.com.au.

How to read these notes

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

Please note any references made to a final investment decision (FID) are based on the premise that Arrow is aiming to present a FID submission to its parent companies by late 2013. This date has not changed. The FID is taken by Arrow’s parent companies, Shell and PetroChina, considering a range of factors.
If you have questions or comments about the project or these meeting notes, please contact the project team during working hours on:

freecall 1800 038 856
email: suratgas@arrowenergy.com.au
post: Surat Gas Project, Reply Paid 81 Hamilton QLD 4007

**Acronyms**

- **ALOS**: Advanced land observing satellite
- **ATP**: Authority to prospect
- **CGPF**: Central gas processing facility
- **CSG**: Coal seam gas
- **CSIRO**: Commonwealth Scientific and Industrial Research Organisation
- **dB**: Decibel
- **DEEDI**: Department of Employment, Economic Development and Innovation
- **DEHP**: Department of Environment and Heritage Protection
- **DERM**: Department of Environment and Resource Management
- **DNR**: Department of Natural Resources
- **EA**: Environmental authority
- **EIS**: Environmental impact statement
- **EMP**: Environmental management plan
- **FID**: Final investment decision
- **GAB**: Great Artesian Basin
- **GJ**: Gigajoules
- **KCB**: Kohn Crippen Bergen Ltd.
- **kPa**: Kilopascals
- **LNG**: Liquefied natural gas
- **NVD**: National vendor declaration
- **PJ**: Petajoules
- **PL**: Petroleum lease
- **psi**: Pounds per square inch
- **QWC**: Queensland Water Commission
- **RO**: Reverse osmosis
- **SAR**: Sodium absorption ratio
- **SCL**: Strategic cropping land
- **TDS**: Total dissolved solids
- **TRC**: Toowoomba Regional Council

**Conversions**

- 1 megalitre (ML) = 1,000,000 litres
- 1 gigalitre (GL) = 1,000,000,000 litres

**Legislation mentioned:**

- Commonwealth Environment Protection Biodiversity Conservation Act 1999
- Environmental Protection Act 1994
- Petroleum and Gas (Production and Safety) Act 2004
- Mineral Resources Act 1989
- Strategic Cropping Land Act 2011
- Water Act 2000
- Water Supply (Safety & Reliability) Act 2008
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**Figure 11 – Risk Matrix diagram for environmental impacts and management measures**

![Risk Matrix diagram](image)
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1. Tony, you showed a slide which had the major facilities on the western side of the project, does that include both the gas compressor stations and the water treatment stations? (see Figure 1 on page 3)

It does. The biggest compression station is at the start of the pipeline because you’ve got to compress that gas a lot to get it into the pipeline to Gladstone. There are a number of other compression stations over the field, so the gas comes from the well and is compressed to a certain level to get it to the start of the pipeline. So yes, it includes the smaller compressor station and the water treatment facilities.

2. The smaller compression stations, the ones in your EIS, they take up about two hectares?

Yes, about half a hectare and we call them field compression stations; essentially the objective of those is to take the gas from well pressure up to medium pressure to take it to a large compression facility where we actually compress it to transmission pressure, and then pop it in the Arrow Surat pipeline to Gladstone.

3. We had concerns that we expressed at a recent meeting about the black soil. Will there be quite a few gravel roads in the black soil? I know you were intending to reduce the number of wells but it’s certainly going to have an impact on farming practices because of GPS tracking, the size of the paddocks and so on.

We’re acutely aware of the sensitivity of those things such as laser levelled fields, flood irrigation etc. We understand the impact that a raised road or use of gravel will have in that area. We’re working to get right how we can access a well but not have impact on what we call intensively farmed land. That’s why we work with the committee (the Arrow Intensively Farmed Land Committee). The guys on that committee are cotton farmers in the main, and we’re working with them to understand how we can put wells in the ground and operate the field but not have a dramatic impact on the other use of that land.

4. Is there a noise problem with the pumping station? Someone said you could hear the noise from 10km away but maybe that was an exaggeration.

Noise is definitely something we consider. If you introduce a new noise into a landscape, you’ll always hear it because it’s not what you’re used to. You’ve got used to the noises around you; even though CSG facilities are not loud, they are different so you do notice them. Noise regulations require we meet certain criteria at certain distances so we avoid sleep disturbance. The distance is around a couple of hundred metres from wells, and
around about a kilometre from processing facilities; that’s the distance where we meet the criteria. This doesn’t mean you won’t hear the noise during the day, it means that it won’t be at such a level that it will disturb your sleep.

(Comment) It probably can’t be worse than the jet planes that fly over at the moment!

5. You say that CSG water will go to replace water that irrigators are already using. At whose cost will that water reach the preferred irrigators, and do the water pipelines come under the same EIS?

That’s what we need to go through with government in figuring out how all that fits together; we’re doing that as part of the investigation of the substitution of allocations scheme. It’s complex; the idea is simple, but implementing it is not. You obviously already have entitlements to take ground water which has value so we have to make sure it works.

Pipelines to return the water would be an additional piece of work for us. That’s why we’re doing the trials, studies and assessments now, to figure it out. We’re investigating whether we want to pump the water back to a central point, or treat it and return it to where it came from; we need to understand the mechanics for that process.

It’s probably important to add that while we don’t talk specifically about pipelines going from the water treatment facilities back to farms for example, the type of impacts we expect are the same as for the pipelines we talk about which take the water from the well there back to the treatment facility. You’d be looking at similar types of impacts and similar types of construction methodologies and rehabilitation.

6. My question is for Tony. In relation to the extraction of water from the underground water table, you stated before that it would have no effect because you’re going to draw water from underground, put it through a reverse osmosis (RO) plant and then deliver it back to an irrigator who would substitute it for water that he would normally take out of the alluvial aquifer. I think you just conveniently forgot that you’re talking about two different aquifers here; you’re going to take the water out of one aquifer, the Walloon. How are you going to protect the existing licence holders who rely on the Alluvium water given you indicated the drawdown might be up to a hundred metres, a huge amount of water out of Walloon?

Good question...I’ll ask St John, our hydro-geologist, to answer it

Those large impact figures are without mitigation offsets so they would only have that impact if we did nothing. That’s obviously not the case as we’ll act to offset those drawdowns.

In the EIS process we assume these impacts are going to happen. If you say we’re going to pull the water pressure down in the Walloon coal measures by a hundred odd metres, obviously landholders are going to have their bores in the top hundred or two hundred metres of that unit. With a pump you would expect to see at the time that the water level will come down, and that bore would go dry. The management measures to try to avoid that, or to deal with that, are an absolute priority. Water being pumped from the CSG wells could be treated and supplied to those people in the interim while the water level is down. Then we look at methods such as substitution or injection, and look at the water balance to see how long that water level will stay down, how long it will take to return, and at what point do we
stop supplying water. We also talked about looking at the field development plan and possible modification perhaps to allow that water level to come back to different areas over time. A raft of management measures such as piping water to people, substituting water, injecting water, are all being looked at to deal with these issues.

7. I can understand that while you’re extracting water and putting it through an RO plant you could possibly redirect some of that water to a user but it seems to me that there’s a huge amount of risk and uncertainty unknown about the future. You guys will be gone in thirty years or so; what happens once you stop extracting water and being able to supply it, and users have wells that are probably dry or at the very best have reduced water quality and capacity?

If you look at a scenario where substitution didn’t bring water levels back, and staging a field development plan didn’t allow recovery to come back at different times, the other option that we’re looking at and trialling is deep injection. If the water is going to take longer to come back, we need to provide a supply of water to the people in the Walloon Coal Measures. One of the options we’re looking at is deep injection down into the Precipice Sandstone and essentially banking water there. Those people will then be given access to it and it would be a case of Arrow providing the bore to that water supply. There is a whole raft of options for management measures there which we’re working through to decide on the final plan.

8. It seems to me that things like deep injections are relatively unproven aren’t they? You don’t know if you can do it so are you going to start de-watering the aquifer before you know if these compensation measures will work. It’s a very high risk strategy.

We are progressing technology trials for injecting into the Precipice. It’s not a new technology, injection and aquifer technologies around injecting water into aquifers and recovering it to balance water supplies have been undertaken for decades in the US. We’ve taken an interest in some of that information for our injection trials.

9. Will you guarantee the users of Walloon Coal Water that their existing bore capacities will continue and that somehow you’ll find a way of substituting or guaranteeing water supply to those people?

I guarantee that we’re going to work our hardest to look at it. There are injection trials and a plan of inter-related technologies and staging before we can say there’s a final guarantee.

10. That’s not a guarantee; you’re just saying you’ll have a look at it and if it works out, well and good.

We are in the process. We haven’t done the technology trials here specifically so I can’t stand in front of you now and give you that guarantee. The statutory requirements are that we must have a make good agreement. The Queensland Water Commission (QWC) will be coming out with an impact report in the next month or so; a direct outcome will be a list of potentially impacted bore owners that companies must have make good agreements with before anything happens. The make good agreements must show we have thought about water capacity issues including proven technologies, which is why we’re looking at injection technologies. However, I understand your point as I can’t stand here now and say that we have the entire concept down pat.
11. You talked about subsidence, has Arrow thought about what make good provisions it would have if long-term monitoring shows that subsidence occurs?

The technology that has been most effective in mitigating subsidence in aquifers has been injection so that would have to be the front-runner. If you’re looking at changes to infrastructure, you’re obviously looking at rehabilitation if that occurs. But having said that, based on the history of the area and the reports of subsidence, looking at the radar interferometry will give us a good handle on how much has happened historically and what we can expect moving forward.

12. We’re looking a long way into the future for some of those effects; you’ll be gone in thirty years, and some of those effects are going to be after that. Unless your measures work out, the make good’s only as good as that.

That’s why we didn’t run a model for several hundred years after the end of the project, because we’re aware that it’s obviously not a project that can be completed if you can’t manage impacts within that timeframe. The best way to deal with impacts is to minimise them as much as possible, hopefully before they happen. When we start looking at substitution, it’s not a case of waiting until 2065 for the Condamine impact and then starting a substitution program. That needs to be started up front to build a buffer against the impact so you can draw down against it.

13. Can you tell me if you’ve done any planning for what’s going to happen to the salt that you settle out in the brine ponds?

One option, [which is not our preferred option] in the EIS is to take the salt to a landfill site. Under this option we’ll solidify it and transport it to a registered landfill. Our preferred option, and the option we are doing most work on at the moment is around how we can beneficially use the salt, and there’s a range of options associated with chemical manufacturing and the like that we’re looking at. We’re talking to the other CSG proponents around whether we can all put our salt together and use it for a beneficial use.

Let me just clarify the landfill and what that means. It’s not encapsulation on our site; it’s a purpose-built solid waste landfill that is independently regulated by the Queensland Government. So we’re talking about taking it off site to a third party landfill that’s regulated. We should repeat though, that landfill is not our preferred option. Instead, putting the salt to beneficial use is our preferred option, and we are working with other parties on this front.

14. You were talking about the shallow monitoring bores in the Condamine Alluvium and I gather that they’re mostly around the irrigation project. Are those bores representative of the Condamine Alluvium areas that are likely to be impacted?

No, those monitoring bores are specifically around the irrigation project to monitor impacts on it. We will need to pick up more monitoring bores in and around the impacted areas.

15. You talk about monitoring the water levels, are you monitoring the water quality in those bores as well?

Yes, the program has both bore level monitoring from open bores and from electronic monitoring devices in cemented bores as well as open bores for water quality data.
16. Are you going to be talking at all about the Queensland Water Commission (QWC) document that’s coming out shortly?

We haven’t seen it yet.

17. Can you give us a bit of a run down on its impact and how it’s going to work? I know you don’t know the outcome yet.

The expectation is that the report will provide its own predictions for the impacts as well as predictions for the heaviest impact if aquifers exceed bore trigger thresholds. It should have contours of the Condamine Alluvium where impacts are greater than two metres and the combined aquifer impacts i.e. areas where impacts are greater than five metres (but without any mitigation in place). From that, the QWC will be expected to provide us with an area where we have responsibility to make good; all the bores within that bore-trigger threshold will become our responsibility. We will need to put make good agreements in place, and we also expect the QWC to advise us on what it sees as an appropriate ground water monitoring system for both water levels and quality.

18. How does it know where you’re going to drill the bores so it can do the modelling?

We gave it our field development plan, like the EIS field development plan. It requested all our data i.e. where we were proposing to have our gas fields, the flow rates for those gas fields, depth of bores, all the data about our model, the data we used in building our model; it can then assimilate our data with the data from the other three proponents.

19. Given that the aquifers we’re dealing with are currently being used, and there are three other major gas producers in the area already, how will Arrow monitor in a way to give us confidence the mitigation methods you’re using are going to be effective?

Arrow is drilling a large number of water monitoring bores for the express purpose of monitoring water levels, both now ahead of production and while the groundwater models are being developed, and in the longer term to check on our predictions and to allow for mitigation in case it is needed. In simple terms we are putting in place a robust monitoring system to provide real evidence of any changes across the entire region. This will allow us to see changes as they occur, and to respond if necessary.

20. No, monitoring the impact you’re having.

A lot of the monitoring program is about water level monitoring data from bores in the Walloons, and electronic monitoring of water levels below. However, we’ll also be looking at the pressure data in our fields so we will be able to use our historical production data to help us predict how aquifers react, how the water flows through them, and then use that as the basis of the picture moving forward. So we use not only water monitoring data but also production monitoring data.

21. So the data given to the QWC was not specific site data where things are being planned because in the previous session you were saying you were unsure of where and when those impacts will be? I’m just trying to distinguish between those two data sets if that’s okay?
Our model is built with grid cells that are 1km by 1km which is currently the highest resolution in our model for 120,000 square kilometres. We might have several bores in one cell and not another so what we did with the model was package up a number of those. We assigned the field development plan to pods of wells so it was an overlapping area where we didn’t have to put in specific, precise co-ordinates. Those 180-190 pods built up through the arc of our tenements to establish the field development plan’s impacts.

That’s also based on what the indicative plan was at the time; obviously as time goes on that will develop and be further refined as well.

22. Has the ground water monitoring got quality in it or is it just quantity?

It’s just water level and water fluxes because we are some way yet from getting water quality. We really need to have our hydraulic model, our water flow model, more refined before we start putting another layer of complexity into it in terms of water quality. Certainly once we get to the point where we can have an aquifer simulator then we can put in the salinity data of the aquifers, and we can start looking at how that might work.

23. What might be the time before you’re at that level...years?

We’re hoping for a model rebuild in the second half of the year so six, twelve, eighteen months perhaps. Modelling is a linear process; it tends to be a bit iterative.

24. I’d like to know what FID is? Because you use acronyms all the time, it might be useful for these presentations not to use as many acronyms.

Sorry, we do try to avoid acronyms. FID is Final Investment Decision, the point at which Arrow makes its final investment decisions on whether it wants to go ahead with the project. It’s the point at which Arrow needs to have a good degree of certainty about the project.

Another is FEED - essentially Front End Engineering Design which is when you are going through the design process. Initially you do a concept design which is essentially getting your thoughts together of what you might want to build. FEED is the next level of design where you go into the design in some level of detail. It’s not the final design from which you do your engineering plans but it’s the next level of conceptual design That’s the process we’ll be heading into later this year with our field development in the Surat; it’s a process we’re just coming to the end of for our LNG plant on Curtis Island.

25. In relation to subsidence, have you got a record of that over in America and other places? I guess it depends a lot on the geology. I know there’s terrible subsidence in an underground mine, it wasn’t supposed to happen. But they eventually ended up buying them a property

Subsidence is a product of geology. I'm not an expert but I have the advantage of experience working on several projects with this issue. The brown coal beds in Gippsland are effectively an unconsolidated geology which is very permeable and soft. The State Electricity Commission has been pumping water out of those aquifers for over 40 years now and they have had quite significant settlement. It’s largely a product of the fact that you have removed the structure from the overlying material.
What’s happened in the Latrobe Valley is different to the long wall effect because it’s been gradual over a long period of time. Most people wouldn’t even know it’s happened, apart from the few farms where the bores have dried up as a result of the de-watering operations. Rivers haven’t turned uphill or anything like that because the whole valley has dropped down. Someone once said to me that it’s like when you put your hand gently on a balloon stretched across a basin and gently push your palm into it, it deforms slightly. Up here the coal is basically a form of rock so it’s self-supporting; it’s not like in Gippsland where it’s compressible. You will only see subsidence in cases such as long wall mining where they actually create a cavity for something to fall into. Here, they’re just taking the water out, they’re not actually changing the supporting structure, so you’re unlikely to see anything like you get in the Latrobe valley or other parts of the world.

While we’re looking at that satellite data for the last few years we can see what has happened historically. Just bear in mind that the amount of water stored in these coal seams is about 2% of their total volume. We’re taking out a really small amount of water, the coal is still intact, and we’re not interfering with it at all. There’s not much of a mechanism for that coal seam to be compressed too far; it will only lose 2% of its current volume.

I’m not sure if you’re familiar with the process of a long wall mine but it’s a device about 200m wide and about three to four metres high which has two large cutting wheels that move up and down the face. It takes out all the coal and behind that long wall miner the roof collapses in; that’s a huge difference where you’re dropping rocks in behind you as you go. In contrast we’re taking a pretty small amount of water.

26. You talk about subsidence. I’d like to know if you apply those same techniques to your existing gas fields, and have you detected any effects?

That’s what the radar interferometry will cover [this technique refers to data acquisition from satellites, which has extremely fine resolution, down to millimetre scale]. There is data from the last ten years which is being collated; we expect to find out the answer to that.

27. In terms of quality, potentially some of your wellheads will be flooded if you have wells down on the floodplain. What procedures are available when the floods come to maintain or access them? What do you do?

That’s already happened to us in the Bowen Basin; the water doesn’t damage the wells at all. We can control them remotely so we can shut the wells down if we need to from the office. What the water does do is prevent us from getting to the well so there is a lack of access. We visit the well to check it every so often, but once we shut it down it’s safe so nothing would happen to the well.

These wells are incredibly robust; they’re over-designed in engineering terms. The pressure ratings on the valves and casings are very durable. We haven’t had any ill effects from flooding in terms of safety; ongoing operations are a problem, but that’s just our problem, no one else’s.

28. Someone said this morning that 70 to 100 monitoring bores are planned this year, but if the Queensland Water Commission (QWC) says we need you to put in 15, are you going to go with the 70 to 100, or the 15?
Our drilling campaigns are planned for 12-18 months in advance, so that would go ahead. What we’d try to do if the QWC nominated fewer (which is hard to imagine as it would probably ask for more), is that we’d rationalise what it wants with our planning. Hopefully it wants something that’s not too far away from our planning so we can come to an agreement.

29. I was wondering what you think about an article that Peter Garth wrote about the nature of vertosols and the concerns that soil scientists have with development on these soils, particularly in terms of the shrinking nature of those soils and the massive forces from it. Is there potential for pipeline rupture if the gas pipeline goes through? So far we’ve seen a lot of CSG water spills, what contingencies do you have for dealing with those scenarios?

The question is how does the gas pipeline infrastructure behave in vertosol or dermosol soils or cracking clays? Cracking clays do heave and shrink throughout the year and can do so quite dramatically. How do you maintain the integrity of gas pipelines when they’re buried in the ground...is that right?

Yes.

It’s an accepted issue as it’s been known about for a long time. What we do typically is bury them deep enough. As farmers who’ve worked on it know, cracking clay can heave a fence post out of the ground. If you get extreme conditions such as drought and then heavy rain you’ll get a lot of movement so if you bury water pipes or gas pipes too close to the surface potentially they will heave out of the ground.

Companies like Arrow generally work out the level they need to go down to in order to reduce the stresses on the infrastructure; however, typically they bury them deeper. Within pipeline risk assessments, Arrow will determine whether there is an unacceptable risk; it can increase the wall diameter of the pipes to withstand any of the stresses that might occur but are not overcome by burying them deeper. It’s common practice to bury them deeper and there are a lot of pipelines built through Gilgai country more extreme than you see here which are based on the principle of burying them deeper.

That was the first part of your question; the second part was spills. I’m not sure if that relates to leaking pipelines, or does it relate to...?

Any spills.

All spills are dealt with in the same way i.e. there has to be a response. As Tony said about the brine and main raw water storage dams, there’s a whole lot of ground water monitoring bores going around those. They look for spills and monitor them; the primary method is to monitor for them. The other is to maintain infrastructure at the surface and with buried pipelines it’s to choose the right materials and pipeline wall thickness to avoid any leaks.

30. On the spills we’ve seen so far, and I’m not saying just Arrow but any of the companies, have not known how to respond to them and remediate. They’re focussed on the heavy metal guidelines but that’s not the issue; the issue is the salinity of the soil after the water spill. I wonder whether you have processes for dealing with a saline spill, more so than any other contamination issue?
I think the first thing we should say on this topic is that the water we bring to surface, water from the coal seams, is not different to the water that has been brought to the surface from many water bores across this region for many decades. That water has been used for stock and other agricultural purposes for many years, so we shouldn't overstate its potential for harm, which has obviously been well and truly tested long before our industry arrived. Secondly, we are bound by very strict regulations which require us to take a variety of actions in the event of a major spill, such as sampling, remediation and so on. We can't afford to have lots of spills, for various reasons, and we spend a lot of time and effort to avoid them in the first place.

It's an issue and will be worked through. So honestly I can't answer that question now, unless someone else can? It's an issue being worked through but the primary mitigation for a lot of that is to design the right process and equipment not to create spills in the first place.

31. That slide you had up before with the grid with all the wells on it, I'd like to see what that property looked like after putting in all your roads and the rest of your infrastructure. (see Figure 2 on page 4)

I might invite Tony to comment on that as access isn't required to all the wells all the time; a lot of them would need only existing access. That's why they were moved to the side of paddocks where you might have your own existing access and the intention as I understand it is not to put in permanent tracks.

(Tony Knight) Yes, as much as possible we'll try to locate the infrastructure using existing tracks and access rather than put new tracks in.

32. What about corridors where pipelines and things go? Can farmers still work over the top of those?

Most definitely, and that was the purpose for showing you that slide. It’s a horticultural farm where they’ve been working over that pipeline for 30 years. The only limitations on working over gas pipelines are driving fence posts into them or excavating over them. When a pipeline is designed to be put in the ground, there's a risk assessment which looks at the land use, and then it’s buried to reflect the land use. If you go up north of Wandoan, up into some of that country still being developed, blade ploughing is used basically to run back over cleared Brigalow. It's basically a big wing keel type thing, like the boat that won the America’s Cup; it's pulled through about a metre and a half down, and rips the root systems of all the regrowth. Blade ploughing and pipelines don't really go together so where that is done the risk assessment was that we should bury the pipeline deeper to below the depth of the blade plough. When the pipelines are designed they're intended to respond to the land use above them, whether it's deepening the trench or strengthening the pipeline. The aim is to maintain the normal range of activities you can do over the top of it, but as I said earlier, neither driving posts into it, nor excavating it.

33. I still think there's going to have to be a certain number of roads on some farms and for small properties I think it's going to be quite an inconvenience to the landowner.

Yes, I don’t disagree with you. There will be a process on each property that works out the road network on the property; can it be utilised; and how can the wells be rationalised to use it. That's the process that has to be worked through. Ultimately that will determine the
significance of impact on the property. Our experience in talking to people throughout this process is that it will vary between properties. I can’t say to you all properties will be least impacted, or most impacted. It will vary between properties.

34. Can I just clarify, Barton, in relation to transmission pipelines you can put them down a long way without a problem? What about the feeder pipelines from the wells to the facilities and things like that? Are you talking about putting them a long way down?

Yes, in terms of the design of the gathering system for both water and gas, you will be looking at variable depths to allow regular cultivation over them. Our requirements under the Petroleum and Gas Act are to design and install gathering lines the same way as for transmission pipelines; we have to go through the same risk assessment and get the same feedback from farmers in terms of their activities as well as any other people who might be working in that area who we might impact upon.

35. I notice you’re going to put monitoring wells around the major facilities; what baseline information will be collected before that in terms of things such as soil quality because potentially the greatest impact is going to be, or could be, around those processing facilities.

I can’t say exactly what information will be collected but Arrow accepts that one of the longer lasting residual impacts of this type of development will be at the integrated processing facilities, simply because you need big pads to build the facilities on and that will involve excavation of some of the soils to get a stable base on which to build the pad.

So this is what we call an engineered pad; it’s usually developed by excavating the top soil and part of the sub soil, bringing in the stabilised clay, or the engineered clay fill, building a pad, putting hard sand on the top and then setting the foundations into that. In some cases it can be more invasive to try to reinstate the soil horizon after 30-40 years and pull all that out than it is to put a light coating of soil back over and put it into grazing use. So the answer is that at this stage we haven’t yet developed that process.

36. My concern around the dams in particular is that there will be an aerosol processor with salty brine water being blown off possibly around the area of these facilities. What baselines are there to judge the impacts of that happening over time? That land can potentially be sterilised into the future and vegetation such as you’ve shown there killed over time so the baseline assessments have to be there to judge the change over time.

At this stage we haven’t done that.

37. Are you thinking of using mains electricity rather than gas turbines at any of these integrated production facilities?

The EIS considers two scenarios for power supply. The base case at the moment is for what we call at site generation, or at site supply. Taking the case of a production well, its power is provided by the gas-powered V8 motor. A production facility has gas fired engines, or gas turbine driven generators. That’s the base case, it’s what all the air, noise and greenhouse modelling has been done on.
There is a scenario Arrow is considering which is partial replacement of on-site generation with grid power. That would involve developing a substation with the integrated processing facilities into which you would bring high voltage supply (about 132,000 or 275,000 volts). From there it would be distributed to the facility itself, to power it and all the compressors, and then out to the central gas processing facilities and possibly the field compression facilities and, depending on proximity to the integrated processing facility, to some of the production wells around there. That is being worked through in the FEED process that's about to get underway, and through what the concept select process which Tony alluded to in his earlier presentation. That's being worked through now as to the appropriate mix and the efficiencies which can be gained from each. However, I think it's fair to say there'll be a mixture of both because when you look at the project development area some sites can be more readily serviced than others.

38. **When you decommission the bore, what's the process of decommissioning? What do you actually do?**

There are two types of bores we drill - exploration and production. Exploration bores only have a short life, a few weeks or a month or so. When we finish drilling and testing samples, we fill them with cement from bottom to top with the rig. It's the same basic process for the production well which has a longer life. At the end of its production life we remove the downhole pump, fill it with cement from bottom to top, and cut off the casing below the ground. We excavate around the casing down to one and a half or two metres, cut off the casing, weld a cap on top, and back fill it. What you end up with is a steel casing full of cement, cut off below ground level then back filled on top.

39. **How do you stop the casing rusting out over so many years?**

The casing is very durable and is not in an oxidising environment. It's below ground and is not exposed to oxygen to cause the rust anyway. It should remain pretty intact down there.

40. **What's the long term potential for the pipelines once the fields are finished with them, and they're no longer sending gas?**

The pipelines will stay in the ground. Do you mean the high pressure transmission ones?

41. **Yes, what will happen with the gas and water collection pipelines?**

There are standard decommissioning procedures with pipelines in terms of cleaning them and there are several options around how to leave them in the ground. It's possible to fill them with an inert substance, completely purge them and then essentially decommission them by cutting off any above ground infrastructure below ground and rehabilitating it. Just leaving the pipelines in the ground is pretty standard practice in the pipeline industry.

42. **Just a little question, for each field compression facility, you've got an area 0.5 of a hectare, what's the actual area that is impacted during construction for each wellhead. The field compression facility is a wellhead, isn't it?**

The wellhead is about a 70 by 80 metre pad. A field compression facility is like a very small compressor station, and it's the 0.5 of a hectare paddock.

43. **So that 0.5 of a hectare includes the construction space?**
Yes. Think of the field compression facility as like a big container here, established on the site. It’s a modularised compressor.

44. **And does that have a little subfloor, something holding water there?**

There’s no water in the compression facilities.

45. **There’s no water...but it goes off through the collection network?**

Yes, the water bypasses the field compression. Field compression is about bringing the gas up to a pressure to transport it a further distance.

46. **Would there be some water produced with the compression?**

There can be a very small amount of water entrained with the gas, or released by condensation. Our major compression facilities have a system to capture and isolate this water. The process is well tried and proven.

47. **In the negotiations with landholders, you talked about existing layouts. Are landholders able to include their future layouts? Do future layouts come into your negotiations e.g. landholders’ five year plan?**

The short answer is yes. If we’re putting in a production well that’s got a life of fifteen or twenty years we have to think over that timeframe. We need to think about how our activity might impact on something in five years.

I’m involved in Arrow’s IFL Committee and obviously one of the issues we talk about is intensively farmed land. We have talked about changing technology, recognising that farming technologies people are using today have changed a lot in the last ten years and are expected to change a lot in the next ten years. We look at how we would manage that with a field development on somebody’s farm, also what people’s future farm plans are and how we could plan to recognise those. So they’re two issues that have been talked about at length in that committee.
1. You’ve been trying to access people about commercial interests meanwhile your own consultant can’t put our houses on a map. How can we trust you, you don’t even go out and ground truth. You are not listening to the community, you come out here and tell us what you think we want to hear. You are not welcome.

It’s a process that takes time.

2. It’s not a process. We’ve had a gutful. This has consumed our lives. You want to protect Lake Broadwater yet you are willing to tear up black soil country. You must be delusional if you can see a gas field east of here.

We’re here today to talk through the environmental impact study process.

3. It’s a flawed process. Have you read your own document? It’s full of misrepresentations that you’ve given to our community. You’ve only given us 30 days to respond to this; we’ve got no time. You can’t even get our houses on the map, it’s ridiculous.

You said you want to respond to questions that are put here but I’ve never received a response from anybody about questions I’ve had with any of these projects; I’ve never had any response from anybody. I put in a question and I have never received anything, only we received a letter saying it has gone ahead or it has been thought about. I’ve never received an answer to a question or a written response and I am sure there are many, many people here who have put in responses to a lot of these projects and have never received an answer to a question.

I can only answer from the interaction I have with Arrow. The questions asked that raise issues around the EIS process come through Arrow to us and then we answer. And as you know, all the questions that are raised in these sessions are recorded.

4. Out of all the projects there have been 50 or 60 submissions against them. Nobody has received any correspondence directly back regarding questions. We all get the shits with generalised questions and answers but in relation to submissions made on these projects to DERM, nobody receives any correspondence directly back with answers to questions that have been posed. That’s what we’re asking for.

I can’t speak for government with regard to a submission to DERM (or DEHP as it is now). If you write to government, it’s out of our hands. Arrow can’t be held accountable for its response or lack of response.
5. **Yes, the government’s responsible supposedly.**

   True.

   In relation to the EIS, the process is that once you’ve made the submission to government, government will provide copies of those submissions to Arrow. Arrow will then take those submissions and it has to do what is called a supplementary report to the EIS. Where we need to respond to those submissions we will do so within that report. You won’t receive a letter back, but you will get access to a copy of the supplementary report which will have responses to all submissions made within the EIS process. I can’t talk about what’s happened in the past, but that’s the process that we are required to go through for the EIS.

6. **Wouldn’t it make sense for you as a company which receives these questions from DERM to then respond to the people who have the problem? Wouldn’t that be sensible in a business sense?**

   In terms of the statutory process that we are in, one of the requirements is for us to respond to submissions in the form of a supplementary report to the EIS. You will be able to see your submission and how it is being dealt with in that supplementary report. If you wanted to contact Arrow and have a discussion about how we’ve dealt with your submissions and the issues that you raise, we’d be happy to have that discussion.

   There are two levels of response. There’s the EIS response which Gerard described. Then there are Arrow’s other contact points and when you make contact with us through those we should respond. There are people here whose job it is to take those queries to the appropriate internal people to provide the requested information. That’s what we’ve done for quite some time. If something’s lost in translation between government and us, we are not getting the question you have asked of us. If you ask us directly, we’ll respond directly.

7. **Barton, you went through the risk assessment process but you’ve a group of people who are unhappy their houses weren’t identified. But that’s just one of the deficiencies I see. How can you run that process when you haven’t identified all the impacts?**

   The other thing, while I’ve got the microphone, is that you make a great play of Arrow’s published commitments. Two comments and a question about public commitments; they are Arrow’s commitments, they suit Arrow’s agenda and, as we’ve all experienced in this community, they change to suit Arrow’s agenda. So unless they are actual conditions they hold no weight. The other thing is that when you read those published commitments they are full of phrases like *if possible* or *where practicable*; there are no definites, they can be changed. That gives us no comfort in the published commitments actually dealing with our issues.

   Okay I will try to work my way through matters. If you can bear with me I can explain the house issue. Yes it’s important we know where the houses are but it’s not important to the impact assessment and I’ll explain why. As I explained in previous sessions we don’t know exactly where the facilities are going to be. What we’ve done as I’ll explain later this afternoon is that we’ve modelled typical facilities under worst case scenarios. The reason for that is to understand the area of impact around those facilities in terms of noise, air, and a whole lot of other issues e.g. traffic. What that then allows us to do is say this is effectively
the zone of impact or the zone of influence of those facilities, wherever they’re put. What we then do with Arrow (and this is a progressive thing because as I said this field is going to be developed over the next twenty years, not tomorrow) is to work through each of the areas and ground truth them. For the Dalby expansion project, we’ve ground truthed all the houses through there because that’s where they are immediately building in the next five to ten years. So we do have an accurate understanding of the houses there and that will grow over time as we move out to other areas. Once we understand where the houses are then the constraints mapping kicks in; it provides advice around the distances separating infrastructure from those houses. It’s through that planning process where Arrow will try to move infrastructure away.

8. Is that a guarantee? Arrow has already made a commitment in this hall that there won’t be any infrastructure east of the river so why don’t you put the houses in now because the EIS covers that area.

The EIS will be out of date in three years’ time because there will be people who have built new houses, there will be new developments on your properties, so the important thing…

9. The decision's already made mate.

I understand what you are saying.

10. The regulator doesn't know that there are people living there.

What I am trying to explain to you is that if I went out tomorrow and spent four weeks ground truthing the whole of the project development area it would not inform you any more tomorrow than what we know today because the potential impact of the facility site would still be the same i.e. Arrow would be designing it, or seeking to design it, to avoid the houses wherever they are.

11. Well it won’t be designed if it doesn’t get approved, that’s what we’re saying. We’re not talking about the facilities we’re talking about the location of well infrastructure. More importantly we’re saying that putting all the houses on the map now would show to this community that the EIS is an accurate document and that you guys know what you are doing. What we have now is a situation where coincidentally you have the single most significant gas reserve in any tenure within the project area, and every house within a ten kilometre radius, or between Watsons Road in the North and Snake Gully Road in the South is missing, right across that resource. We understand that once you go out and start the planning you’ll pick up those homesteads but our concern right now is those houses have been left off after the information about them has already been provided to you by the community; we’ve supplied maps to you with them on. The issue today is that the community continues to have a lack of confidence in Arrow Energy because it can’t identify environmental values; the houses are just one example. If it can’t identify houses on the map, how can we have any confidence Arrow can correctly identify other environmental values?

Let’s not just get bogged down on the house issue. When I read the EIS agricultural report, there are a host of unidentified impacts, so my question is how are you dealing with the significance of the impacts in your risk management matrix if you haven’t identified the impacts in the study to start with?
I understand your comment; can I perhaps ask that we leave that discussion to this afternoon?

12. **No tell us now.**

Well I’ll answer it now, but there’s a lot of context around it. There’s a presentation on agriculture after lunch, so I am happy to talk about it now or we can wait until after lunch when I provide some of the context, it’s up to you?

Graham’s indicated that he’d be happy to wait until after lunch, so perhaps can I just go back to one point about the houses. We estimate it’s probably 80% accurate.

13. **20% mate, that’s all you’ve got on there.**

Well, let’s agree to disagree on that. What that tells you and the way we interpret…

14. **Are we all living in the creek?**

(see Figure 3 on page 5)

What we are trying to interpret is the density of settlement so that has informed a lot of the comments that Tony made earlier about the preference to locate the production facilities to the west and you can see why. If you look at that diagram, you can see why going to the west is preferable to being east of the Condamine with production facilities. We mightn’t have every house on there, but we can see settlement patterns. We do know it’s densely settled when you get east of the Condamine, it’s reflected in the map even though it may not be 100% accurate. The whole purpose of putting up that matrix and talking about what’s above and below the line is that it shows us things that should be addressed. This information was fed into Arrow two years ago and it is informing the planning. You have not seen all of it yet, that’s playing out as Tony said through the processes he detailed, but that’s how the EIS has approached this issue.

15. **What about the published commitments?**

I didn’t intend to make a big thing of that, I guess the point I wanted to make around commitments was that you don’t usually see that level of commitment in an EIS and you can take from that what you will. The thing about making commitments like that is the regulators do take those into consideration in setting the conditions of the project.

16. **Yes that’s what worries us. If the regulator would make them a condition that would be different but history has shown us that the regulator defers to the company.**

I can’t comment on that.

17. **Well we’ve got the evidence, hard evidence, of that; you say you don’t influence government; you’ve got to be joking.**

My question’s along the same line, to a certain degree. Tony spoke about pitless drilling in his presentation. But that is only for exploration wells and it took 18 months to finally do one. Most of Tony’s presentation spoke about *hoping* and *studying*. Now we’re looking at an EIS covering our farms; it did say a lot about studying, looking at, and hoping. But it’s pretty hard for us to understand what’s going to happen on our
farms from this EIS when Arrow’s still studying and hoping and doing desktop studies. I know for a fact that you haven’t been on any of our farms when you did the environmental study so it’s very hard for us to understand why you cannot come onto farms, talk to some of the landholders and do a study on how you are going to mine our farms.

My question to you, Barton, is can you tell me truthfully if Arrow can work on this Strategic Cropping Land country? When you look at the EIS Arrow is looking at it, studying, strategy etc. It says it is going to look at rehabilitating the sites but we haven’t seen any of that yet. In this EIS Arrow says what it is going to do but can’t prove it. There’s very little in this EIS which can actually prove that Arrow knows what it’s doing so that’s the question for you Barton?

Tony, I am afraid your word doesn’t carry a lot of weight with me after the last meeting we had in Dalby so the question was to Barton please.

I want to correct you on the drilling issue. Pitless drilling is a drilling technique, it doesn’t matter if it’s exploration, production, whatever. That technology is applicable to any sort of drilling that we do.

Thanks Tony. The answer to your question is that with most impacts on projects, it comes down to how they are managed. I am not about to stand here and give you guarantees, I can’t do that. What I can say to you is that we recognise we’ve captured about maybe 60% or more of the impacts that we understand will, or might be, realised on your properties but that is not conclusive. Today Stuart pointed out another impact to me that we had overlooked in the EIS. Does that change how we would manage it? Not necessarily. It’s something added that needs to be factored in and I will talk a bit more about that this afternoon. Can Arrow operate on black soil country? Yes, it can operate on black soil country with the right controls. I’ll show you a photo in my presentation this afternoon of this very type of activity on black soil.

18. On half a volleyball court?

No it’s not on half a volleyball court.

19. Are you going to take all your equipment onto that half a volleyball court?

The point I am trying to make is about appropriate management. A lot of people have concerns about what is appropriate management and how it works. If you want to ask my personal opinion from my experience working on a lot of these projects around Australia, the thing that affects the effectiveness of management, the single thing that is most effective in ensuring the outcomes you want delivered, is supervision.

20. 24/7, at $100 an hour?

It’s not a cost to you, it’s a cost on Arrow to ensure that it provides appropriate supervision and Tony’s already alluded to that.

Oh rubbish!
Stuart asked me if it can be managed and I’m saying yes it can. I also am saying that the key factors in how effective it will be are the management and supervision levels.

21. **I’d just like to ask the Arrow people and Barton what experience have you had with the land, agriculture, farming, cattle, livestock in the last five years? Have any of you chaps had that experience?**

   I’ll answer that; I’ll start.

22. **No, hang on, I want everybody to say yes or no. Have you had experience?**

   (Barton) I have.

23. **How much?**

   I was born and bred in the Victorian High Country so although I lived in town I have been living with graziers all my life. I have friends… just bear with me, you asked me a question, let me answer it please. I have friends who are broad acre croppers in Western Victoria. I have worked on EIS processes on everything from intensive farming operations to intensively farmed land in areas that are similar to this, not the same as this, it has its unique characteristics. I've worked with people on those farms; I have worked with agronomists. I don't have an intimate understanding of your exact situation, but I would like to suggest that I understand some of the issues and concerns that you have, so that’s me personally and I will leave it up to the others.

   I think I can probably answer on behalf of people here, we are not…

24. **No, not on behalf, I want…**

   I guess I can answer because we are scientists, we are technical people, and we’re not from a farming background.

25. **Well I’ll put it to you this way, if you’re not off the land, and you don’t know anything about farming or livestock and that we have to produce clean, green livestock. How the hell can you come and talk to us about something you know nothing about?**

   We don’t claim to have that expertise, that’s why we use people that do…

26. **Yes but you’re doing these EISs and telling us what’s good for us but you don’t come out and see what would suit us. You come and do these EISs which I've had a fair bit to do with over the last few years and I have even written submissions.**

   Pitless drilling was not a preferred option for the company 18 months ago…now it is? You’re all saying every company is the same. I haven’t met one yet that can stand up and tell the truth and I've had a lot to do with them. I've had three projects, infrastructure projects of significance, going out through my place and they were all designed without my knowledge. Nobody knew and that includes the people doing the EISs.

   Anyone can write an EIS, all you’ve got to do is know what the answer is and you work back from there. We saw that only the other night on TV when a mining company said that the land was of poor quality. That’s the biggest lot of bullshit you
have ever heard and that's what we get from the people doing these EISs, they don't know what they are talking about. They don't see how we work, and the conditions under which we work. You might know the mining industry but you don’t know agriculture. You’re coming onto our land, we are not going onto yours and it’s about time you fellows realised that. It’s our land, not yours; I don’t have any problem with gas companies because I won’t let the bastards on!

27. You speak about the significance of certain factors that will affect us and you talk about noise. How can you put a factor on something that is already zero? When I go to sleep at night I hear nothing, that’s why I live where I live, I like peace and quiet. How can you change a zero and say something else because it’s zero, it’s nothing. When we all go home tonight and we go to sleep, we hear nothing. It’s why we don’t live in the city. I am not sure where you are all staying tonight but if it’s out here somewhere, you listen to how quiet it is and you’ll realise what I’m talking about.

I know exactly what you are talking about and I will answer it in part now but I’m going to give a presentation on noise after lunch. Yes you will hear things, it will change. The Queensland Government tests are based on World Health Organisation (WHO) Guidelines which are designed to ensure the noise doesn’t result in what we call sleep disturbance. The guideline has been in place for a long time and is based on research and development around the world into what constitutes sleep disturbance and the like. It’s not based on a whim or something that’s plucked out of the air. The government’s noise guidelines are based around ensuring you are not subject to sleep disturbance and it’s based on the WHO’s measure of that.

So yes you will hear things, it will change when you live in a rural environment.

28. Well we don’t want it.

You say the government has set this up. The government all live down in bloody Brisbane, they don’t live out here, same as the mining company. The mine managers don’t live out here where the mines are, they live in Brisbane or somewhere down on the Gold Coast, and you’re trying to tell us what’s good for us. You come out here and tell all us what’s good for our business and you don’t know anything about it. I invite the person who makes the rules on noise levels to come and sleep in my house and realise how quiet it is, that’s why I live where I live.

29. G’day. I work here in Cecil Plains. I have been to quite a few of these meetings. I’ve tried not to sit on the sidelines, I’ve tried to listen and think. There’s one fundamental question I have that I cannot answer and ask you to please answer. If what you propose is so good why are you not doing it on government land commonly known as Crown land?

There’s a simple answer to that...we can only go where the coal basins are i.e. where the gas is. Unfortunately that’s below private property in most cases. There are certain areas of state forests where we might be able to work but that’s only a small portion of the area in the region.

30. Sorry is that the Red Zone you were talking about on the map? Is there no gas there?
(see Figure 3 on page 5)

No, the Red Zone to the west of here is a highly constrained area.

31. What is it?

It’s State Forest and it’s highly constrained because it will require special management measures to work in there. I’ll explain to you later this afternoon that special management measures will be required to operate on strategic cropping land in the same way. It’s no different; the only areas that are excluded, or are no-go areas, are the towns because of Arrow’s commitment not to develop in or near towns and national parks which are protected under specific legislation.

32. With respect to the old pipelines out through the Yuleba State Forest can I ask the same question that gentleman asked you? I think that the government should revisit access to State Forests because the Yuleba Creek State Forest of 200,000 acres west of where I live has been traversed by old pipelines for years and you can see how quickly that area was cleared and how quickly it comes back. They are constantly trying to suppress the seasonal regrowth across there and it’s obvious that when the infrastructure reached its use by date that forest would just sweep over the top of it and then 20 or 30 years later you would never know there had been gas infrastructure there. If there are gas reserves beneath these areas that’s where the focus should be, not on this fragile, highly productive agricultural land. The government needs to relook at it.

In the three to four years I have been working here and, being an old truckie by trade, I know there is more Crown land than people think. If you came via Toowoomba today as soon as you left the Range country you were basically following a disused railway line which is at the heart of everyone’s concern here. Somebody’s grandfather built the line, we have let it go to where it is today. If that area is within the area you are looking at, why aren’t you doing what these people asked for three years ago, a moratorium, and do it on that land?

Yes on a small scale you are right, if there is a rail easement or an area that doesn’t cause as much impact then we should go there.

33. I’ve about three questions but the first one only requires a one syllable answer. With regard to the commitments you’ve made, would Arrow be opposed to having those commitments enshrined as conditions in the environmental authority? Yes or no?

We don’t create the environmental authority. That’s…

34. I know you don’t create the environmental authority but you have input into the conditions on the environmental authority. That is true because when members of the public have an opportunity to write an internal review request they can only do it on conditions that haven’t been agreed to by the proponent and the administering authority.

It’s not a yes or no answer in that the environmental authority can only contain certain things, so it has to operate within the Environmental Protection (EP) Act and there are only certain things within the Act that can be conditioned by way of an environmental authority.
35. So you’d be happy for those commitments to be conditioned by DERM (now called DEHP)?

They wouldn’t be captured by the Environmental Authority because of the regulatory framework.

36. My next question or statement is on what Stuart was talking about and considering information that both Tony and Barton presented. Tony you said pitless drilling trials were underway, your company was looking at doing infrastructure, pipeline and power reticulation trials, and that you were looking at doing, or are doing, a detailed feasibility assessment of substitution of allocations. So you have lots of trials going on or planning to be done.

My statement Barton is that I find there to be a fatal flaw in this project. If Arrow is currently doing trials or planning to do trials to determine if its activities can successfully co-exist with our current land use without impacting on the environmental values we require to use our land successfully, how can you say that you can identify the environmental values, constraint and management measures and the extended operating procedures? You can’t do any of that until these trials have been completed because you don’t know yet whether those trials are going to be successful. Do you understand what I am saying?

I understand exactly but you said ‘won’t impact on the environmental values’ and the very first point I made in this presentation was that all projects have impacts. We are not saying that Arrow’s activities will not impact on environmental values, they will.

37. Then why aren’t you saying that you are going to change our environment forever?

That’s probably just a poor choice of wording on my part then.

38. Everyone in this room is of the opinion that with the thousands of years of collective experience in the room your industry and this company you represent cannot successfully co-exist with our current land use. Getting back to your matrix, you said the low constraint parts of your map were basically industrial land and when you said that I thought probably some industrial site on some crappy country at the end of some town. But you were talking about our part of the world when you said that. I still believe it to be a fundamental flaw and I think it’s probably not so much with the project but it’s with the legislation because unfortunately land use and agricultural productivity are not captured in the EP Act and that’s where we fall through the cracks. My last comment is that I gather you don’t have any land on black soil yet because I am deeply distressed you are using private properties in this area or similar areas to ours to act as guinea pigs for all these trials.

I think that just reflects not everyone perhaps shares your view. There are other opinions out there. That’s why those people are willing to let us trial these things. We’ve said to you before that you know we want to demonstrate that we can work and co-exist on the black soil country and that’s the way to do it. There are people out there who are willing to give us that opportunity to see how we can do it. It’s a different viewpoint and that’s the simple reality of it.
39. Do you have conduct and compensation agreements with those people?
   Yes, that’s a requirement any time we access private property.

40. These property owners, have they signed a conduct and compensation agreement?
   Yes.

41. Does the company that presented at the intensive land committee have a conduct and compensation agreement with you?
   We’re working on that but we haven’t done any trials there yet. We’re telling you in advance what we’re proposing to do.

42. Mate, you presented to an intensive land committee in Dalby last week misrepresenting the company you have a commercial arrangement with. All you are doing is opening it up to be the first blockade in the floodplains, which isn’t fair to the company.
   We have not made any misrepresentation on that topic. We told the committees what we were up to, we showed...

43. Why don’t you show us the report you issued to them.
   I am not sure what report you mean.

44. The presentation you gave.
   All we showed was the proposed location for the...

45. You’re slinking around...
   No we’re not. Many of you know who they are, that’s where it’s proposed to drill two exploration wells.

46. And you have a signed conduct and compensation agreement with them?
   We are getting that in place now but they don’t share the view that we are hearing today.

47. No, because their business is not farming.
   I think FKG Farming Enterprises is farming.

48. It’s not their core business. We are farmers, we make our livings on farms, they do not make their living on farms.
   I think this has to be a discussion where FKG is also present.

50. My question relates to the first presentation. Tony mentioned you weren’t going to pump the CSG-produced water into the ocean. I was curious because I’ve read in the EIS that you were investigating an ocean outpour; that’s contradictory to your statement, can you just clarify that for me please?
Until we get an approval to undertake any of the options we’ve proposed and any options that we’re still looking further into and for which we’re undertaking more technical feasibility studies, we can’t conclusively say we’re doing one option over another. We can certainly list out what our preferences are, but the responsibility that we have in the EIS is to identify all the potential options we might be pursuing. It doesn’t mean that we would do them all but certainly our preference is not to take the water to the ocean.

51. **But you will investigate it as an option?**

It’s still raised as a potential option in the EIS because it’s available to us should we choose to go down that path in the future. At this stage we’re not proposing to do so.

52. **This is just a question to Tony, a general thing about the EIS process. Firstly I just want to ask you a few quick little yes/no questions to see if we agree or we don’t. Do you agree that the EIS is an important document?**

Yes.

53. **Do you also agree that since it covers Wandoan to Goondiwindi the land use over that whole area is very different and diverse?**

Yes.

54. **Reading through the EIS, quite a few things pop up. Some of the maps date back to 1998 which I think is a bit old. There’s a table here where you are using average yields in the Darling Downs region from 1989 to 1996; again very, very old. So if we both agree this is important and the area it covers is very diverse why is the EIS not written per land use, why is it so generalised?**

That’s not actually a question for Tony in that Tony hasn’t been closely involved in the EIS.

55. **He’s the head of the company, he’s here on behalf of the company and he keeps saying…**

If you want to understand the EIS data and the reasons for it being there, you need to talk to the people who have undertaken the EIS and that would be Barton.

56. **Well I am just saying there’s a pretty picture here of a typical agricultural block within the whole area and there’s a fellow sitting on a four wheel drive with cattle and lots of trees around him…that’s not a typical area! So someone is sitting in government thinking that’s what it looks like out there, yes tick it off. You can’t give someone a generalised document and ask them to make an informed decision, it just won’t happen.**

The nature of the EIS is that it’s not there to make an informed decision about a particular land parcel…

57. **No but it’s a general thing that ticks this project off.**

It is a stage in the process, but it’s not an approval for us to undertake the project so we may get an approval for the EIS, we may not. That approval will have conditions attached to it.
58. But isn’t the EIS, all 6,000 pages, isn’t it the primary document DERM will use?

No it’s not. The EIS is a statutory process which requires Arrow to address certain information which is what we’ve done. The next step in the process is a completely separate statutory process which is to get all approvals, including an environmental authority. That’s when the more detailed assessment of location-specific impacts comes into it after the EIS.

59. Wouldn’t you provide all the information to the administering authority for it to set the conditions? If it’s not the EIS…

We’ll cross that bridge when we come to it but we’re working on the information now and are continuing to gather more information around the areas we hope to work in.

60. But isn’t this our last opportunity to make some sort of comment on the information you are giving to the government?

This is your opportunity to input to the EIS, you’ll have further opportunities in the future to input into the project.

61. I have three questions, one to St John and two to Tony. The planet we draw our livelihood from is constantly shifting. With the information you have what would a seismic event do to that information given that three to four weeks ago, South Australia had a 6.1 seismic event up in the north?

So the question was what would a seismic event do to the information?

62. That’s right, as well as what you have under the ground and what we know about water moving between the different water levels.

I could probably talk in general terms about what could happen to ground water during a seismic event. I am not a seismologist or a geologist but I believe what you see in the aquifers are oscillations in water due to the pressure of sea water levels going up and down. I can’t remember off the top of my head if that is going to make a significant change over a long period of time to ground water levels in that area. What we see and know about is compression of aquifers and the changes in water level. Down that way in South Australia there is an alluvial aquifer with some confined aquifers under it; water levels in the confined aquifer can be used as a type of weighing scale for the aquifer above because as it rains a lot into that aquifer above there are pressure increases in the aquifer below, so you can expect those kind of responses I’d imagine for the seismic events as well.

63. Tony I’d just like to thank you for your presentation earlier. Last time I spoke at a meeting like this, I put a suggestion to you about using radial drilling etc. which you seem to have adopted. However, it’s ludicrous to think that going from 800 to 1500m is a huge improvement. My question firstly is that as we have drilling machines in Australia capable of doing 14km or more, what’s to stop you from using two holes 28km apart, then drilling sideways and meeting in the middle and potentially getting your wellheads 14, 28, 30km apart?

That’s ok in off shore drilling where there is massive...

64. This is on shore, Tony, it’s happening in the centre of Australia as we speak.
One issue is that the size of the rigs used for that drilling is different i.e. much, much bigger because of the distances being drilled. The real issue is the geology of coal when you've got separate coal seams and we want to drill through a number of coal seams that are stacked vertically. That's why an inclined well with a sub-vertical component is important. Horizontal wells can be part of the solution but they are not the entire solution. We're definitely looking at horizontal drilling but it's not a simple answer.

65. At an earlier meeting you answered a question about a technical difficulty you had at Dalby with enhanced evaporation, could you enlighten us on the technical difficulty?

I am not sure what that refers to...

66. You were the man who gave the answer at the time.

I honestly don't know what that issue was. I don't work in the Dalby area but we can take that question on notice.

*Arrow does not use "enhanced evaporation", and in any case this technique is not preferred by government. It is not relevant to discussion of our future activities*

*This issue is also addressed in the response to Question 70 below.*

67. Could I suggest that at the time because of the enhanced evaporation you were putting salt into the air and killing conifers within a 20km radius?

I honestly can't answer the question; it’s not my area of knowledge and business. Although I'm not sure what you're referring to, we haven’t been undertaking enhanced evaporation.

68. Yes you were in the early stages in the area where you were. I believe you are not there now because of that technical difficulty, and those are Tony's words verbatim.

So you’re talking about seven, eight years ago?

69. No, I haven’t been coming to meetings that long.

I mean in terms of the experience with evaporation?

70. Whenever it was, yes.

It was well before my time and that of most Arrow people. There were some evaporation trials which used turbo boosters that you've probably seen across the mining industry. As I understand it Arrow did have some spray drift at the time which is why it decided that wouldn’t be the technique to take forward. If that’s what you’re referring to that’s probably the answer you are looking for. It was discontinued many, many years ago.

71. In relation to your water presentation can you show us how you have been monitoring and checking the levels and different inputs from different events and everything else over a period of time? The one thing I consider lacking is its basis. If you base it on the worst case scenario what if something happens that exceeds all possible scenarios you've taken into consideration? What are your fail-safes? Do you close down your drilling, do you stop everything and hope that everything comes good or what? What do you do?
There’s a framework in place where we will be conditioned around our impacts on ground water just as the other opponents have been around other impacts on ground water. That will be based primarily on the work the Queensland Water Commission has done as compared to what we put into our EIS. That is something both the Federal and Queensland Governments will give us conditions around; in the past those conditions have included everything from what the make good arrangements might be and mitigation measures right through until we stop production; we’ll have to comply with those. It will be a very open process in terms of all of the data that’s collected and how it is communicated.

72. **In other words you don’t know?**

The EIS makes it clear there are a number of ways we are looking at to minimise potential impacts or offsetting whatever those impacts may be. We haven’t extended our model out to several hundred years like the other proponents did because we believe that we will be addressing a lot of those issues upfront rather than waiting for them to occur and then resolving them. We’ll know how we are going with that over time as we will be monitoring right through the project; if there are any indications that some things are behaving differently to what we expect, then that’s when we need to take some alternative steps.

73. **Which is what my question was, what are those fail safes?**

They are outlined in the EIS and St John has presented on some of them; there’s a range of options from injection right through to shutting wells in particular areas. It may include other types of arrangements, but we have outlined a lot of those in the EIS.

74. **Shutting down your wells or our wells?**

It would be our wells and perhaps even the wells of other companies, it depends where and how excessive the impact is.

75. **And how long do you think it will actually be before you realise that something is going to happen or will you wait until the event?**

Arrow has in place an early detection regime for that purpose which has been put in place by government to ensure that not too much time elapses before we know about it.

76. **Define early detection for something you haven’t anticipated, something that is beyond the worst possible scenario because you really don’t know.**

I guess it depends on the rate of change of movements. If we’re looking at an aquifer’s pressure signal we will have made a prediction for it with the idea that these processes take decades to occur. If we see a small movement away from the prediction, then that’s when we need to go back and look at our models and recalibrate them or see why they’re not working. Perhaps we can also then start looking at the performance of substitution and injection, wells might need to be shut in, maybe even some specific drilling in that area if there’s something that’s operating in a way other than as we predicted it.

77. **So basically you’ve got your models right? I realise there’s not a whole lot else you can do, but it still doesn’t answer the fact that if something you haven’t modelled comes along you won’t necessarily be able to pick it up quickly and be able to stop it.**
I guess you are talking short term events that happen really quickly? Seismic?

78. **Not necessarily seismic, but something like that.**

In terms of groundwater flow modelling, we see the outcome by pumping from lots of different wells placed throughout the system. One of the things we’re doing in the current iteration of the model is reducing Arrow’s grid size in the Condamine; the original model was a one kilometre grid size and we have reduced that down to a 250m grid size.

As we do that we put in more refined data so it depends partly on how much data there is. There is a lot of data on the Condamine because of work done by CSIRO, DERM and KCB (Klohn Crippen Berger Ltd). With other aquifers like the Kumbarillas there’s less data to populate a finer and finer grid size because they go down further. If something does start happening in an area with a small amount of data, there has to be an investigation to work it out but in areas where there’s a lot of data it’s a case of refining the model.

79. **I saw on one of your presentations that you said the Kumbarilla probably looked set to respond by 2061. Is that based on everything going wrong with your modelling prediction?**

No, not everything recovers to where it does in that model as it is an impact assessment model. It’s drawn out to impact as a project comes on; we took it a couple of decades past the end of the proposed project life to see what the natural effect for recovery of water levels would be if a system is operating with just rainfall recharge and groundwater flow, but without any mitigation measures and management measures. Obviously it is over decades so we did that because we wanted to be able to say to ourselves this is too long, if we want to have a successful project we want to be able to deal with these issues up front.

80. **You mentioned that in your presentation the very well regarded and highly independent and professionally competent Queensland Water Commission (QWC) is going to morph into Jeff Seeney’s gas and land commission. Might I say I have absolute faith in Mary Boydell as she has met very high eligibility criteria which includes no conflicts of interest. From my investigations in this matter, I believe that the CSG Unit which currently operates under the very independent and highly professional QWC is going to be retained within it. I would hope so because Mr Randall Cox has been a very independent leader of that unit and I would hate to see it being compromised by being transferred to Jeff Seeney’s rather dubious land and gas commission. Perhaps you might be able to clarify and ease my concerns in that regard?**

So the first question is if the gas fields and land commission are going to be under QWC or under...

81. **No the inference in your slide was that it would be the GasFields (formerly the Queensland Water) Commission. I would hope you are 100% incorrect in that description?**

What we’re trying to say is our understanding is that it will become part of that commission. It’s a government decision not ours.
82. Well my understanding is that the QWC under Mary Boydell will continue and that the CSG Unit, under the independent water commission, will stay within that independent commission but I may be disappointed to find out otherwise.

As I understand it the GasFields Commission will be a subset. Mr Cotter is here today; perhaps you can approach him to clarify.

83. The specific question I’d like to raise with you is the matter of reinjection trials. They have been on and off over a number of years that I’ve been involved in this debate and it’s obviously on again. But where there’s been significant reinjection in the United States and more recently in the United Kingdom, there’s also been high pressure reinjection of their fraccing fluid, the massive amounts of fraccing fluids that they are trying to get rid of over there. It has caused seismic activity and that’s been agreed to by the numerous government bodies over there. In your EIS are you dealing with the seismic risk that has become apparent overseas?

I understand the EIS addresses injection trials. Injection isn’t the same as a high pressure injection system because it’s a long term, decades-long, injection system; however, the risk assessment will cover issues such as the fracture pressure of the overlying, confining unit, and it will look at that because it will have to calculate the fracturing pressure and make sure it stays 10-20% below that pressure.

84. Tony, you still persist with that (I won’t call it a mistruth, but it’s a sliver of the truth) about the 0.004% impact on the Great Artesian Basin (GAB). That would be true if the CSG impact was over the whole GAB but it’s not. It’s in a very small portion of the Basin and where we sit here in this hall is in an area of it called the Eastern Downs Management Unit. GAB has a legislative resource operations plan and it dictates who can take water and how much. When that plan was formed there was a document called the Hydrological Framework which was put together by a lot of people who understand far more about groundwater than I do. I want to quote to you a couple of portions out of that Hydrological Framework document and it relates to part of the world where we sit currently. It says: ‘the current demand is one of competition and likely developing interference with associated potential supply loss. Against this background development and take will largely come at the expense of progressive storage depletion and head decline. The approval of additional entitlement would clearly impact negatively under these circumstances’.

That was talking about people who had applied for extra entitlement; we’ve a couple of very prominent users quite close to here who were part of that process and they declined that extra entitlement because of this information. In other words the Basin is already over allocated. If we don’t do something about that, we are going to see head depletion and aquifer storage problems. Yet you’re asking us to believe we can come along on top of all this with your CSG take and it’s not going to have any effect, only this small percentage. That’s false and misleading; it may work on stupid politicians, it may work on the unsuspecting public who don’t understand the real issues about groundwater allocations, but for those of us here who have lived with groundwater regulations and lived within the confines of allocations all our lives, it’s deeply disturbing. It’s divisive, and you should stop it because if the CSG industry
was as squeaky clean as you’d like us to believe in this area, you wouldn’t need to resort to those types of tactics. It undermines your credibility.

We hear media claims we’re going to ‘break’ the GAB. I’ve seen that sort of terminology used. My point with that 0.004% is saying that the GAB’s massive. It covers a large portion of Queensland, and if you put in context the CSG area we’re talking about it’s quite small. That’s my point in regard to the whole of the GAB. I think I also said in the presentation that there will be local impacts which are much greater. I am not disagreeing with your point, I am not saying that impacts here are only 0.004%. The work St John has presented shows our impact predictions are different in different aquifers; Carolyn also talked about proposed measures to maintain the integrity and levels of those aquifers. I am not trying to say there is no impact on the aquifers here. I realise that intense development in a smaller area has a big impact; we acknowledge that and it’s what the groundwater model and the mitigation measures and monitoring program are all about. It’s trying to ensure we can put back that water so it doesn’t leave the system; it’s why we like the substitution of allocations scheme, so we can return that water back to where it came from.

85. St John, your statements in the EIS surrounding the makeup of your model is a little concerning and I will quote. It says ‘the model is based on an approximate development sequence including an approximation of the number of production wells likely to be installed, the likely volumes of gas and water to be removed and an estimate of the likely timing of development.’ Then it says ‘this information constitutes Arrow’s conceptual design.’ To my way of thinking, that’s a whole lot of likelys, estimates and approximations. It’s hard to have a whole lot of confidence in the outcome of your model when these are the words used to describe your model.

One other thing before I give up the microphone...in your cross sectional representation of the Condamine Alluvium or of the Basin where the Condamine Alluvium sits, you show the western portion of the alluvium with quite a degree of separation from the Walloon Coal Measures. It could be some hundred metres in the extreme western portion but when you go east from that and when you go east from here on the flood plain, the alluvium is incised into the Walloon Coal Measures. In your EIS, you say that the separating strata is, or may be, absent yet your model seems to show that dewatering the Walloons has a greater impact where we have the most separation and a lesser impact where we have no separation. I can’t work out how that can be.

So the first point about the field development plan is that there are lots of likelys and other such words in it because that field development plan is prepared at a fairly early stage. I will be upfront about the fact that this isn’t final as it is missing the modelling over time. As we hone in on the final project, and relinquish land that is currently in the project area, there will be water we thought we would be taking in our current model that isn’t there at the moment. What we’re seeing, and what we tend to see with models versus projects, is that as you refine them you tend to go from something larger to something smaller so you refine them to get closer and closer to the truth but usually you find that you hone in on it. Maybe it’s not where you think when you come to it, maybe if it’s towards the other end of the spectrum you come up or if it’s lower in the spectrum you move and come down but it’s generally somewhere within your starting parameters. I understand that language could be concerning
in terms of not giving you a lot of certainty with what’s going to happen, but it’s there because it’s the broad estimate before things are refined down.

86. **What you need to understand is that we exist on entitlement from that water source; those sorts of words don’t appear on our allocations. We’ve just had to stump up for new meters; not because we didn’t have them, but because the Department deemed that the old ones weren’t accurate anymore so we had to pay for new meters. There are no likelys, there are no approximations; you’re meddling with our livelihoods when you use those sort of words. It creates a degree of uncertainty and mistrust of what you’re saying by using those types of words.**

All I can say is that as the infrastructure expands and is refined, and the engineering design comes along, we will be refining our predictions. In citing the example of the metering on your bores, it’s a fixed point that is known and established. What we’re saying is that we’re still in the process of refining our plans. We can’t be specific yet to an XYZ coordinate on the ground for everything. We are getting closer to that point but it’s normal practice in scientific circles to be very conservative. You never make a definitive statement because science by its nature, finds it very hard to be definitive for every case. Scientists will always say words like approximately, at best estimate etc.

87. **What is your current prediction?**

The area that we draw down to in the current model for the Condamine prediction is a maximum impact of 6m from a prediction of 2.5m up to 6m.

88. **By squeezing in your area like you just said where you abandon some areas you are not going to pump isn’t that going to put pressure on this area which means your trampoline effect will actually get deeper and harder and last longer by concentrating more in this area?**

No you’ll be pumping less water overall.

89. **Yes but if you’re concentrating your pumping more into this area instead of having it spread further out, you’re concentrating more which makes the trampoline effect even worse does it not for this area?**

Well no, there would be pumping rates in blocks, so there wouldn’t be a huge difference between the pumping rates. It’s not that you are increasing pumping rates here to compensate for a pumping rate you are losing there. You are pumping at a rate that brings the water level down to get the gas off. You don’t have to do it harder here because you are not doing it over there.

The simple answer to this is that you can’t squeeze any more gas out of any one area as there’s only so much in the ground.

90. **Your EIS statement specifically said it’s built on 800 metre stations between pumps but then it says there are infills which could come every 200 metres. Is that your worst case scenario, 200 metre well sites?**

I haven’t read that in there...
91. It’s in your EIS, you should know this stuff, we are farmers and we are expected to know this. You are standing up there, you should know this stuff.

The issue of well spacing comes down to the timing. You can have a few hundred wells over a long period of time extracting gas; the more wells, the more quickly you get the gas.

It relates to the development sequence where you’ve got the shades of red going right across the whole project development area in terms of how it develops. The Arrow advice to us was that it will start to focus in areas which it will develop and then you get infill in blocks, not infill between the wells. Those highlighted areas up around Wandoan and Dalby are the early work and then you’ll see the infill occurring across the whole area, that’s what is meant in the EIS.

The question relates to if you have the Condamine Alluvium sitting here and the impacts are occurring on this western side, not necessarily where that major contact area with the Walloon Coal Measures is. If you look at the structure of the underlying layers in our geological model, this western edge is underweighed by a lot more of the Kumbarilla and Walloon Sandstones so what we think is happening is that pressure is migrating upwards into the sandstones because those are more permeable, it’s actually transmitting them along through that area. This is one of the things you learn when you are doing these kinds of studies; you start with a basic idea of what the situation is, you do your modelling and find out maybe it isn’t, then you need to go and test other areas too. I guess that’s the process we go through to understand more and more about the system.

92. So what you’re saying is that it’s a major source of recharge for the Condamine Alluvium?

It’s probably a source of discharge of the Condamine Alluvium.

93. That doesn’t make sense, you’re telling us a lot of bloody crap. How can we believe you when you say probably or maybe? When we go to the bank manager, we’ve got to be able to say what we definitely are going to do. We don’t say maybe or probably. We’ve got to give him a definitive answer but you’re giving us maybe and probably.

What we’ve done in response to that is we’ve identified it as an area we need to further understand.

94. You don’t know what the outcome is going to be because you are mucking around with our environment. It’s our environment, not yours.

We have planned a study into the connectivity. What we need to do is to understand the geology and better understand how it interacts. We’ve had extensive discussions about…

95. And you’ve got 6,000 thousand pages of bloody crap because you don’t have any bloody facts, because you don’t know.

I’ll take that as a statement. Most people in this room understand the work we are doing to try to improve everybody’s knowledge and it will be of value to everybody; it’s work we want to share with everyone.
If the industry does get up, the legacy we’d like to leave behind is that this will be the best understood groundwater system in the world. There will be a lot of information known about this that we don’t know now. We’ve had a lot of conversations about trying to improve our understanding and the way to do that is to work with people in the area who have the knowledge. We will do some more drilling to understand what the geological structures are and to understand what that interconnectivity looks like. We are very committed to doing that.

96. You are only telling us half the story, the good part. It’s like when you come on the property to drill, you’re going to drill one test bore but that’s only to get on the property. Then you want to go over there and do another one and then over there and do another one. You are doing the same thing here, you are only telling us half the story.

That’s not how we approach our access arrangements.

97. You do, you are all the same.

No it’s not but that’s fine, we’ll move on.

98. I have a quick comment. You’ve heard from a number of people today a number of times and there’s a reason for that. They are very passionate and articulate about what they do. I just want to say that hundreds of us support them in what they do, so I wouldn’t like you to think there are only a few people agitating or asking questions. There are hundreds of people behind these very articulate and passionate people who are agreeing with what they say.

Can I just say that’s a given. These people are here to listen and they understand that.

99. I want to emphasise something said before about the 0.004% of the GAB. Can you tell us what percentage of the Walloon Coal Measures is going to be drawn down by your project or by all proponents in the Surat Basin? That’s a more realistic and meaningful figure, particularly in light of the fact there are people in this room who have allocations from the Walloons as well. I think that’s pretty important to find out.

Tony Burke’s group said a couple of years ago there would be drawdowns in the order of hundreds of metres and that recovery would take hundreds of years. That’s the sort of data that’s more appreciated. It’s like saying Cecil Plains takes up 0000.001% of Australia, that’s meaningless isn’t it?

I think in the slide St John showed there were different aquifers, with different impacts listed against them, so we are not saying that it’s a trigger impact in one aquifer that applies to all.

100. I did take note of that slide and I also noticed that the Walloons were not considered high sensitivity despite the fact they are receiving the immediate impact. The Huttons and the Marburgs were considered high sensitivity but the Walloons and the Condamine Alluvium which was previously mentioned as being one of the top ten aquifers in Australia (I’m assuming in terms of its importance or usage), were only moderate.
I’m assuming you are still contacting landholders for the baseline groundwater stuff to feed into the QWC, is that still happening? Are landholders still being approached for the monitoring system that is supposed to be happening throughout the Surat Basin? This is a suggestion, and obviously the QWC or whatever it is now, would have to be agreeable and you guys would as well. Considering the recent deterioration in the relationship between Arrow Energy and this community over recent weeks and months, and the fact that landholders have been approached over that time to feed into the model, they have been saying no because of the deteriorating relationship.

I was wondering if Arrow would be opposed to the idea of an independent third party coming in and doing that baseline analysis so landholders didn’t have to have Arrow on their properties doing it so it was a mutually beneficial solution to all parties concerned, landholders, you guys as the proponent and the state government?

The reality is we have a huge number of these assessments to do and on most occasions we are engaging third parties to do them for us. We have an obligation to do them so the land access arrangements are Arrow’s arrangements and it would always be present while that’s being done, regardless of whether there is a third party there or not. For those done so far, the landholder has been there and participated so it’s quite an open process. The landholder receives all the information, the third party signs and certifies that everything is accurate and that the right thing has been done. We have complete faith in the people we’re using. Because of the quantity of work, we’ll be using a number of different contractors.

101. The contractors are not the problem but we have heard reports from landholders who have invited companies to come on to do these baseline groundwater assessments and the individuals from the companies have taken the opportunity to rubberneck and look around the property as well. It’s a worry you don’t have confidence in the contractors to allow them on properties without an Arrow representative being present?

We have obligations under the legislation so we have land liaison officers who will accompany them and in most cases we will also have an Arrow technical person. I can’t speak to your comments about the other companies so I’m only talking about how Arrow will do it.

102. Well I was being polite; it was Arrow I was referring to.

I have a concern about the comments on the science, the assumptions, the trials and the case studies, all those things that have been done but there is no definite layout at the moment, is that correct? My concern is that we only get to make a submission on the assumptions; we won’t get to make a submission on the facts when they are established.

I guess it comes back to the answer I gave earlier which was that this isn’t the only opportunity you have for input. Following on from this exercise we have to obtain all our licences and approvals so you will have opportunities then. Arrow also intends to continue engaging and working closely with those people whose properties we will be on to work up the detail, not just coming and surprising people and then going ahead.
103. So what will our opportunities be in the future to make submissions?

Across our project we’ve still got a number of Authorities to Prospect (ATPs). As you know we are just undertaking exploration on a large part of the tenure; we have to go through a specific process if we are going to be able to get a Petroleum Lease (PL) to produce there. Now that’s a long application process with a lot of things feeding into it; one of those will be the Environmental Authority (EA) which will require public notification. The same process you’ve been going through with a couple of other EAs will be available to you.

104. But isn’t the Surat Basin project under a single EA?

It still goes through the same process so even though it will be an amended Environmental Authority it will include new activities of a scale which the government would say requires public consultation.

105. So the results of all the case studies and that sort of stuff will be made public through those environmental management plans and things like that?

Where they’ve been completed and where they are relevant to that particular project, yes. But we have other mechanisms of engagement for communication as well. Even the amendments to the Environmental Authorities may be incremental over time as the project develops; we won’t be doing everything in one area across the project tenure at the same time, it will be incremental over 20 years or so and will be changing.

106. Yes but won’t there be a risk the government will deem the increments are small enough that public submissions are not required?

It’s not about the scale because it will understand what the scale is, it’s about how the authorities are conditioned.

107. You are going to amend the Dalby Expansion Project (DXP) is that right?

Yes. As you know, the conditions don’t actually say what you can and can’t do in terms of a well, but they do say how you can go about it, where you can’t go, what management practices you need to have in place. It’s all of those things that the EA will contain and therefore will apply to wherever we do that activity. The environmental constraints or the values in those areas will change depending on where we go so the EA shouldn’t be too specific in its level of detail, it’s about how to manage it. It’s supposed to be a measurable performance or outcome based condition rather than being overly prescriptive and saying ‘in this paddock you can only do this or this’, it’s just the way the regime works.

108. I came here thinking the EIS is what we have to comment on. Can you tell me exactly what this EIS is for? Basically we’ve come in here thinking we’ve got to read these 7,000 pages, comment on what is a very generalised document. It’s missing a lot of data and contains a lot of old data in it but we still have to comment on it. The whole time we’ve been here today you are saying Arrow is testing, trying, doing new things still. How can we comment when it’s not in this document and down the track we might not be allowed to actually comment? You say we will be, but that’s not 100%.

The EIS is at a point in time. It’s a statutory process and is done at the very early stages of a project. What it does is evaluates the environment we plan to work within if the project does
go ahead. At that point in time there is only a certain amount of information available about how the project will look, the size and scale of what it may be, and over time we will improve on that information. The EIS is really to flag the potential options we may undertake in terms of how we construct our facilities, the different combinations of those, their size, emissions, noise. It sets out to define what the landscape looks like in broad terms, recognising the different types of land around as well as the different types of land practices that people currently are using on their properties. It’s supposed to identify potential impacts and ways of mitigating them, and they will vary depending on where we operate. In many cases, as Barton says, it will be highly constrained. We will have a whole range of constraints on us but in some areas it will be business as usual in terms of how it’s generally done. The EIS is a document that you have the opportunity to comment on; I’d encourage you to do so because it will mean issues of concern are then understood by Arrow and can be addressed. It will give the government information it can consider in future applications as well even though it doesn’t have to. The follow-on applications will actually include more detail around what it is we plan to do at the time; that will be part of the PL applications in terms of our work programs or development plans and also the environment authority details.

109. But isn’t this Environmental Impact Statement saying what your impacts will be on the environment? If you are still testing and trying to find what the impact is then it’s not in this document so we can’t comment on it.

The testing is to minimise the impacts; we’ve identified them so what we are now doing is try to work out better ways of managing them and minimising what those impacts might look like. It’s not that we don’t know what the impacts will be, it’s more that we are looking to improve on the way we manage them.

110. If this is a very generalised document, how do you distinguish what the impact is going to be on black soil to what it is on a cattle plain?

The EIS process is the government’s formal process to allow a project to go to its detailed approval process.

111. And that’s what I am saying, if it’s generalised how can it make that decision?

It’s generalised but there is a lot of specific information in it in terms of understanding impacts. We don’t necessarily need exact locations etc. to understand impacts and a lot of the work that Arrow has talked about today is ongoing. Recommendations have come out of the EIS so when you read it you will see recommendations for further work to be done to better understand issues to inform mitigation measures. Through that process we’ll be reporting on that work through the supplementary report to the EIS. When you see conditions of approval that come out of an EIS process, should we get there, you will see conditions that will require Arrow to produce other reports and management plans. If you look at some of the EIS approvals for the other proponents there is a lot of work that has to be done before they commence work; Arrow will have similar requirements which will feed into the future approvals process as well.

112. So you are guaranteeing that we can comment on this and then make other comments down the track once you know all the data, all the definites? We will then have another opportunity?
Yes, through the process Carolyn was talking about, through the *EP Act*.

113. **Can you guarantee we will get another chance?**

Under the *EP Act*, there is a requirement for us to publicly notify amendments to any EAs we plan to do for this project, so yes you will get another chance.

114. **So why hasn’t it happened on current projects where there’ve been amendments?**

I think two prime examples are ATP 683 and the Dalby expansion project which did happen. We haven’t done it since the one you’re contesting at the moment but it’s happened.

115. **That was changed in April last year wasn’t it? The conditions are very specific.**

The only changed condition was in relation to an error the government had made and it was covered by an administrative amendment. We weren’t involved in that process, it was just re-issued.

116. **No there was a very specific condition in one of those documents that was taken out regarding the level of water in a holding pond; 85% of the water in a dam had to leave the dam within a three month period. That condition was removed and we were not notified.**

That condition is something that has been changed across all the companies. It was a misrepresentation of their policy that was impractical and impossible to implement so it was changed as an administrative amendment.

117. **But we were not notified. You said when there are amendments made to the EAs...**

Amendments that are substantial in nature...

118. **Recategorisation of a holding pond to an evaporation pond is a fairly substantial amendment.**

What we have is a system under the *EP Act* which has certain things that must be considered by DEHP. It has a decision-making committee which can determine if minor applications don’t have to go to public notification. An administrative amendment doesn’t go through that process but if we were to apply for an amendment to our EA, it goes to that decision-making committee.

119. **So we may or may not be informed, depending on whoever is doing the decision making, as to whether it’s critical enough that the public needs to know about it.**

I think as you’ve made clear the Department would think it was in the public interest.

120. **Well I would have thought that re-categorising holding ponds to go to a reverse osmosis (RO) plant, then re-categorising back to an evaporation dam, is supposed...**

That’s not what that condition did.

121. **Yes it did.**

I’ll agree to disagree with you.
122. By not requiring you to remove 85% of the water from that dam it means you can leave it there longer which effectively gives you an evaporation pond so this whole phase out of evaporation ponds is complete nonsense.

In regards to our ability to comment further, if this project becomes a project of ‘state significance’ after the EIS is approved, we will not get the opportunity to comment further.

That declaration precedes an EIS so it won’t come to that. We never went down the path of a state significant project.

123. Can I ask why you’ve done that? It would save the community the nightmare of having internal reviews to work out why you haven’t gone for significant project status?

There was a mechanism available to people under the EP Act; we didn’t see any reason not to use that.

124. You can’t enforce it.

It’s essentially that there are two ways of doing the process and we opted to go down this path. The feedback I’ve had from this community is that you are happy we went this way because it gives you a lot more involvement so I’m pleased that was the case.

125. You mentioned a 6m fall in our aquifer as a worst case scenario and I think as farmers we have to accept that will happen. Just in the last ten years, probably at a cost of hundreds of millions of dollars, we have made this aquifer sustainable. A 6m fall in that aquifer will mean I won’t have water for my house and I wouldn’t be the only farmer in that situation. A lot of farmers in this room would not have any water for their house, for spraying or doing other commercial activities on their farms, they would lose that. To put it in context, if you live in Brisbane and your house water is switched off because someone wants to wash coal in Wivenhoe Dam that would be the same thing. I think it is very, very lax of Arrow to say that a 6m fall is the worst case scenario; you’re going to say you’ll do trials and reinjection, but those trials have not worked yet. But you are forecasting six metre falls so we have no confidence in what Arrow is telling us because we are just seeing the demise of our capital asset.

The 6m prediction is estimated for 2065, that’s how long it takes. It’s not going to happen suddenly, it won’t happen tomorrow. In that time we can do injection trials, we can better understand the system to put management measures and technologies in place to prevent that happening.

126. Do you think I should notify my bank that my asset is being eroded by 2065? Oh don’t worry, Arrow will make good!

The interesting part is that you are going to reinject but the water production from your wells peaks within 18 months according to all the information I have received and then it declines rapidly. So you are going to have a big production of water from your wells to reinject and in 2065 we’re going to see our worst case scenario. But by then you won’t be producing water anymore, so if reinjection doesn’t work (and no one says it can or can’t) the make good provision isn’t going to work so we will be left high and dry.
The water will be available throughout the project and the idea is that the potential drawdown is offset by substitution or injection providing a buffer against that impact. I can certainly see your point.

127. I’d like to tell these people here in Cecil Plains what’s happened out where I am at Miles. I’ve had three years’ experience out there with CSG companies around me. With other people out there we wrote a submission on the EIS. Before that submission there was only one holding pond in the area. Before the EIS was approved, QGC bought a property two blocks up the creek from me and came along and pegged out three holding ponds or dams. But they are not holding ponds, they call them transfer dams because they put water in before they pipe it. It’s the same thing, it’s an evaporation pond. I got onto DERM and it came out on some other issues because the company was building in melon hole country which runs into my place and had no provision for stopping any chemicals or run-offs running into my place.

I took the DERM guy out and showed him these things that were pegged out because I’d done a bit of research myself. So DERM contacted QGC and a few weeks later a fellow came along and said ‘I’ve come to re-survey some dams, these ones are in the wrong place’. Now that was all rubbish, they were all done by the surveyor with all the pegs, measurements and everything on them but they weren’t in the EIS. How much has been left out of this EIS?

You were talking about projects of state significance. I have three of those that were going to go through my place and they reckon they are the be all and end all; none of those have gone through my place, they’ve gone around me. Don’t believe anything that these people tell you because they are all rubbish. They just walk over people like cockroaches, making you sign things you don’t have to sign. It’s about time you people came out and told the truth. As I’ve said to you, you are only telling half the story, the good side; you are not telling the bad side.

You have made your point. We are here today to talk to the community about the EIS process, explaining how it works, explaining the inputs and mechanisms that are in place, the management systems we’ve used. Arrow is not QGC, it is not fair to say here today in an Arrow forum that what happened with QGC is what we would do, that’s simply not fair.

The EIS is a study to identify potential impacts and measures to manage those impacts. It is not a development plan. Once the EIS is in place, we will understand the constraints we have to work within and then we can start to put our plans in place on the ground. Arrow looks at where the impacts are, and the types of things we can do. As Carolyn said, what Arrow does in one area will be different in another, it has to be fit for purpose. The EIS process really is looking at the volume of impacts at this stage and how we might manage them. We will then be able to refine infrastructure and operating practices suitable for different parts of the Basin in which we work.

128. But you are talking about what Arrow wants, not what we want. You’re not talking about that, it’s all about what Arrow wants. When QGC had its EIS approved, it barely had the ink dry on it and QGC added an amendment so it could get these other things in.
Caroline said that the EIS is a point in time. We are talking about a 20 year development plans and things will change over that time. Everything changes over time. What QGC did is no different to what you would do in your own case, you would change plans over the years. But you understand my point, today is not about QGC.

129. **You are all the same.**

We are not all the same.

130. **I have to ask the question we’ve been beating around the bush. You represent a company called Arrow; the truth is it is owned by a Chinese company. In that country you don’t have freedom of speech, the right to vote, certainly no free media. You’re coming here and allowing that country to access a resource. Many farmers and I here are Australian citizens but we can’t access any more water to grow crops. We try to farm in a sustainable manner. You are representing this Chinese company which has a dubious record in how it acts in its own country; it has access to our resources, unlimited power it seems. Now I hope to be proven wrong. How do you feel when you can take as much water as you want from the Artesian Basin and we as farmers and citizens don’t have that right? How can you justify that to everyone here, that’s the guts of the matter?**

Thanks for that, there are two issues that I will touch on. Arrow is owned by Shell and PetroChina 50/50 so it is privately owned. Arrow is not listed on the stock exchange but Shell and PetroChina are…

131. **PetroChina is not listed on the stock exchange I notice.**

They are investors. They are bringing in funds to develop a business here. It’s a simple commercial arrangement like any other company, Toyota, Boeing whose products come in from overseas.

*Clarification: PetroChina is listed on at least three stock exchanges: Hong Kong, New York and Shanghai.*

132. **They are not going to screw our environment and take our resources.**

Let me finish on water, you touched on it. I am confident that with the work being done here Arrow is putting in the right legwork, the right scientific rigour to see if development can occur without an impact on your water. As I’ve said before, if Arrow can’t convince itself or government that it can manage those impacts, then we won’t do them. Arrow is not trying to destroy the environment, it’s here today to try to describe what it does; it’s studying the impacts and looking at potential management measures.

I am comfortable we are doing the right work. We’re not at the end of the line yet, we haven’t reached the decision point with the project so we are still running through that but I am confident that we’re applying the right level of rigour, science and fact-finding. Through exploration we are gathering real information out of the ground to give ourselves the best chance of that happening. I am not saying it’s a 100% slam-dunk outcome.

133. **St John, were all the figures you gave in your presentation pertaining only to Arrow’s effect on the underground water or the total CSG industry?**
The maps up there were for our estimate of the entire take from the CSG industry. The table had a column for Arrow’s impact, and a column for the cumulative impacts.

134. I was fascinated to hear you say you wanted to do a study in the Tipton area and you’ve all been talking about future drawn down effects. Last year I gave Tony Knight detailed information about an irrigation production bore that as far as I’m concerned has been ruined by the gas that has been taken from the Grassdale area. It went from 40,000psi to about 12 or 13. I’ve never heard back from him and yet here you are talking about wanting to do a study on Tipton. We also found out when we did this investigation that there were no local test bores around there. People on the river have lost their windmill water, their household water already, so if you want to do a study on Tipton you had better start with that production bore.

Arrow is taking steps to undertake bore assessments and implement make good agreements with the 15 bore owners identified in the QWC Underground water impact report as being within the Immediately Affected Area.

135. Barton, you were talking about one site measured for noise. If you have a thousand of these things going full power does it still work the same?

It works the same. Those wells are over 800m apart. As you can see the noise naturally attenuates at 300m so they will never add together to create a bigger noise.

136. What about under different conditions? Can you have some conditions and the noise will spread.

That’s why they monitor under different meteorological conditions over a year to get long-term averages. You’ll see in the specialist report there is a wind rose which tells you the percentage of time the wind is coming from a certain direction. The models are run from all directions for the whole year.

Those worst-case meteorological conditions occur on only a very limited number of times a year. The other thing you need to remember is there are some very substantial levels of conservatism build into the model so what you actually experience will be less than what you see here, and that has been proven by experience on many projects. Right from the outset we are required to model worst-case.

137. What are the background noise levels based on? What about at night time?

The government sets rating background levels; it’s a process the government comes up with to set a benchmark level and then says a developer like Arrow can go 3dB above that. So it’s 25dB plus 3 which is 28dB. You and I can’t perceive a 1dB change in noise. The first time you notice a change is at about 3dB. So if we measured a noise of 28dB in this room and then measured at 29.5dB we wouldn’t be able to tell the difference but if we measured at 31 or 32dB we’d be able to tell the difference.

138. What’s the lowest you can monitor? 19dB?

I can’t answer that but there are limits on what can be monitored. The noise consultant did provide information in the technical study about what the measuring limits were.
People do get accustomed to noise. Where I live in Brisbane there’s a lot of background noise – alarms, ambulances etc. I’ve tuned out to that even though where I come from in regional Victoria is very quiet. I’m used to living in a very quiet environment so it surprised me when I moved to Brisbane on a regular basis that I’ve become adapted to the noise there. You adjust naturally. I’m not saying you should accept the noise only that people do assimilate to the noise.

139. You’re coming into our environment and disrupting us.

What I’m saying is that scientific authorities advised the government and have determined that is the level which will protect your sleep and your wellbeing.

We modelled the typical production facility, and 1km was found to be the point at which we reached 28dB.

140. What about when there is inversion?

That’s why it’s modelled when there is inversion and breeze. The specialists apply management measures and attenuation and model it again to see how it changes. Either it meets the criteria or it doesn’t. If it doesn’t meet the criteria then we have to apply more attenuation, more soundproofing.

Distance is an important factor which will be considered in planning. It’s a combination of applying the appropriate treatments and distance to manage it. The noise assessment looks at the full tonal spectrum of noise i.e. it looks at all noise frequencies. Higher frequency noise attenuates more quickly than low frequency noise so the guidelines for the assessment of noise for CSG gas activities required the entire spectrum to be monitored.

141. My question is about the substitution of allocations as a mitigation measure in the long term. Some of the wording in the EIS concerns me a little. It says that Arrow has commenced discussions with relevant regulatory bodies regarding the appropriate legislative framework that would facilitate this CSG management strategy and it’s expected that third party users will accept legal responsibility for the impacts of their use of water. As allocation holders from the Condamine Alluvium, some of that wording leaves us feeling a little nervous. Does commencing discussions with relevant regulatory bodies mean we are going to be forced to use this water? Will we actually have our groundwater entitlements fiddled with to accommodate Arrow’s disposal of CSG water? What are the legal and practical risks and responsibilities we’ll assume for any impacts from the use of this water?

There are a few elements to that one.

There is a lot of science and research around water quality and soil types and how they have to match very well to be able to sustainably hold water. There has been a lot of angst amongst regulators and others around whether it is sustainable to use CSG water which has been treated and amended. Irrigators such as yourselves are already regulated; you know how to manage your water, you know how to apply those regulations. There shouldn’t be any additional framework that will question your ability or imply any additional liabilities or impacts to soils as a result of your continuing to operate.
The framework we’ve been talking about would be voluntary so if you choose to opt into that scheme you would be welcome but it wouldn’t be mandatory. We are telling government we wouldn’t want any existing rights of bore owners to be put at risk; we do not want to be involved with taking allocations away from users. If the government wanted some degree of comfort around how a substitution arrangement would be regulated in the sense of the user leaving it in the ground, it’s basically an arrangement between the user and Arrow. It may be leasing your bore for the time of the agreement to supply water and Arrow would be liable for maintaining the bore. If Arrow didn’t have enough water in that time to ensure you have your allocation it would actually take water from the bore instead of giving you CSG treated water.

142. You talk about substituting existing water allocations. How will substituting surface water mitigate the impacts?

It will allow more groundwater in the Condamine Alluvium to stay in the ground, and let it recover from many, many years of over-allocation and over production. If we supply water to irrigators at surface, it simply allows them to use that water without needing to draw down the Condamine Alluvium.

Additional Information: the process is not to substitute surface water. We are looking at a true substitution of groundwater to minimise potential impacts to the Condamine Alluvium from CSG activities.

143. You made some points that don’t exactly line up with what it says in the EIS in regards to well spacing.

Essentially infill drilling is very unlikely. We have had to identify every potential activity across the tenure area as part of the broad assessment but it is not economical for Arrow to drill more wells than it needs. If there is drilling at that sort of spacing essentially there’s no project as it’s not economically viable to do so.

144. So you wouldn’t object to a condition in the EIS that there be no infill drilling on strategic cropping land?

It wouldn’t necessarily be a condition in the EIS. The conditions are more around how things should be done and if they can be done. This comes back to the framework we have and the approach we take to it i.e. a site-by-site assessment.

145. Can you put it in writing that there will be no infill wells?

We’re talking about a big area here – Wandoan through to Millmerran. There is different geology, different areas we’ll have to work in through that whole region so we won’t put that in writing. However, we will comply with the EA conditions and good practice but we’re not going to put in writing matters that are very hard to quantify in the first place.

146. In regards to that Gatton pipeline you showed, around home some landholders are being harassed by QGC, and now it wants landholders to stop driving over high and medium pressure pipelines unless they are overlaid with a certain thickness of gravel. A weight restriction has been placed on vehicles that can cross i.e. QGC doesn’t want a grain road-train going across it other than across a specially prepared thoroughfare across the pipe. The scenario you showed there at Gatton probably wouldn’t apply in a broad-scale grain-growing production area where there are heavy tractors and road-
trains full of grain, not according to QGC anyway. Does Arrow require those restrictions if it doesn’t use cheap Chinese pipes or have wells that don’t break down and corrode?

Obviously Arrow is not QGC so I can’t comment on what it’s doing. But the question is whether you can operate and drive equipment over a pipeline. Yes you can. Pipelines are designed based on risk assessment under the Australian Code AS2885. Part of that risk assessment requires that the land use be considered. When Arrow puts in high-pressure pipelines it looks at every land use along the pipeline route. That determines two things, the type of pipe or wall thickness, and the depth of burial.

Yesterday someone raised the issue of Gilagi, cracking clays heaving pipes out of the ground. The risk assessment will identify the potential for this so pipes will be buried deeply so they won’t become exposed to cracking and heaving shrinking clays. The risk assessment works to ensure land use over the pipe can continue with two exceptions. You can’t drive things into the pipe and you can’t excavate over it. Those are the two key restrictions that might change the way you can operate on your property. If you are excavating a big pipeline to carry irrigation around your property you will need to talk to Arrow about how to work with its pipeline. It doesn’t mean that you won’t be able to cross it or go under it, but you will need to work with Arrow to make sure you do it safely.

147. I have a scenario – QGC must have laid its pipes too shallow in the first place and now it is saying to a landholder he can only drive across it at a certain point where QGC will build it up with a reinforced gravel road. That made that particular landholder unhappy; the same one is now being told by QGC that it wants to put its 42 inch pipe right underneath his centre pivot paddock. He’s not really happy about that idea given the potential subsidence over that big pipeline; he’s having a hell of a battle with QGC and it doesn’t want to shift the 42 inch pipe so there’s a standoff there. This is a guy who co-operated with QGC from day one. So I hope Arrow learns from some of the experiences I’ve related here today because they are an ongoing source of considerable angst and bad will between landholders and gas companies.

Can I respond and say that we are learning from those experiences. Arrow is not QGC and does not want to adopt any of its alleged bad practices. But things like that feedback are good because it helps us make sure we don’t make the same mistake; that’s one of the benefits of being the last of the four proponents because we can learn from other’s mistakes and make sure we don’t repeat them. In terms of land use, that’s a discussion that occurs prior to us thinking about putting a pipe in the ground. We need to understand what the use of the land is and what plans there are for it so if we need to put in a heavy wall pipe and bury it deep that can be done upfront.

148. What will be the maximum weight we can cross these pipelines because things change within practices. We might want to bring a dozer or road train of grain through; what is the actual maximum weight that can cut across these pipelines?

Unfortunately we don’t have our pipeline experts here because that’s a detailed technical question. It will depend on the depth of burial, the type of soil, the thickness of the pipe, things like that. There’s not just one standard thickness of the pipe, one standard burial the whole way. I can get back to you on that, but I can’t answer it now.
149. We are talking about a black soil floodplain where the soil structure doesn’t vary too much across that floodplain. I thought that would be something you had investigated before you decided to put pipes down.

No, the pipelines we’re putting in are primarily on the west side, on the grazing and forested type of country. The only pipelines we are contemplating putting in on the east side would be plastic gathering pipes which are low pressure.

150. We still have to travel across those.

Yes and we will have detailed information on that once we have specific plans.

151. It’s important for us to know there are restrictions on agriculture and other activities over your pipeline.

Yes, the two restrictions Barton talked about were excavating and pile driving.

152. Yes but we’re just talking about driving.

That’s not a limitation. If we plan up front and design the pipeline to suit an activity then that’s not a problem.

153. Do you have any pipelines buried now where you are limiting landholder activities over that pipeline?

We only have the one major pipeline which runs from our Moranbah production facility in the Bowen Basin so that’s not relevant to here.

154. I am talking about every single piece of buried infrastructure you’ve got in the ground. You’ve got more than one pipeline, you’ve got gathering lines be they low or high pressure everywhere. Do you currently limit landholder activities over any of your buried infrastructure?

If landholders want to do some deep ripping we discuss that with them before we put the pipeline in.

155. We’re not asking about deep ripping, we want to know if we can drive across the pipes.

Most of our infrastructure is currently on grazing land and there is no restriction at the moment on driving over the buried infrastructure.

156. At the moment, you haven’t done the work, you have no data...

There are no restrictions currently around driving over buried infrastructure.

157. Just say you don’t know.

We haven’t put any restrictions on...

158. Yes you don’t know.
We want to give you the right answer. What I'm saying is we're not the pipeline experts but to my knowledge there are no restrictions in place on any of the pipelines Arrow has in this area or anywhere else. However, we'll get back to you on that with additional information.

Additional information: every location is different and every farm has different activities. Pipelines can be designed to suit the needs of the individual property. As such, restrictions or the design of a pipeline to remove restrictions will need to be part of the discussion closer to the time of installation of the pipeline. Any concerns of other land users should be raised at that time. Activities such as excavation or driving fence posts directly over the pipeline are restricted to protect the integrity of the pipeline and maintain safety.

Comment - It's a very important issue for us and you can see how fired up we are. You thought they were all asleep, didn't you? The load limits on these pipelines have to be upfront so when anyone rocks up to a pipeline there's a notice nominating the load limits on that particular soil.

159. Tony, your EIS says you allow normal cultivation activities. Now we do a host of things on our farm that Arrow wouldn't describe as normal cultivation activities. We want to know what restrictions there will be on those things that fall outside normal cultivation activities.

The risk assessments we have to do now are more than we had to do before. We have to get everyone to respond with the types of activities they carry out on their land, the types of machinery they use and the types of ground disturbance there might be.

160. But these things change. When we started, picking machinery could weigh seven or eight tonnes, now it weighs 38 tonnes, a whole host of things change. How can we be sure that in future you won't place restrictions on what might be allowable now? Will you change your pipelines to suit what we might want to do in the future or are they there forever?

Pipelines are designed to be there forever. What we'd have to do is make sure that they could withstand any potential future uses.

161. I'd like to know if this whole shebang does go ahead do we have a choice of what depth we want the pipeline buried. Are we allowed to say that we want to drive a 100 tonne vehicle across there and will you comply with our request or will you say Arrow is going to put it three foot deep and then throw a bit of dirt over it?

The answer is that we will comply if it's a fair and reasonable request. That's what we do when we have the conversation with you about the Conduct and Compensation Agreement. If you say you are going to drive a space shuttle launcher across there, that's not going to happen but if you say you're going to drive a dozer across there then that's a likely scenario.

162. So we can cross that anywhere on our farm?

It's a conversation that will vary farm by farm so we would have to do it site-by-site.

163. But that's what everyone's saying, things are going to change over time so we need to know now.
There’s not a simple answer. All I can say is that we talk to landholders in different regions about the expectations on maximum potential load. We can design the pipeline accordingly, both the location and the construction. We are saying we can respond to the particular issues on any one property and we can design accordingly; that’s a conversation we have on an individual landholder basis because it varies across the region.

164. My question was about pipeline markers. Is there any scope for extending them any further apart or using other technology to mark them other than the signs we see now?

There is a code about distances between markers for the big high pressure transmission pipelines. I have to come back to you on the exact distances but usually it’s a certain distance or at a significant change in direction. On most of the high pressure transmission line projects I’ve been on, in agricultural areas they do them on fence lines and the like, but we will come back in terms of the detail behind that.

Additional information: pipeline markers must be visible from one marker to the next, or where there is a change in the pipeline route. There is no specific distance, and they can be spaced out quite widely if the countryside allows.

165. What about between the wells?

It’s based on a risk assessment in terms of the pipes between wells so we’ll do a risk assessment looking at the risks associated with people potentially accessing that pipe and then we’ll look at what is required in terms of signage.

166. Do you make good for the whole of the community or just properties?

In this area it’s basically dealt with by the QWC. In its underground water impacts report it will delegate who is responsible for certain areas. Arrow may therefore be responsible for people who are not on our tenure; it may be on someone else’s tenure or may not even be on any CSG tenure. So yes we are responsible for doing that and we will.

167. So it will be for the whole community, as long as it’s in your tenure?

It doesn’t need to be on our tenure. If the impacts are in the area we’re designated to look after, we look after it.

168. If we’ve got no water, what type of things would you do to make good?

The previous arrangements we’ve talked through are some simple things like deepening pumps through to alternative supplies as compensation. It very much depends on where it’s located and what type of supply it is. As soon as we have an indication that there may be an impact on your water supply (and that will come about through the underground water impact report to be published by the QWC) when the triggers of five metres for the confined aquifers and two metres for the unconfined ones are triggered we come and do a water assessment with you and enter into a make good agreement immediately. In that agreement we discuss what the potential options may be, understand the depth of your bore and what type of impact there may be. We then come up with something that we both agree are the potential options to be implemented so if there is subsequently a problem there is an agreement in place as to how we tackle that make good.
169. How long will this take? How long is the process? Like if we’re out of water, are you going to be there the next day to sort it out?

We shouldn’t be in a situation where that sneaks up on us. With everything that’s in place we would know it was going to happen and we would already have had some discussions with you. For instance, the Walloon Coal Measures are the first discussions we’re having because that’s where we’d expect to see the first impacts. Arrow will start that from next year.

170. In an earlier meeting you guys suggested you wouldn’t come near Cecil Plains until 2023. At the same meeting you also said if there were more than 90% of us unwilling to sign agreements with you that you would walk away. Do you still stand by that?

I don’t think that’s what we said.

171. You said if you couldn’t get agreement from more than 90% of us, you’d walk away.

We’re committed to working in this area, that’s our starting point. We will do everything we can e.g. the studies, the research, the demonstrations that show we can work in this area. We talked about our preferred approach to access to land which is to negotiate and reach agreement. But we do have rights which we reserve.

It was just a comment you guys made and I was wondering whether you were going to stand by it, that’s all.

172. Someone said before that sometimes with the gathering lines the gas is going to go to a field compression facility but the water will go straight to the water treatment plant. Does that mean we could then potentially have two different pipeline paths through our property going in different directions, depending on whether one’s going to a field compression facility (but can’t make it all the way into the central compression one) and then another one for water going straight to a water treatment plant?

No, the lines will be in the same trench where possible. As Tony said, the lines go together and gas and water lines will always be put in together. There won’t be a full water treatment facility at the central gas processing facility. You’ll have ten central gas processing facilities (CGPF) with about two or three water transfer systems, each CGPF has a small pumping station that takes the water to the treatment facility.

173. Is that the same for the field compression facilities because sometimes it doesn’t go straight to the main gas facility, it can't quite make it there without having to be boosted through a field compression facility? Does that mean that there’s going to be a water transfer system going into a field booster station?

Yes we will have a few booster stations.

174. And they are about the size of a shipping container?

Yes.

175. So the compressor is a shipping container, there’s the other pipeline infrastructure for the gas and then there’s a water transmitter as well?
Yes.

176. My question is in regards to strategic cropping land (SCL) legislation and the timing of the Terms of Reference for this project. I have heard it said that Arrow’s Surat Gas Project isn’t captured by the strategic cropping land legislation because of the timing of your terms of reference and I was wondering if someone could comment.

The Terms of Reference don’t cover SCL; it’s a separate statutory process and Act of its own. The transitional arrangement in the Strategic Cropping Land Act basically says if Terms of Reference were approved by a certain date then the Act would not apply to the process. That said, it does apply to any changes or amendments to tenure, grants of tenure, EAs etc. Despite the fact it didn’t apply to the original EIS process as soon as we try to amend our EA or apply for the additional PLs and EAs, it’s triggered.

177. I was interested in your mock-up of the farm schematic and how you might dig wells that would create maximum interference but then you could move them to places to minimise or decrease the interference. Aren’t you assuming that farm layout would stay the same? Wherever I stand on my farm now it looks different to what it looked five years ago, and different again to what it was ten years ago. We are sometimes forced to make changes for a number of reasons, exposure to government regulation of environmental things like water runoff or pesticide application but more likely through our reduced access to water entitlements we’ve had to change how we do things. That pressure doesn’t look like easing any time soon, so we’re going to have to change again, probably in the form of overhead irrigators.

Under your second scenario if you move those wells somewhere else to accommodate existing practice, and we then need to change that practice, which industry will yield? Will the gas industry pull out some wells and dig up buried infrastructure to enable us to stay in business or are we expected to stay the way we are to accommodate the life of the gas industry? How will that process work?

There is no simple answer I can give you now. It will depend what your plans are for your property and your neighbour’s. All we can do is try to locate wells where they will be out of the way regardless of any changes. That will be our approach but I can’t give you a rock solid answer as to how we will do it on your place, or any other place. It will be site-specific and will depend on the owner’s plans for the property as well as a whole host of things. All we can say is that the schematic is just a concept that shows we are flexible in regards to where our wells can go. The precise location would need to be agreed.

Comment - That’s another one you haven’t thought of is it?

178. Tony is there any notion that the gas industry will yield to agriculture or is it all going to be the other way?

We can say there is flexibility in us giving way to agriculture to make the fit. We are trying to have a co-existence model here; we are not trying to have it one or the other way, we are trying to have both but to minimise our impact on your properties in this area.

179. I am also interested in some of the commentary in the EIS and particularly in the agricultural impact statement or expert report. It talks about developing in times of
fallow or times when we are actually not doing business. That sounds simple and it will probably work on a grazing property or a dry land cropping regime but it’s totally impractical on the floodplain around Cecil Plains here. I am unsure how you can develop on a farm that is an integrated system; your activities on one part of my farm can influence what happens on the rest of it. It’s not just the impact on 2%, in fact that’s a critical area because it impacts on the other 98%. I can’t see how this industry could develop east of Cecil Plains without your actually buying out the production of those farm units during your development phase.

You know we are working to try to understand how to work in the area. I don’t have a text book answer but what we’re trying to do with the committees and trials is to see how it can be possible. I am not saying we have the answers here, but we’ve got some more time to try to get it right.

180. **Tony, if I listen carefully to your answer to the 2023 question, and the 95% acceptance, correct me if I’m wrong but it seemed to me that your answer was that most of those things are off the table now?**

We should address the 2023 issue. What we tried to do a number of meetings ago was give people some sense of roughly where we would start developing in the region from Wandoan to Millmerran. The logic was to expand around the Tipton area where we’ve already got a footprint and in the area around Miles and Wandoan. We hadn’t put a timeframe on the Condamine but it didn’t mean it wasn’t there at some time. If you recall, we made a commitment about addressing concerns before we considered development in that area. So we just hadn’t put a timeframe on the Condamine.

This is what we are talking about (see Figure 4 – Indicative Development Timeframes page 6). We showed this figure some time ago in the context of trying to explain to the community across the region our initial development scheduling. You can see there is a gradation timeframe which shows the area around our Tipton field and expanding north and south from there. You can see here the white area ‘timeframe not determined’. We understand the issues trying to develop east of the Condamine; we made a commitment not to do that development until we can address the concerns in that area. That’s why we haven’t determined the timeframes and it’s why we are doing the current work, the trials and testing out here to try to find a suitable timeframe for this area.

181. **We are not inventing the 2023 thing, you guys said it.**

This is the map we showed and there may be a difference of interpretation but this is what we used.

182. **The statement was that if our gas reserves are good enough, there is no need to go east of Cecil Plains until 2023.**

We will have to differ on that point. What I’m saying here is that that was an indicative schedule which didn’t put a timeframe to east of the Condamine. We acknowledged that it required a different approach and that’s still our position.

183. **Tony, we have a record of what you actually said and what you are saying now is somewhat different to the record, but anyway. I’ll say one more thing before I sit**
down and shut up. We've just had a local government election in this region; all of us here were probably here last year on two occasions when the Mayor Elect spoke in this hall and made certain statements about development east of the Condamine River. He was also prominent in his election advertising campaign in repeating those things, basically saying any council he led would strongly resist at this stage any development east of the Condamine River for a number of very good reasons.

Cr Antonio was elected with an overwhelming mandate I would have thought. Arrow would be wise to take into account that's an indication of how the community feels about it. It’s not just a few irate people who have a vast amount of experience in this. I can’t for the life of me work out how the two industries can co-exist. Will you take those sorts of public indicators on board in your deliberations about this matter?

We do...this is the fifth time we have been in this hall. We've heard you loudly and clearly and we are here again today. We heard Paul Antonio last year. We do the work the government asked for in the studies, we submit matters for its approval; it determines whether we go or don't go in this area and we'll have to abide by that decision. What Arrow is doing is what any company would do in trying to develop its business and we are using the proper processes and methods to do that. I understand about Toowoomba Regional Council and understand that Mayor Elect Antonio has voiced the concerns of the community. That’s what we are trying to address with this process today and in other ways.

184. Can you tell me the extent of the intended buffer along the river?

The buffer along the river is dictated by the environmental sensitivity that DERM has set for water courses. You will find in the EIS that it’s 100 metres and also limits petroleum activities of certain types. It doesn’t exclude them so you can still run pipelines across rivers etc. but it does limit production facilities and other infrastructure.

185. You told us how much water you are going to suck out of the Walloons, can you tell us how much salt you are going to bring up?

We have made some estimates in the EIS; I can’t recall the figure right off the top of my head but you can see there’s a water balance in the EIS which shows peak and average production from the field in totality. Then it shows how that breaks down into water to be treated or the remaining salt content. The salt might go to a registered and regulated landfill facility but it won’t be buried out here or it could go to a facility for what we call ‘selected salt precipitation’ where it converts brine into soda ash or sodium chloride (NaCl) for industrial uses or chemical manufacturing. That water balance is in the EIS and indicates how it breaks down in tonnes over the life of the project.

186. How much?

The EIS assumes the salt waste will be trucked to Swanbank and buried as landfill. Using the figures of an assumed 4.5 tonnes per megalitre of produced water and assuming an average of 22 gigalitres and a maximum of 43 gigalitres, it's somewhere between 90,000 and 190,000 tonnes of salt going to Swanbank to be buried.

I have spoken with Bryan about this map here. It's not the map that's in the EIS, so we'll go with the EIS one. It shows a red area to the east of Cecil Plains in PL258. It
doesn't have white for the rest of the area in Cecil Plains; it’s a nice peachy colour. When the EIS talks about the mitigation and management protocols for agricultural change, it talks about the Intensively Farmed Land Committee and the Community Reference Group as being part of that management and mitigation process.

I went onto Arrow’s website last night to see what I could find out and there were minutes of those meetings on that website. I noticed that the last meetings posted for the IFL Committee were April 2011. The other one is a little bit more current, I think it’s February 2012, but there has been a meeting since then so my question is could the missing minutes from those committee meetings be placed on the website as soon as possible so that we can scrutinise them as part of our submission process please?

We can do that.

187. On a personal level I’d like to ask the Arrow employees what commitment they have, have they signed a 20 year contract to be with Arrow? When we let you on to our land it’s a lifetime commitment.

No we are employees; it’s not a long term contact. Next year the final investment decision takes place; if for whatever reason the company decides not to proceed it wouldn’t want a whole lot of employees hanging around for the next 20 years just doing nothing.

188. I think the point is, Tony, you are asking us to sign a lifetime commitment but you are not willing to sign.

What I’m saying is that we can’t.

189. Sorry we can’t either...we don't want you here.
1. **Tony, how many joules are there in a petajoule?**

   It’s a number like $10^{15}$.

2. **As you know, I went to the session yesterday and I’ve a few more questions today.** There’s one about stormwater and contaminants running off disturbed areas and into watercourses and waterways, or even out into the melon hole country into surface water. I’ve got about six questions here, so I’ll go through them one at a time.

   I’d like a hundred per cent guarantee that you will not let any contaminants or stormwater run-off any disturbed area into any watercourses or any water.

   So stormwater run-off?

3. **Yes, from any disturbed area into any water - that includes well sites and roads but mainly from well sites...and that includes sumps and whatever.**

   As you know it’s regulated through the environmental authority and you will have seen quite a few mitigation measures presented in the EIS. We are not allowed any run-off from any water contaminated by petroleum facilities or activities which means any disturbance we create needs to have sediment and erosion control structures to minimise any run-off.

4. **Including bunding?**

   Yes, bunding and the like to make sure it doesn’t occur. That’s something which at the moment is a very big focus of the environment department; it’s doing a lot of audits around operations at the moment to make sure there is no run-off. It’s a very important issue and we do recognise it.

5. **Okay now...pits and drilling. I know you say you’ve got this pitless drilling but that’s not the case at the moment. I think there are others in the room here who will back me up on the fact that you do use pits when you’re drilling and that’s been a big concern for quite a number of years. It’s not necessary; it should all go into containers. It should not go on the ground at any place so that it can flow into any water.**

   Yes, that’s why we’re moving to pitless drilling so we’d agree there’s an industry change occurring.

6. **Yes, but you’re doing it at the moment.**
Yes.

7. **You’re using pits at the moment.**
   Yes but we’re trialling pitless drilling now. There’s a…

8. **Well, why are you still using pits?**
   It’s because we’re still trialling the pitless technology. There are a number of parts to it and we’ve got to make sure they work properly, then we’ll move across to…

9. **But why can’t you put it into containers? Why do you have to put it into pits in the ground?**
   That’s just been the practice for many, many years.

10. **But why hasn’t it changed?**
   It is changing. That’s what I’m saying; it is changing and we’re in the change process now.

11. **It should have changed already. I brought this up 18 months ago.**
   Yes I’d say we’ve been working on this now for a year.

12. **You know there’s no need for it. You should be putting it into containers and taking it away.**
   I’m saying that we are in the process of doing that now.

13. **Taking water from creeks and dams, what’s your policy on that?**
   You mean for construction?

14. **For drilling…any water from creeks or dams, for that matter.**
   What we do is that we source our water from people with entitlements. So we don’t just pull up at a creek or a dam or whatever and just take the water. There has to be a formal process in place, and there is a legislative framework within which we work.

15. **I think there are people in this room here who’ll back me up and say Arrow you’ve been taking water out of creeks where you have no entitlement.**
   I don’t believe that’s the case; we’re not allowed to. Also, I know most of your experience is not necessarily with Arrow.

16. **I beg your pardon?**
   Locally, most of the experience isn’t with Arrow but there is a process in place…

17. **In this instance I’m talking about Arrow. It’s drilling up Ryalls Road above the mine and has been pumping water out of the creeks.**
   There are a couple of areas we’ve taken water like that but we have a water allocation or a permit from government to do so.
Comment - Well, you didn’t have it in this case, and there are others in the room here that’ll back it up.

18. **Bio-security and washdowns, what’s your practice on that?**

Again we have a procedure in place where vehicles have to be washed down and there’s a declaration certificate that goes with it. So if vehicles are going from one area to another and there’s potential to transport any weed seeds or other pests, then the vehicles must have a washdown. There are specific obligations based on landholder agreements as well which can dictate when those washdowns must occur. So we have a very, very strong procedure in place at the moment.

19. **And who does those washdowns?**

They can done either by Arrow staff who are experienced in doing it or they can be done by a third party, but generally they’re done internally.

20. **Well, do you realise that unless those certificates or whatever you write out are done by somebody who is accredited to write them out, it is not legal for those vehicles to come onto a property? In my case, I nominate the person who will wash down your vehicles and I have to have a certificate from that person every time your vehicle comes onto my property. Every time it leaves, it’ll be deemed dirty.**

That’s not actually how it works; there isn’t actually an accredited…

21. **Well, that’s how it is.**

Well, actually there’s not…

22. **Because you’re coming onto our land you have to abide by our rules, not yours. I’ve checked this out and it’s got to be done by an accredited person who has to sign a statutory declaration to say the vehicle has been washed down thoroughly.**

In terms of the accredited wash down you’ve referred to, there isn’t actually a process to accredit people for a washdown. There is no recognised third party provider which is certified or accredited to provide that service. It’s done by a person who is trained and experienced in doing that sort of work and they must sign the statutory declaration. The people we have doing that work are more than capable of signing a statutory declaration which carries as much weight as having somebody external do it who may not in fact be qualified.

23. **Have they been trained first?**

Yes, they will have been trained.

We have used third parties where they’ve been nominated and that comes down to what’s been agreed with the landholder as the landholder can dictate when, what, where and how things are done on the property.

24. **Righto. Soil-borne stock diseases...what procedures do you have to mitigate the possible transport of those diseases from one property to another?**
It’s the same process we have for the washdown and it also applies when we’re bringing in our loads of gravel, soil or other construction materials; they have to be certified or declared as being clean, so it’s the same process, the same procedure.

25. **Yes, but what I mean is that if you go onto one property and then come from there onto mine, how do I know that you haven’t been in contact with some soil-borne diseases?**

Again we have to disclose that to you so you need to have that declaration provided. Every time we enter your property you will receive that declaration. That’s the process we have in place.

26. **Now another issue which I think is a pretty valid one, and there are a lot of other people around here with the same opinion now, is before any of your employees or anybody can come on my property I want to see a police check on all those employees plus a blue card before they come onto my property. Have you done anything in the past about that?**

We haven’t, but we’ll take that one as a statement.

27. **That’d be a stipulation if you were to come onto my property i.e. all your employees, including you, would have to have a police check. I’ll leave it at that.**

**But there’s another thing that I’ll bring up now. National Vendor Declarations (NVDs) and chemicals...what do you do to protect stock from possible contamination when you come onto a person’s grazing property?**

You’re worried about the chemicals we might bring on? That cattle might eat them or they get sprayed?

28. **Well, they could be spilt on anything, and then the cattle lick the ground.**

There are a whole lot of processes we have in place to select the chemicals we use in the first place to make sure wherever possible that they aren’t toxic, that they’re managed properly when they’re transported and stored onsite, and when they’re used. If they are spilt, there’s a clean-up process. At all times we look after the products we use.

29. **Yes but have they been approved by the DPI?**

We’ll provide a Material Safety Data Sheet (MSDS) for any chemical we use. It will depend on what chemical you’re talking about.

30. **No, but have they been approved by the DPI?**

Well, it’ll be specific to the ones we’re talking about.

31. **Does that mean any chemicals you bring onto the property?**

We can look at what chemicals we use. I’m not sure what the DPI process is.

*Additional information: any chemicals Arrow brought on to a property would only be used for purposes related to petroleum activities, and be carefully managed. DPI is not the relevant*
regulatory authority, everything we do is managed in accordance with our environmental authority and Environmental Management Plans.

32. Well, you’re coming onto our property...

I do understand.

33. When we sell stock we have to sign a statutory declaration that there’s no chemical contamination. You’re supposed to give us a full list of all the chemicals you might bring onto our properties. We then have to send it to DPI to get it verified as to whether it can be brought onto our property or not.

What we do is provide the landholder with a copy of all the material safety data sheets for any chemicals we use. All the information about those chemicals is provided to the landholder; that’s a requirement and it will be done.

34. It’s no use your wanting to come on today and presenting me with a certificate today.

No, that’s done at the initial stage when we come and talk to you and go through the arrangements for the compensation agreement. We have all that dialogue very early with you so that you’re clear about our future activities and what we bring on site – that’s an important process.

35. But it’s got to be on a daily basis. Whatever vehicle comes on that day, you’ve got to know what chemicals are brought with it.

Yes, and we will have that dialogue with you about the specific arrangements you can have with us about how we enter and operate on your property.

36. The earlier person was talking about the statutory declaration. That’s a declaration we have to sign when we sell our stock guaranteeing that it is free of any chemical contamination. If we can’t supply that then it could be cause for anyone who buys our stock to have them destroyed or rejected for the food chain; then we also have to assume liability for any losses those people incur. The worst case scenario is that I sell a beast contaminated with lead or something like that; it’s then found in a container of beef in Japan. The Japanese go crazy about it, refuse to pay Teys for the container of beef and then if Teys can trace it back to me I’m sued because I put a contaminated beast in the container. So we assume legal liability in a statutory declaration form for the clean, green health of the stock that we produce which is the context in which the earlier question was raised.

I understand that...

37. We have a serious legal liability…it could put the whole beef industry out of business overnight.

We recognise that. It’s something we’re aware of.

38. I’ll deal with that more perhaps in the agricultural section this afternoon. A question I’d like to address to Tony is about the final investment decision (FID) which is not until the end of 2013. I’ve noticed that because the spot price of gas is down to $2 a megajoule, there are rock bottom prices in the gas industry as a result of
overproduction worldwide. *The Australian* on the weekend said that QGC is considering not building one of the trains in Gladstone because ConocoPhillips wants to exploit excess gas production in the US as the spot price is down to $2 a megajoule. I’ve worked out that your reserves are still only worth a measly 16 thousand million dollars even at $2 a megajoule. Given increasing world production will this ongoing low spot price for gas have an impact on your FID?

No, not at all. That’s why I pointed out earlier all the gas we produce has effectively been sold to our parent companies, Shell and PetroChina, so we’re not trying to sell on the open market. Our gas sales and pricing are secure and independent from the spot market.

I’m sure the shareholders in PetroChina would feel much more secure.

39. A point that I’d like to bring to your attention was my impression yesterday that there were still a lot of unanswered questions for those people at Cecil Plains and yet you’ve been dealing with them longer than you’ve been dealing with any of these other groups. In fact there are still a lot of unresolved issues across Australia given that 8,000 people rallied in Sydney yesterday expressing their concerns about CSG in New South Wales. I just make that as a comment to give context to this meeting today in that while you’re doing your best to allay our fears not all the issues have been resolved.

Just a word of response, we’re here to try to give you more information which is the process we’ve been following for a number of years and it’s not over yet. So yes, we’re not saying we have all the answers today but we’ll roll those out over time.

40. I’m out Burncluith way? One of my properties is under your tenement; luckily my other two are not. Last year we had somebody who was contracted by the Queensland Government come out checking the bores in the Burncluith Pelican area. They wanted to test their depth, their drawdown and their flow, and this was all to do with the aquifers you CSG people take water from. Bores in our area have dried out in the past but they were probably in confined aquifers. There were 16 years of dry weather when the creeks were not running properly; that’s why they went dry.

The Great Artesian Basin goes right up into the Gulf of Carpentaria and some people say they’re probably filled from the rivers of New Guinea... who knows? The government contractor told me that to claim any compensation I have to be testing my water every week? I spent $30,000 putting a bore down and you’re not going to drill in this area until 2020. Who’s going to pay my costs to check my bore every week? I’ve got enough things to do without checking the flow and checking whether it’s drawn down. I’ve got enough work to do but apparently I have to do that to claim compensation. I think that’s quite unfair because the bore is 20 minutes’ drive away. It’s an hour a week I’d be spending, then the time to test my bore for something that might or might not happen.

Somebody was issued a big licence down near the Condamine River and we had to put two more lengths of pipe down because my drawdown went from six lengths to eight, and this is years ago when somebody put a bore in for a feedlot. That bore was put in really before records began; it’s been drawing at six lengths of pipe, now we’re down to eight, and that happened after somebody got a licence. I’m just trying to
work out how am I going to get compensated for doing all this when it might be for nothing?

You don’t have an obligation to check your bore every week. When you talk about compensation, I assume you’re referring to the make good provisions of the Water Act which say that if there is an impact Arrow is liable to make good. We don’t rely on you checking your bore every week. In the area we’re talking about, the Surat Cumulative Management Area managed by the Queensland Water Commission (QWC), it is modelling the impacts it predicts will be in that area.

For a consolidated aquifer like the one you referred to, if the Commission predicts there’ll be a drawdown of five metres or more we need to come and talk to you to make sure that we’ve had the discussions around make good and what the potential options may be for us to provide water to you should you be affected. Those discussions become an agreement that is locked in place well before you should experience any of those impacts. We also have our own groundwater monitoring programs in our testing regime which will be in place for the sole purpose of detecting any changes as they occur. The expectation isn’t for you to do that and you shouldn’t have to do that to be claiming compensation. It’s not how the framework works, the important thing is the baseline that’s established and the predictions that are made will be used for that.

41. Yes, well I guess the biggest problem is if it’s you taking the water or somebody else? My bore is eight kilometres east of your tenement so who will be liable if it is affected?

Regardless of whether it’s on our tenure or not, we still have the same obligation as it’s not constrained by the boundaries of the tenure. If we impact on your bore and it’s not on our lease, we still have the same legal obligation; the same agreements will be put in place.

42. I’m just trying to work out how. So if my bore drops, I come to you and say ‘you’ve taken my water’. Do you understand what I mean?

We shouldn’t get to the point where you experience that without having us come and see you first but if you do experience something like that, yes, you should come and see us. You can report it to us, report it to the environment department or report it to the QWC. Whichever channel you decide to go to, it will come back to us and then we will do what we need to do to make sure that we engage with you and we rectify anything for which we have responsibility.

43. So the process is that if I have to go down more lengths of pipe into the aquifer, then I go to Toowoomba and see the water fellows, and they look into it – is that how we do it?

You can do that although if it’s due to us you can deal directly with us and the cost of deepening your bore or pump will be a cost to Arrow. That’s how the framework works and that’s what the agreement will also say.

44. So what those men were telling me last year was incorrect?

A lot of the guys are technical operational guys who don’t really deal with the legislative framework. It’s probably fair to say that it’s often hard for them to understand the detail and
how it works but in fact it does work this way and there are some government fact sheets here which will outline what I’ve told you.

45. **The reason why I was concerned is we’re eight kilometres out of your tenure and I couldn’t see how I could prove anybody took anything. I mean, I have trouble proving who took my stock if they disappear and they’re a visible thing.**

That’s all got to be figured out, so we’d have to investigate the cause. I think you mentioned that a feedlot put in a deep bore and took water which impacted your bore. We need to understand the local impacts and if we’ve caused it. If we did, then it’s our problem but if it’s a situation like the feedlot then obviously that’s not something we can fix.

46. **But that happened 20-odd years ago?**

Arrow would investigate it to develop an understanding into what’s going on.

47. **And it’s stayed at that level of eight lengths now for the last 20-odd years.**

But I think that should be good news, you don’t have to make those three trips every week.

48. **So everything inside that five metre line which is the red line there triggers make good provisions? (see Figure 5 on page 7)**

Absolutely.

49. **And as you go inside that line to where it changes in colour to a lighter blue, you were saying the biggest drawdown is 120...**

The prediction I think was around 130.

50. **So the point you guys are trying to sell is that unlike some other CSG companies who are happy to wait until 2065 before there’s remediation by natural methods, you’re investigating procedures whereby you can reinject or whatever and bring forward the restoration of the water levels in those areas back to something more acceptable. Is that the point you’re trying to make?**

That’s right, what we’d like to get to is a process where we can minimise unacceptable impacts. I mean it’s an extractive industry, so there can’t be a situation where there’s no impact, but Arrow’s aim is to say what it can do with this water to reach a position where it’s not an unacceptable impact.

51. **How are you going to make good for all those bores?**

That’s a process we’re working on now. We’ve taken the output from this model and done another iteration of it by adding complexity to the model to try to refine our predictions while we’re doing this work. We look at the DERM bore database for the Walloon Coal Measures to see how many bores are recorded in the database and try to get a handle on how many bores there are in that area. Then we work out when those impacts appear; there are bores towards the east, then further west and getting a bit deeper. They have different distances from the primary impact area so the question becomes when do we think those bore levels will drop? What make good measures can we put in place? In the short term that becomes a question of do we pipe water to those people when their water level drops?
We treat the water we’re pulling out of the ground by putting it through a reverse osmosis (RO) treatment plant to maximise the amount of usable water we can put back. The question then becomes does that go back as an injection into the deep aquifers e.g. the Precipice, and do we drill a bore to that aquifer where we’ve put the water or do we put it into other aquifers sitting above like the Springbok.

We’re currently working on the first lot of injection trials on the Precipice. There’s a raft of measures from piping water to someone deepening their bore. If they’re in an area close to this five metre contour, maybe it’s a case of just deepening the pump.

52. Where does that area extend from? What towns are we talking about?

We’ve got Wandoan up here in the North.

53. Yes but the northern extremity and the southern extremity, what towns are they?

Millmerran and Wandoan.

54. And how far west would that be?

You’ve got Roma out here and I think Miles, Chinchilla and Dalby.

55. You see I have a nice little bore in there which flows at 9,000 litres an hour. It’s perfect water, 33 degrees, perfect to shower in. Even Clive Palmer would use it for his very expensive scotch. And I’d hate to think that you couldn’t make good.

Me too.

56. I would be very cranky.

I can understand that.

57. In twenty years’ time, when all your bores are developed the water you’re pumping out around Miles and Chinchilla could be affecting those people down at Millmerran, lowering their water table so the water you pump out is really an entitlement of the Millmerran landholders who already have restricted irrigation licences.

The primary source of the water causing the drawdown here is in this area, and it’s just due to the rate of ground water flow under the ground. The ground water moves fairly slowly so it isn’t going to move from here to here in twenty years. If you’re looking at the recharge beds here, and the rate of ground water movement from this side to the other side, we could be talking several hundred thousand years.

58. So the water around Miles is not connected to the water at Millmerran?

It’s all part of the same aquifer but the rate of movement is such that if I was to put a bore down over here and move five kilometres away, and then start pumping I can have a cone of depression that’s sucking water in here but it may not affect your bore. So while it’s in the same aquifer, the radius of influence of a pumping well can only extend so far. The primary effect in this area is from the bores here. This is one of the things we looked at in the EIS where we tried to produce a worst case scenario as we try to narrow down our confines after that. As Tony was saying earlier, Arrow has relinquished ground down in the southern area,
and a lot of it is probably not going to be developed so the final area of impact will be reduced. We’re trying to start off with the worst case and if we think we can balance it then we’ll get more confidence as we move forward.

59. Is that the cumulative scenario?
Yes, it is.

60. It’s scenario three, that’s a relief. I was worried that it might have been just Arrow’s impact and QGC and Origin would have been down to minus 500 feet or something. So the worst case scenario for the cumulative management model is 130 metres.
In our prediction, yes.

61. What’s going to happen when the QWC comes out with its first report, will it have similar figures to this? Or don’t you know?
We haven’t seen its published report yet as it’s not due for a couple of weeks. Arrow was in discussions with the Commission when it was preparing the report. As it’s entitled to do under the Act, the QWC issued us a notice for most of the information we had like our model files, field data etc. The other CSG companies were given notices and provided information as well, so the QWC now has a model containing all that information and in a couple of weeks we’ll see what its predictions are.

62. Does the QWC have sources of data other than what you people have used?
Yes it does. We squeezed all the publicly available databases and literature for as much as we could. We also had our own data but the other companies at that time had data we couldn’t access. We now have data sharing agreements coming into place so we can share our data and build more refined models together. But yes, the QWC had more data for its model so whether it’s the same or different, it will tell us a lot about how good these predictions are.

63. So you might have to revise those?
It’s possible that in the supplementary EIS we will put in further modelling and more results. It’ll be interesting to see what the QWC comes up with. When you look at these large models, there are probably areas of similarity because we have the same conceptualisation system. There may be areas where we have differences because there are different conceptualisations of the system but modelling is an iterative process where you learn from each model.

64. I live about 20km south of Miles and saw a coal company rep in my area. I asked him why he was there when it’s all CSG. His response was that his coal company wouldn’t be there for about thirty or forty years. I then asked him how he was going to get long wall coal when there was so much water there. His response was that there would be no water there when the gas was finished. That’s what he said, there’ll be no water because it will all be taken out. Who do we believe?
There’s been a lot of confusion about dewatering versus depressurisation. When we were first out here some people thought the coals were going to be dried out; but you don’t need
to dry out the coals to get the gas. It’s like opening a carbonated water bottle, you reduce the pressure and the gas comes off. Because we’re reducing pressure a lot of the water comes from the expansion of the water during that depressurisation. I can understand your confusion; you’re getting different messages from different people.

65. What are make good clauses?

The QWC (or the part that’s been working on CSG, which I think is going to be called the GasFields Commission) has responsibility for the Surat Cumulative Management Area which covers all the CSG operations in the Surat Basin, and the southern part of the Bowen Basin. The QWC has done its own independent modelling which is coming out in a couple of weeks. Under its remit from government it is responsible for producing what’s called the Underground Water Impact Report which will produce maps similar to these – well we hope they’ll be similar. They will produce maps of impacts in the aquifers and will identify which areas particular tenure holders or companies are responsible for. We’ll be assigned an area including the bores in our tenures as well as outside them for which we have to make good if there are impacts.

The QWC’s model will nominate potential impacts are and it will identify which company is responsible. If it’s in our tenure then we will obviously have responsibility but if the impacts extend outside our tenure it will tell us which areas we also have responsibility for. We then have to put make good agreements in place prior to those impacts happening so the Report will give predictions for three years’ time, and a peak impact at any time.

66. If you aren’t within that area and experience a drop in water can you report that?

Yes certainly. If you experience a change in water level greater than the bore trigger thresholds, or a change in water quality (it’s not just water level, it’s water quality as well) and you think it’s the local CSG company you can go to the QWC, report it and then it’s the company’s responsibility to show what’s happened.

67. What will they do – go into the Hutton?

It depends, it’s a complex intermix of answers. There isn’t a single answer for any single bore because we have very shallow bores in the Condamine in some areas, bores a hundred or two hundred metres deep in the East, in the sandstones, and in some of the coal measures down to 900 to 1,000m deep like in the Hutton and Precipice bores.

In terms of making good, if you’re in the Hutton and Precipice, and you’ve a bore that has an 800 or 900m water column in it because it’s so deep; if that water level drops by 50-75 metres over a couple of decades we’d have a make good agreement in place that says we will put a new pump at a deeper level or we’ll extend your pump down to make sure that you get the same flow rate coming out of that aquifer.

68. I’ve had a ten metre drop already.

If you’ve had that sort of drop already and you’re on an Arrow tenure you can come directly to us, QWC or DERM. We can start putting make good agreements in place and deal with the issue before it gets even worse if we are the source. If you have experienced a drop in water level already, you don’t have to wait for the QWC Report. At a minimum if I were you, I’d ring the QWC and tell them what has happened. Are you on Arrow tenure?
69. **One half of my land is on Arrow and the other half is on Origin.**

And the bore’s on which one?

70. **Arrow.**

If it’s on Arrow tenure, we can talk to you afterwards.

71. **If that bore gets contaminated, or in the worst case scenario if those aquifers get contaminated, how are you going to provide water for stock in those areas in the middle of summer before they start dying?** You’ve probably only got four or five hours before those animals start dying. **Who’s going to take responsibility for that? You could have thousands of cattle die in the middle of summer in a matter of hours because of a contamination.**

That’s where the whole adaptive management framework comes in because, as you saw, ground water moves slowly, so we see impacts coming through from aquifers leaking. If you say it’s an issue of one aquifer leaking into another and becoming more salty, that’s a process that is going to take decades. So we predict the rate at which that’s going to happen and have monitoring in place so that it’s not just a case of waiting for people’s bores to change water quality or level and then responding to it. It’s a case of establishing monitoring systems early so they’re almost like sentry systems. They start closest to where you are and move out so you can see the impacts coming in. You can see if they are following the desired trends i.e. are the mitigation measures working? You can see those things coming so you are actually ahead of the game. You don’t want to be in a position where you are not looking for these things.

72. **What about what happened up near Kingaroy?**

That’s underground coal gasification which is a different process from CSG.

73. **Those people didn't have any water.**

It’s a different process where they’re injecting oxygen down into the coal, combusting it underground and then withdrawing the gases they want from the underground coal gasification.

74. **St John, is there any estimate (perhaps for 2020) how many farm, domestic, stock and irrigation wells within the five metre drawdown range will come on line needing make good provisions?** How many farms are likely to be affected? On your predictions you say we’re going to go below the five metres in three years’ time. Can people put their hands up now because we believe 5,000 farm wells will need make good action in the next three years; we’d like you to get to ours first. I can see people lining up as it could be a massive logistical operation if there are going to be 5,000 farms in any particular year needing make good provisions. Do you have any idea how many farms per year are going to come online needing make good provisions?

The first data we’ll be working on for that will be QWC’s predictions in two weeks; its *Underground Water Impact Report* will produce impact predictions telling us those bores which might be affected in three years’ time. That’s the data we’ll work from. We’ve been doing model refinements, looking at landholder bores and divvying them up into aquifers.
We’re still working through that so I can’t give you a number but we know we’re going to get that from QWC in a couple of weeks. We’re running through the available databases on the bores and seeing which ones are in the footprint of a particular aquifer. We then have to go through and check those bores against whether they really are in that aquifer, because one of the things we’ve found with the database is that about 25% of the data is really good, you can pick a bore and it will have all the details telling you exactly where it is. With other bores, you might get the depth of the bore and that’s it; it doesn’t tell you anything about where it is. We’ve had to go through the data several times to hone in on the actual number in a particular aquifer.

75. Would you recommend applying for make good provisions right from the start in terms of business opportunities?

Well if we’re looking at make good options which include drilling new wells, deepening bores, deepening pumps, it might be a good time to buy a few shares in those companies.

76. Could be a growth industry!

It could be.

77. Do the Walloons have a recharge area?

Yes…

78. Where does it recharge? You’re taking the water out of it; is it going to end up like the fellow over here said, there’ll be no water left and you can get the coal out of it afterwards. I’m a bit inclined to think that way.

It’s not the case that there’ll be no water in it; the field development plans require a pressure that brings the water down to just above the top of the coal. The predictions indicate there will be water in the Walloons although will that water pressure up near the surface be lowered. There are a number of outcrop and sub crop areas of the Walloon Coal Measures (generally on the eastern side of the Condamine in areas that have been dissected) so those are recharge areas for the Walloons and probably significant ones as it is rainfall recharge. We know there is the connection between the Condamine Alluvium and the Walloons because if you look at the water levels in the Condamine and the Walloons you can see areas along the length of the Condamine where the water levels are higher than in the Walloons which suggests water is recharging down into the Walloons. In other areas the Walloon pressure is higher than the Condamine so that won’t be such a large recharge area.

Those are probably the two main recharge areas. We’ve made estimates in our model of recharge rates but we’re refining those in our further modelling. We started off with four or five recharge areas in the EIS model; we’re refining those to give us better predictions.

79. I have a question about what you classify as recharge. In this area around Pelican and Burncluith it takes anything up to five years for that creek water to get down into the aquifers. I don’t know how you come to these judgements about Condamine and the likes because it’s just not accurate. I don’t know why you tell people these things when they’re just not true? With the ground water in this area it takes about five years from Charlie’s Creek, Rocky Creek and the like. That’s the estimate so I don’t know where you get your information from.
You’re talking about deep drainage recharge?

80. Yes recharge.

There’s some deep drainage recharge through the clays; in other areas where it’s more alluvial and permeable the recharge is faster. That was one of the interesting things we saw from looking at the response to the Condamine in the 2010/2011 floods; the data from that showed an average 1.8 metre increase in water levels across the Condamine. That’s not the only recharge; obviously you’re right in relation to those clay areas, that deep drainage process takes a long time, tens of years. I think it was the CSIRO Sustainability Model of the Condamine, or the KCB one, that used a structure in the Condamine of sheet wash and alluvium to model those recharge rates.

Clarification: in sandy permeable areas recharge can be relatively fast (in groundwater terms), in clay areas deep drainage recharge occurs slowly over years. However, as its ongoing recharge is still occurring i.e. infiltration from five to ten years ago may be seeping through clays to groundwater now. Current infiltration will take years to travel through, while recharge is still ongoing at varying rates.

The KCB water balance assessment of the Condamine Alluvium undertaken for the Qld Government estimated recharge in the Condamine as:

- Recharge of 2.5-5.1 ML/annum/Km2 via Streambed Recharge
- Recharge of 0.3 ML/annum/Km2 via Rainfall Recharge
- Recharge of 0.1 ML/annum/Km2 from irrigation deep drainage recharge indicating the relative amount of recharge via different mechanisms.

The recharge system is complex and not yet fully known in intimate detail e.g. factors such as the amount of recharge that gets to the shallow aquifer and the time lag between infiltration and recharge reaching the water table and the variability of this throughout the Condamine between alluvial tributary, sheetwash and alluvial areas. And the appropriateness of scaling from testing at point locations to extrapolation across large areas requires consideration. Arrow is undertaking monitoring at both detailed scale and through broad geochemical assessment to understand these issues.

81. My question is in regards to bacteria in the aquifers. I asked about this previously and you said there are bacteria in there, which I knew previously anyway. I’m trying to find out what species it is, and is it controllable by antibiotics? And if something that’s been down there for hundreds of thousands of years, what effect will it have if it comes up?

My understanding of what quality testing has been done is in relation to Sulphate Reducing Bacteria (SRBs) and micro-organisms that will potentially affect infrastructure e.g. pipes.

82. So there’s no effect on live stock or humans or anything like that?

They will be removed 100% through the water treatment process.

83. Can you guarantee that? Because we can’t trust mining companies.
Yes, I can. They will be 100% removed through the reverse osmosis (RO) process.

Right, I'll take your word for it for the time being.

84. Can you guarantee that all bacteria will be removed by the RO membranes you use?
Yes that's correct.

85. No exceptions?
Only if there's an integrity issue with the membranes which we'll pick up on very quickly and shut it down.

86. So if there's going to be an RO plant built and water reinjected with added minerals and salts to bring it back to what was originally taken out, what's going to happen to the brine that comes out of the RO process? This seems to be an ongoing question to which I haven't received an answer.

Currently there's an enormous amount of work going on in relation to brine disposal and management. The current base case will be selective salt precipitation, so we'll be producing a sodium chloride product. That is still in the options phase so it has yet to be determined, but the base case is to produce a viable product.

The EIS presents a couple of options. It says that our base case in the EIS for the brine is disposal to a land fill. And when we say land fill, we're not talking about land fill in the dams where it is, we're talking about taking the salt and removing it to a waste facility independently regulated by the Queensland Government.

The salt precipitation is about looking for a beneficial re-use for the salt so it's about considering how we can make it into a resource whether it's salt precipitation for chemical manufacture or whether it's common table salt, they're the options we're looking at.

87. I asked about that subject last time. Your EIS says that Arrow alone is producing 25 gigalitres (with all the other proponents, that's 125 gigalitres) but Arrow's water alone is estimated to produce between 90,000 and 190,000 tonnes of salt a year. Is that correct?
Yes that's correct.

88. That's 90,000 to 190,000 tonnes of crystalline salts. And it's not all Sodium Chloride (NaCl) as you know because there's sodium, chlorine, bicarbonate, magnesium, etc. It is a mixture of salts, not just sodium chloride. So let's say the figure is about 140,000 tonnes on average. I estimate that is 3000 B-doubles of salt to be transported to a landfill from Arrow's operation alone. So if you want to extrapolate that to all the proponents, you're probably looking at five times that, so 15,000 B-doubles carting salt to landfills. Now if that doesn't cause an impact on roads, I'm not here. It's a massive issue that has not been resolved. People have been finding beneficial uses for this stuff ever since I've been involved in the debate and I don't think they're any closer. I would like to know, in the absence of a plant, even if you do get a beneficial use, how's this stuff going to be carted out of here on these roads. You take your life in your hands at the moment, Tony, on these roads. In fact people think twice about
driving to Brisbane. I’m a great Reds rugby supporter and I used to go down there regularly. Now I think twice about the hassle of driving down and back because the traffic is impossible and you take your life in your hands, you really do. It is not only impacting on the roads, it’s starting to impact on our lifestyle as to when and how often we want to travel. It’s a real issue, it just adds to the stress, I can tell you.

There are a few issues you touched on. Don’t be under the misapprehension we don’t understand the significance of the salt and brine issue. As Brad’s outlined, there’s a lot of work going on. Our preferred solution is to make use of that salt and create another product from it but the important thing is that we are working towards a solution on that front.

You also talked about roads, transport and access which, as you know, is a separate topic but I do see how they link together in terms of transport, not just salt, in this particular case because there are pipes and other equipment to move as well. That’s part of the studies we are doing on the roads and across the region. It’s not just us, the government’s conscious of this too. I want to be clear we haven’t overlooked the salt issue. It’s not new, there’s a lot of work going on. The numbers are large, but everything about this project is large. The scale is huge but the solutions, the investment and the work we’re doing are also huge. We believe we’re a match for this challenge that we have. It appears overwhelming but it’s not.

(See Figure 6 on page 8) The roads marked in red are those carrying the biggest volumes of traffic. The traffic study looked at the composition of the traffic and it that basically breaks down into light and heavy vehicles. The heavy trucks carrying equipment and pipes would be the ones you are concerned about. But they include trucks carrying the salt because they were identified as a large traffic load.

There was a set of calculations done based on the worst-case production of brine and salt, using no salt precipitations (as using selective salt precipitation reduces the volume considerably). We assumed worst-case where the ponds have to be dug out and the salt carried away to a registered landfill somewhere else. The assumption was that that landfill was at Swanbank, near Ipswich. It doesn’t all happen at once, those ponds are designed to carry the volume for quite a long time. So retiring those ponds begins to occur around ten years before the end of a facility, and progressively from there on. When you look at the profile of the traffic it amounts to about four to six B-double movements a day when Arrow starts to clear out those ponds and takes the salt to a registered landfill. It’s not thousands of trucks, it’s in the order of hundreds over a year based on the volume of salt, what a B-double can carry and the period of time over which it needs to be moved. When you consider that the production facilities are spread out over the whole project area, and come online progressively over the 30 years or at least over the first 15 years as they ramp up to full production. They are then progressively retired as the ponds reach capacity and that will happen over a long period of time. We won’t get to a point where we suddenly have to clean out all the ponds, so the volume of traffic will be spread over 10-15 years. That 190,000 is across the whole project, it’s not per facility. When you consider it’s a lesser volume and from parts of the project development area at different times, the equation we worked out gives four to six truck movements per day when Arrow begins to clean out those ponds.

89. So that’s just Arrow?
Yes but if you say a similar scenario exists for the other players in the region, then it will be four times that so it might go up to 16 to 24 trucks a day.

90. **A few years ago we were told there wouldn't be any more of these evaporation ponds.**

   They’re not evaporation ponds.

91. **No they’re transfer dams, it’s the same thing.**

   They are...

92. **You’ve only changed the name. They’re the same thing.**

   No they’re not. Evaporation ponds are where you put the water, the produced water, and then you let it evaporate and it leaves the salt.

93. **Do you put covers over all those dams?**

   This is a concentrate, a heavy solution. It’s the brine concentrate from the RO plant so it will solidify in the base of the pond progressively.

94. **What about the ponds holding the water before it goes into the RO plant?**

   You’re raising the issue about whether they’re aggregation or evaporation dams. There will be natural losses through evaporation, you can’t avoid that, but we won’t be covering the dams. In all our fields the water will be gathered, sent to a central processing facility where there’ll be the feed water dam, the treated water dam and the brine stream. That’s the way they’ll be managed, they won’t be evaporation dams. We’re in the process now of installing new infrastructure on the way to making that happen.

   As you pointed out earlier, the issue then is what is the cumulative effect across all the projects? That’s what this list of roads down the bottom is. We did an assessment of the Arrow effect and then we looked at what the other projects would do to the road network. Where you see the red lines on that map is where the traffic is going to become concentrated as a consequence of Arrow’s development. You are more familiar with the local road network than I am but I think you’ll find most of the roads highlighted there are listed because of the cumulative effect. These are the roads that are going to experience localised congestion and an increase in traffic as a consequence of all the projects. The reason for identifying those roads through the study is because they are the roads which are now the focus of the cumulative assessment with the Department of Transport and Main Roads (DTMR) as to what has to be done over the next ten to twenty years to make sure these roads don’t reach a point where you can’t operate your business as well.

95. **How come the Warrego Highway isn’t in red on the map?**

   That’s because it’s the Arrow only scenario there on the right *(See Figure 6 on page 8)*. I apologise I don’t have a map here for the cumulative solution. The reason it’s not in red is that Arrow’s traffic, because of the project’s development, is distributed off earlier. Arrow’s development is down the bottom here in the Tipton area and as you’ve seen in the diagrams Tony put up earlier, a lot of the early development is around moving out from Tipton and Kogan and those areas. So the traffic is turning off at Dalby and heading south west, it’s not running to the north. It’s only when traffic goes to the north-west, up into the Chinchilla,
Miles, Wandoan area, that you start to see congestion on those roads, or increased traffic as a result of Arrow’s activities. But as you know, QGC, Santos and Origin are operating here now and they’re creating traffic issues at present which (as it shows in the bottom) will be contributed to by Arrow. These roads are the ones expected to experience the greatest increase in traffic, and therefore issues around safety as well.

96. I’m a third-generation family farmer. I only own 1,000 acres, but it's in 25 paddocks and well-watered. It’s predominantly Brigalow to Brigalow melon holes. I want to follow up a couple of things brought up earlier about National Vendor Declarations (NVDs) for stock and vehicle washdowns. You can wash a vehicle down here and you can do a good job. You can get a certificate and come out to my place. But the tyre grooves can have sand burr by the time you get onto my place. The running boards could also pick up African love grass from along the highway. If you now come onto my place I can get those two weeds. With all this well development, it appears you’ll have a gravel road linking your wells?

Quite likely, but can I answer some of those other issues before you keep going?

97. Yes.

In relation to coming onto your property, there will be one-on-one arrangements with each landholder. In many cases that will also involve us leaving our vehicles outside the gate and using clean vehicles you’re happy with just for traversing the property. Part of our policy is that any time we do leave a sealed road e.g. we’ve gone onto dirt roads and areas where you can pick up weeds, a wash down is required. But there is the option also to use only clean vehicles that are used only on your site. Those vehicles don’t leave the site until it’s time to go again.

98. So you’ve got an employee in a four wheel drive running a trap line once a week to check the wells. Is he going to have a portable wash down to come onto my place, then a portable wash down to go into the neighbour’s and then a portable wash down to come back into my place before he leaves?

It wouldn’t work like that. Obviously there wouldn’t be a truck with a portable wash-down following them around when they’re just going in to check on wells. What they need to ensure is that their vehicles are clean each and every time they enter, and they need to give you that certification. So they may not go directly from one property to the next. It’s a matter of what they’re doing that day, how they plan it out, and how they manage it. Those arrangements have to be in place and they’re agreed with you as the landholder. There is a statutory process to go through which they have to demonstrate they’ve met.

99. You’ve got your heavy trucks and you’re building a gravel road to connect your well heads. That truck is ten kilometres up the road. You get your load of gravel from the pit, it comes down a public road with African love grass on it. It comes into my place and it dumps the load, and it goes again?

As I said earlier, if that’s the case we need to put some management practices in place to manage that field properly. That’s the sort of thing you’ll be talking about with the land liaison officers early on in relation to our proposed activities and how we go about them, and appropriate mechanisms we put in place to make sure you’re protected. It’s our obligation.
100. I think that’s a lot of bull. I cannot see any way it’ll work. We’ve got resource companies working in our area now, and it is a joke. It looks terribly good on paper, right? But it’s a joke when it comes to keeping my place, a third-generation place, weed-free. It is nothing but a joke.

What we aim is not to expose your property to any greater exposure than you have currently. If you drive on that public road between that place and your place, and it’s not an issue for your vehicle then we would treat it as the same. Where it is an issue, we will treat it differently. We’ve also been talking to DERM about the procedures we have in place, and it has confirmed Arrow is the only company with the extent of such procedures in place. The processes are robust and Arrow has and will implement them, we’re very committed to doing that. We can’t afford to infest your place.

The EIS does mention that if we introduce pests we must remove them from the property. That’s already in place now as it was before the EIS because it’s our obligation to do so.

101. So you’ll get them off my property at your cost.

If we introduce them, yes. We absolutely have to.

102. Now we come to the NVDs. I’ve been to a stack of meetings, and we can’t get any guarantee where we are with this National Vendor Declaration for stock. If you go back to Kingaroy, fair enough the government shut down the plant and all the rest of it. I do believe the stock was looked after. But wasn’t the poor landowner tied up for about three months while the company, DERM and DPI fought it out? In other words, they were sitting with stock they wanted to sell but were landed with them.

We did talk about that one earlier. Underground coal gasification is a very different industry and contamination potential is very different to CSG. Arrow has recognised this issue and has had experience in it. We’ve had one landowner who was concerned his stock were exposed to contaminants from a drilling mud pond. We undertook to have those animals tested, we did that, and there was no issue. But we absolutely acknowledge this is a very important issue, not just for stock, but also for organic farmers who need to maintain their status so there is a whole range of things that needs to be considered and protected.

103. If you test the animals and they’re contaminated with your chemicals, are you going to take the onus on clearing our name with the NVDs, and recompense me for the damage done to my name and property? Is that right?

The extent of what we would do in relation to NVDs is not something I’ve looked into. Under the legislation we are responsible if we’ve had an impact on your business so we have to compensate for that.

104. And you would put that in writing in any agreement?

My name is Julian and I’m the Land Manager. My guys are the ones who go out and negotiate agreements with landholders. We have a number of agreements in the Bowen Basin with landholders who have large cattle businesses. The issues you’re talking about are definitely very similar to the ones up in the Bowen in the sense that they have European Union etc. accreditation for meat. On a number of occasions we’ve put into our agreements the list of chemicals that would be taken onto land. Every time we bring something on, we
have those discussions with the landholders. Currently we’re talking to one of the accreditation groups about being able to spread a particular chemical on the property as it has the potential to impact on those accreditations so we’re going through that process. It’s a chemical that makes roads a bit firmer. It’s based on termite excretions, from what I understand, so that comes as an added benefit not only for us but also for landholders in using their roads. We’re going through that with the chemical company at the moment so we do understand the accreditation issue and make sure we have those discussions with the landholders. Here in the Surat where landholders have concerns about bio-security, we’ve set up bio-security cleaning stations outside properties. Before our vehicles went into the feedlot they were all cleaned. So it is something we definitely recognise and understand its importance.

105. Roughly how often would you be visiting that feedlot?

We put that station outside the feedlot. It was a condition of entry that every vehicle had to be cleaned before it entered the property. It held up our drilling operation for about a week while we made sure we got the right equipment there as per the landholder’s requirements to be able to do it properly, so it was in order.

106. My question is on the strategic cropping land. Could someone enlighten me on its relationship to heavy and fairly dense Brigalow melon holes, or as you Mexicans call them ‘Gilgai’. From the different EIS maps I’ve read, I’d probably fit into a Class B soil.

On good quality agricultural land, you’re probably right. You might fit into Class B which is partial cropping land, from what you’ve explained about your property.

107. Well, I do crop.

Class A is full cropping land so as you said you’re probably sitting on Class B good quality agricultural land. The way we’ll determine if some or all of your property is strategic cropping land (SCL) will be how the property is assessed against SCL criteria. I don’t have the criteria with me but if you look at the regulation on the website you’ll see that you’re in the Western Downs zone of the two that cover the area. To satisfy SCL criteria you need to have a certain Gilgai micro-relief. It will be a percentage of the property or a paddock of it on the property. If you’ve a paddock that’s perhaps 70-80% Gilgai micro-relief it may not be classified as SCL. If you’ve got a nice, clean paddock with no rock and it meets those soil depths and criteria, then very likely it will be SCL. Probably the best indication you have without a formal assessment is to look at those criteria. You’ll need instruments to know soil chloride content and things like that. You’ll see from the perspective of rockiness and Gilgai micro-relief, there’s a percentage of a property or a paddock that can’t exceed that soil chloride content. The way the criteria work from my understanding is that if you don’t meet one criterion then you’re not SCL. You must meet all of them. If for instance you meet all the other parameters, but your Gilgai micro-relief was so bad you exceeded the limit set for it, then you wouldn’t be SCL.

108. I’d just be that good quality agriculture land?

Correct.
109. **What is Arrow’s policy then for putting a well in a heavily melon hole paddock of Brigalow soil where it’s even difficult to put a water pipe in. A massive bed will have to be built as well as a massive bund constructed around the well for safety purposes. I don’t know how you can bury a pipe in ground that’s like this. We developed it when I was about 14 and it was so bad the shearer plough used to jump around and come up into the crawler tractor, and you had to push it back again.**

I understand what you mean. I’ve flown over this country so I know exactly what you’re saying. Gilgai does present an engineering challenge but it’s not insurmountable. We’ve a lot of pipelines and flow lines that go through Gilgai country. It translates into the burial depth because the risk to the pipes from the Gilgai is by virtue of its shape, size, etc. Arrow will bury the pipe down below the depth at which the Gilgai and the shrinking/expanding can cause problems. That’s common pipeline practice throughout Australia. There are numerous photos I could show you of pipelines going through severe Gilgai micro-relief up in the Bowen and elsewhere. They overcome it by generally burying the pipeline deeper and it will be similar for wells. The well is a vertical hole so it’s not going to be exposed to the same stresses as a pipe laid in the ground. As the clay heaves and shrinks, it’s generally moving up and down in a vertical plane as opposed to the pipe where it’s lateral which is why Arrow will bury it deeper to overcome the stresses the cracking clays apply to the pipe. There are proven and tested methods for building CSG and gas infrastructure generally in Gilgai country.

110. **Can Arrow bury the pipe and return two feet of black soil back on the top?**

Yes, it can. The photos I put up earlier shows that it can be done. *(See Figure 7 and 8 on page 9).* That wasn’t Gilgai country near Gatton; it was black soil floodplain. But the same applies because it’s how you separate the soils as you bring them out. You remove the organic layer and topsoil separately, and then you separate out the subsoil below that. When you lay the pipe you put the subsoil in first, compact it back as best you can, and then bring in the topsoil on top of it. You treat the topsoil, as I said, on the basis of the advice received and the standard measures for deep ripping, harrowing and cultivation to get the soil structure back functioning, as well as the organic and biologic processes functioning. Then you sow it, and if necessary fertilise it to bring back the productivity. So yes, it can be done.

Gilgai country is a bit more difficult. As you know, the melon holes will reappear so you’ll have some diminished productivity there because of that but you’ll be dealing with that on a daily basis anyway.

111. **Can you go through vegetation that’s marked ‘red’?**

*(See Figure 3 on page 5).* That comes up highly constrained on here. As I explained earlier, it doesn’t preclude putting pipelines or gas wells through it. The constraint maps are designed to avoid that where possible but they can still be put through it with specific management measures. If we clear Brigalow out here, there is a moratorium on it under the Commonwealth Environment Protection Biodiversity Conservation Act. It’s also listed in Queensland. If we clear any Brigalow we have to do an offset so must replace it with an equivalent amount. In the case of the Commonwealth it’s a multiplier of ten so if Arrow clears
or degrades one hectare of Brigalow it will have to find ten hectares of Brigalow as restoration. That means there’s an incentive for Arrow to try to avoid clearing Brigalow.

112. **When you offset what does that mean?**

   Basically, you can’t use Crown land. Generally what happens when we look for offsets is we’ll purchase degraded land from a farmer who doesn’t want it, or is interested in getting out of the farming game. This is usually partially cleared country because the maximum value you get from an offset is in bringing something back. You can’t just take a bare paddock like the football pitch out here and plant it out in Brigalow. You can, but it takes a long time to accrue the value under the offset strategy whereas if Arrow buys a bit of country where the Brigalow has been pushed over and for economic reasons the farmer decided not to develop it, if Arrow buys out that country and lets the Brigalow come back and helps it by keeping the weeds and cattle etc. out, you will get recovery not only of the Brigalow, but of the ecosystem. In a quicker timeframe you’ll achieve the benchmarks for achieving an offset. As you can appreciate, there are costs associated with that. Arrow can find and buy a property; inject money into it; control exclusion of threatening processes like cattle and feral animals, pigs, things like that. Then Arrow has to manage it for a period of time until DERM agrees that it meets what is called ‘remnant status’ or it has achieved some semblance of what’s been taken away when the Brigalow was cleared. It’s a costly, time consuming process. The reason it’s highly constrained on the maps is because it encourages Arrow to look elsewhere; it doesn’t want to incur those costs if it doesn’t have to.

113. **What was your area in square kilometres? It was 8,000-something, was it?**

   8,600 square kilometres.

114. **How many wells were you going to put down in that total area?**

   7,500.

115. **So that’s one well roughly per square kilometre.**

   Correct, very roughly, yes.

116. **So you’re saying 800 metres apart?**

   Arrow has indicated it needs to develop about 7,500 wells in that area to achieve the production it wants over the life of the project. Earlier I spoke about the 2,500 to 3,000 wells achieving sustainable production. Concerns were raised in some of the previous sessions that there will be a massive drilling campaign to put 7,500 wells in and then it’s going to stay at that. That’s not the case. Arrow will ramp up to 2,500 to 3,000 wells to achieve sustainable production; some of those wells will retire as they exhaust the gas resource, and Arrow will then bring on other wells. But over the life of the 35-year project, you’re going to have 7,500 wells drilled; it doesn’t mean they’ll all be operating at the same time. You will have some areas being developed as other areas are being retired.

117. **That means if you live in that coloured bit going down there, and you own at least a square kilometre, you’ll have a well on your place. Is that right?**
Not definitely, but yes potentially. The reason, as was indicated earlier today, the 800m is the conceptual well pattern to achieve the output. As Tony explained, investigations are indicating that might be up to 1,500m.

118. With that new system with one well every 800m.

Yes, that and also proving up the gas resource. You may find that there's a lot less wealth.

119. That means you could be on the neighbour's property but take the gas from underneath my place and I get no compensation. Do you understand what I'm saying?

I understand what you're saying. Unfortunately in Australia you and I don't own rights to the stuff below the ground, the government does.

120. I understand that. If we're going to be compensated, can you compensate us now instead of 30 years' time? I'll be dead then so I would like the compensation now, not in 2065, so I can go to the Gold Coast. You understand we're being told that production will end in 2060, and it will peak in 2030, is that right?

It will be 2020.

121. Oh, well, I'm not dead yet, but you know what I mean? We're having all the scares now so I almost think you should start compensating now while you are scaring us?

One of the dilemmas of trying to explain this type of development which is different to a mine or a power station that sits in a fixed spot is that it’s like a construction period extending for twenty years instead of four (e.g. the LNG plants on Curtis Island will be built in four years so all the impact associated with its construction will be over in four years). The construction impacts for the Surat Gas Project extend over a much longer period of time, right up through 2020 and beyond. However, they are small incremental impacts. It's not 7,000 wells in five years, there’ll be incremental small development over a period of time. The peak of development is going to be the concurrent development of facilities. You might see a facility being developed in the Chinchilla area at the same time one’s being developed down near Millmerran for instance so you’ll have two facilities being developed at once, possibly in geographically different areas. When we spoke earlier about the road network and the CSG impacts on it I got some reaction to the comment I made last year when I said the overall Arrow traffic for the project is within the growth predictions of normal traffic growth in the area. That’s because it’s spread over such a long period of time and is geographically diverse through that huge area you see there. So the traffic’s not being concentrated in one area or in a short period of time, it spans a long period of time.

122. I'm told I have an area for a possible three wells. If that's going to happen in my lifetime I'd like it to be over and done with now. I could enjoy the benefits of how much you're going to pay me per well, considering Telstra pays $6,000 a year for a fibre-optic tower and the showgrounds have been offered $6,000 a year with increments for a 10x10 metre spot. You fellows are going to be real good to me!

My question really arose out of the fact that last night after that big meeting at Cecil Plains, Mr Morgan and I went to a meeting at Columboola with 25 people. When I walked in and looked at their faces, I saw they were pretty distressed. They're having real problems with a particular company, QGC. I had been asked to come along that
night to deal with some complaints that I will tell you about. QGC said it was coming. At 4:00pm it advised it couldn’t come.

There were a few people in particular who I estimated were getting very close to depression. I know a little bit about depression, as does Mr Morgan, because we’ve both suffered from it. Being a vet I can look at animals and tell when they’re crook. As a relatively intelligent human being who has had depression, I’m getting pretty good at picking it in people’s faces as well. Last night, it stalked that room. One lady in particular with 1,000 acres has a 42-inch QGC pipeline that’s been laid out across her property supposedly for twelve weeks but it’s now going to be there for twelve months. It has gutted her enterprise. It has wrecked her fences so dingos have entered the property and killed 130 sheep. Some of her cattle have walked off but she can’t get any satisfaction. She was at her wit’s end when she came there last night. She was hoping to talk to QGC and it didn’t even show. That is why many landholders in this area despise CSG companies now. I know Arrow is trying to do a lot better but that’s the backdrop to the environment you’re working in. I was tired when I went to that meeting but when I came away I was fired up and angry. I can’t walk away from that sort of situation and it’s why I’m going to continue to be involved in this debate.

Mr Morgan, who decided on a change of life after experiencing depression, wants to do something for this problem that stalks rural Australia. Depression does stalk it, it’s there all the time. Methuen went back to the University of New England to study psychology to try to understand how to help rural populations. He came up with this survey with his professor and his supervisor, world-renowned statisticians in measuring social phenomena and sociology. I know the effort he’s put into this and then in the Australian, APPEA comes out and bags it via tricky-Ricky Wilkinson who’s not worth feeding in my view. I don’t know why APPEA pays him $500,000 a year to lead it nowhere. APPEA comes out and bags a highly credible academic exercise by someone who wants to do something about rural Australia. The CSG industry has to do a lot better than that if it thinks it is going to engage with rural Australia for the next 30 years. We have a life sentence, like a forced marriage. There are laws against it in every country in the world, but it’s being reintroduced here. It’s a forced marriage, and you marriage partners are going to have to lift your game because there are going to be divorces if you don’t. There is a severe social impact, Barton, and you agreed with me when I raised it with you. I hope you know what I’m saying and I hope you do something about it.

We understand as much as we can but we’re not from here so we’re not trying to say we have your depth of understanding. That’s one of the reasons we come out here and talk to the community. We’ve done this a number of times, it’s a regular event, and we’re committed to keeping these going. But this is just one way to contact us and for you to learn who Arrow is. You get to know the likes of Barton and the Arrow people around the room. The land officers are also here...you can start to know these people by name. The boss of the land team is here. There are different people here you can meet and understand what they do.

However, we recognise there are other issues in regional Queensland and Australia e.g. commodity prices, fuel costs etc. Within the bounds of what we can influence, we’re not saying we’ve got it right but it’s why we’re out here. That’s why we’re doing these studies.
1. Thank you for those presentations. At present, we are dealing with the EIS approvals process and I’d like to understand how our submissions are handled by government and by Arrow, and what response the submitter gets to his submission and also what input the community has after the EIS approval through the planning and design phase and the construction and operation phase.

In other words, how does the whole process work over the next few years from today to a well being constructed on my property? Perhaps you could explain that to us?

After 14 June all the submissions presented to DERM (now called DEHP) are provided to Arrow and to the consultants, Coffey. We will look through those submissions to see what concerns, comments and issues are raised in them.

Typically they will fall into three categories:

- submissions where people simply haven’t been able to find the information in the EIS; we will respond to these by saying where it is located and that we believe this answers your question or your concern.

- issues where people have struggled perhaps to understand the science or the information that’s provided; we will provide some clarity around that and explain what the EIS is saying.

- submissions which will raise questions that may not have been addressed in the EIS; we will work through those questions and determine whether they have been picked up in some of the other work that’s going on through this process, or whether we need to actually bring them into the impact assessment and assess the impacts associated with that issue.

A supplementary report needs to be prepared after the EIS. It deals with what we call information gaps; if you look at the recommendations and conclusions chapter of the EIS you’ll find that we noted some information gaps and said there is ongoing work in these areas.

We have sufficient detail to understand the impacts, what they mean and their significance, however, the impact management required will need some further investigation.

So the supplementary report will respond to this ongoing work, it will respond to the submissions in the three ways that I’ve discussed, and it will deal with one other aspect. If Arrow has changed its project description between when we submitted the EIS for your
comment and now, we will report that and whether it triggers what we call a material change in the impact assessment. In other words, is the change that Arrow has proposed within the bounds the EIS has identified as the scale of the likely impacts or is it new and therefore requires more assessment? If it requires more assessment, we will do it and it will be reported in the supplementary report.

So as we’ve said, the first phase is the very broad impact assessment level where we potentially identify all the project activities. The next phase, assuming Arrow has received in-principle approval to go to the next stage, is obtaining its licences, environmental authorities and those sorts of things.

So we continue to do the work that we currently do with our existing projects, where we have to engage with each landholder individually, and go through the licencing process. It is at the environmental authority application stage where the detailed impact assessment work will be done on each property where we'll be working. That’s when we actually engage with you about any special requirements, any special environmental values you might have at the same time.

Those environmental authority applications will be subject to public notification which will be the time for people to have further formal feedback into that process. We will continue to have the existing engagement forums, our community sessions like this, and other means of communicating with the broader community about the project as it develops.

2. Thanks Barton and Andrew. It’s good to hear that you relinquished 700 properties under ATP683. Firstly do those properties still go through the EIS, are they in the EIS boundary or are they totally out of it?

And, secondly, what are you doing about the tenures to the north such as ATP676 that have Strategic Cropping Land? Are you going through a similar process there and if so when is that going to happen?

I'll just answer the very first part of your question. (See figure 13 on page 13). The EIS assessed all the green area so everything in that area, whether it's been now relinquished or not, was covered by the EIS. We will update that in the supplementary report to show the areas originally covered in the EIS that have now been excluded. The impact assessment you see covers the totality of that green area.

3. So a lot of the focus was about ATP683 which was to the south of Dalby. What about those areas to the north? Will they go through the same process for the relinquishment of properties? Is there a timeframe for that or is it just a case of wait and see?

Some of the Arrow team have been drilling exploration wells in the area you are referring to, so it’s around the Warrego Highway. If you look at that green polygon on the diagram (see figure 13 on page 13), it defines Arrow’s arc of tenements which stretch from Wandoan in the north to Goondiwindi in the south. They sit on the easterly boundary of the Surat Basin.

There’s a certain point at which the coal doesn’t hold enough gas to be viable for us. That’s what we are trying to pin down which is why we’re able to give back the ground that we did under ATP683. In September this year there’s a date for us to meet where we'll do the same
sort of thing in ATP676 which is that area to the north-west of here. It’s an ongoing campaign of exploration work and you’ll see the results of that later this year.

4. I do think Arrow has (well, NR&M made sure they did) tightened up on its drilling. I think there was a lot of damage done out there initially, I’ve got a report to prove it. One of the big problems I feel with what you’re doing is that you’re not offering landholders enough money.

The amount of money you are offering equates to three weeks’ wages of some of your top staff. You expect to drive all over the land for that. What you are offering is probably one load of fuel coming in for the next month or two. You are spending all this money, you are doing all these sorts of things, but you are just not offering the farmers enough money. I think you should be offering at least five or ten times as much as you are offering.

We try to be fair in our compensation to landowners for work that we do. There’s a process we go through to figure out the impacts and what we regard as a fair compensation amount. We look at the type of land that it is, the uses of that land, how long we’re there for, the activities that we’re conducting, that sort of thing.

We have to be consistent over the region so that we are not favouring one person over the other; we’ve got to be fair across the areas we operate in; that’s our basic approach. I take your comment on board and your feelings about the level of compensation, but we do try to link the compensation we pay to land value and to make sure you are not out of pocket as a starting point.

We have also raised as a discussion point the concept of compensating beyond our impacts, but that’s a conversation we haven’t had yet. It’s something we talk about in our committees, for example, as an idea about where you’re heading in terms of making it a more attractive proposition. That will differ for different people and different operations across the regions in which we operate. That’s a work in progress but as I said we will take on board your comments today as an indication of the sentiment out there.

5. You’re just not offering enough money, especially on good cropping land, because it’s worth at least ten times what you are offering.

Regarding the controls in place can I ask Arrow the management measures for its drilling contractors and if they reflect your land access rules?

The land access rules apply to all staff and contractors, we apply them equally. Those rules are intended to be in effect in regards to the way our people operate and represent us. We are very conscious of the behaviour of contractors because in effect they are our people so we have to ensure they behave properly. We are very uniform in our application of those rules. If people don’t adhere to our land access rules we have a disciplinary process; staff and contractors who don’t adhere to our rules don’t work for Arrow.

6. When you were speaking about the significance and the environmental sensitivity of things, you mention flora and fauna, farming, water and a few other things but you didn’t actually say the words house or home, although you did follow through with that later on when you and said that the purple dots were people’s homes. I really
think that a man's house is his castle; one of the main things to be considered is whether these wells and everything else are happening close to a home. I don’t live in the country but I would imagine people do so because they want peace and quiet. I think it is very important that the proximity of homes to drilling etc. is avoided and in that sensitivity section you mentioned there needs to be at least something about a house or a home.

Thank you. There is reference to them, although in the impact assessment they are called sensitive receptors. We don’t just refer to them as houses because from an impact assessment point of view they are classified as sensitive receptors along with hospitals, kindergartens, nursing homes etc. In terms of how we deal with that in the impact assessment, it’s recognised in a number of ways. It’s recognised through the socio-economic impact assessment which looked at what I think you are alluding to i.e. people’s livelihoods, their homes, their place where they go at night and seek some refuge. The socio-economic impact assessment has dealt with that. It’s worth noting that it’s not just loss of services and things like access to doctors, education etc. which you would expect, but it was also identified that as your community suddenly experiences this growth the anxiety associated with it and the uncertainty are high social impacts of this development. We also deal with sensitive receptors in the air quality and noise sections, so the whole assessment around air and noise is all about sensitive receptors.

7. As a councillor, one of the things I hear most is that it’s the effect on the home and the close surrounding area.

Yes, we understand that. We have undertaken not to drill within 200 metres of a household. Barton will talk through what that means in terms of noise and attenuation measures later on but we also have one-on-one negotiations with landholders about how and when we access their properties and the issues that relate to the disturbance you are talking about.

8. I am actually quite intrigued as to know (after pouring over the maps and EIS) why you don’t have sensitive receptors on your own properties marked e.g. the houses that your employees occupy on your farms are not shown on the map. I would have thought you were as sensitive to your employees as you are to your neighbours.

I’ll let Arrow speak to its relationship with its employees and how it protects them. The sensitive receptors you see there are only the first pass. It has been raised in the last couple of days that we don’t have all the houses on the map. The reason we don’t is because there is a process by which we identify houses; the mapping you see there is based on two sources at the moment. Government mapping is picking up about 80% of the houses but there have been a lot of new houses built, possibly houses on Arrow properties. We’re in the process of ground truthing the whole of the project development area in terms of where the houses are; we do that by a combination of satellite imagery and high resolution imagery and then ground truthing where we drive around the public road network and try to resolve (if we can’t work it out from the satellite imagery) whether it’s a house or a shed for example. The intent is that this year Arrow will have accurate locations of where all the houses are, including on its own properties because the guidelines don’t differentiate between them.

There is no difference between Arrow employees and anyone else, so if there is anything missing we’ll ensure it is captured.
9. Re the 200 metres, it might sound a lot but when you are out on a property 200 metres is not a big distance. You talk about the amenity value of our properties, there’s visual, there’s noise, there’s activity. 200 metres is not far from a person’s home; if you want to gain a social licence and acceptance in this community you have to consider giving people a bit more space around their properties so they have the view they have treasured all their life and can see their farm without gas fields or strangers operating on their properties. It’s something you have to take serious note of...people want more space around their properties for the privacy they have enjoyed in the past. When we hear we are only compensated for out-of-pocket expenses losing that visual aspect and security is a big cost to us. We’ve had those in the past and I think you must take that on board they are important issues for our community.

I might just respond on the 200 metres because obviously it’s a sensitive issue. There is no mandated number as to how close Arrow should drill; it created the 200 metres as a minimum. We’ll take on board your comments so that if we need to get in close to a house we would have to put other measures in place, that’s fully understood. Don’t think that you will be seeing rigs with noise and light all around the place in close proximity to houses. We are just trying to put some dimensions around it, but we absolutely understand the concerns from people living in those houses when we are working nearby.

10. It just sounds to us as though you want every last drop of gas that’s in the ground. We operate our businesses to be part of the environment and we’ve got trees which we could have cleared in the past but we didn’t. We enjoy and protect our environment and I think you’ve got to take on board that you may not be able to access every drop of gas.

When you talk about that 30 year project and the 20 year recovery, will there be total recovery in 20 years, including the five metre drop and impact of between 20 to 24m.

In that prediction for the 30 year project life of the Arrow-only scenario there is a drawdown, a reduction in pressure in water levels in those aquifers. In the model simulation there are no injection or substitution measures, it looks at what the impact is going to be and how does it recover under natural conditions. We see that from just natural recharge and natural pressure recovery in the aquifer (there’s pressure around where we work) those water levels do start to come back but not all the way. It’s almost like if you’re standing on a trampoline and you put a high stress on it but it’s a saggy trampoline so it’s not going to come all the way back on its own, it will sit somewhere down here. That’s why that 20 year prediction is those five metre contours, those red lines. The peak will come up a bit but that five metre contour hasn’t changed so the whole area greater than five metres hasn’t changed significantly. If you ran that model for 1,000 years, you’d probably find everything would come back to all the levels. I could stand here and say in 1,000 years everything will be great, but there is no point to that.

11. Our concern is where that water comes from to get back into balance. Is it going to drain the Condamine and/or other shallow aquifers which are being used for stock and domestic water around the Surat Basin.

If you look at the Walloon Coal Measures and take out the average Arrow production of 25 gigalitres, doing that over the couple of decades of the project will cause impacts to the
aquifers above and below including the Condamine. So for the Condamine we know the
drawdown is equivalent to a two gigalitres a year flux (that’s our current prediction); if from
that 25Gl we take two and put them in there every year for that period we feel we can
mitigate that impact.

We also now have to look at the fluxes between each aquifer so we can say if it’s 25 from
here, ten from this one, five from that one, can we take ten of ours and put it in here, five
there, can we put stuff underneath? We’re trying to make a water balance if you like. It’s an
extractive process so we can’t make it zero impact. We have to work out how we can
minimise that impact and is that impact acceptable. There are ways of doing that.

Because we have varying water production over time, we also have a peak in water
production upfront and then our water production slows off. However, our impacts are
coming the other way so we have to decide what we are going to do with this water here.
But we need it now and that’s where these injection trials come in. Over in the US, injection
has been used for a couple of decades and there are more than 50 operational injection
sites in the US. What some of them do over an annual cycle is take water and pump it down
into an aquifer in the wet season when there’s a lot of water and a lot of run off; then in the
drought periods they pull it out. So they deal with their imbalance in water supply and
demand by storing it in these aquifers underground; that’s one of the benefits of the injection
trial. If we can take our water supply and put it down somewhere deeper like the Precipice,
we can then bank it away to use later. Or if we see that someone in an aquifer up here, in a
coal measure aquifer which is going to be depressurised significantly and is going to run out
of water, we can then, in consultation with the regulators, move an allocation there, drill them
a bore to that because we’ve put the water there. It’s a complex four dimensional puzzle of
flow rates spatially because substitution, while it works well in the Condamine, is not going to
work as well further north so for injection good targets will be set up here. Further south we
know the Precipice fades out so it will be a different aquifer; the time when that water comes
in and when it’s needed, that’s the work that’s being undertaken at the moment.

12. Thank you...you were talking about the Advanced Land Observing Satellite (ALOS)
surveys in relation to subsidence and there’s a lot of data out there. Has there been
any subsidence from extraction in the Condamine to date and how does Arrow
account for wet and dry soils because the expansion of the soils is quite great?

I haven’t seen the results of the ALOS survey but as an unconsolidated gravel sand aquifer
it would be a lot more susceptible to subsidence than the rock ones. The ALOS surveys
won’t be able to tell why ground deformation has occurred, only how much of it has
occurred. What we’ll need to look at is overlaying that data with other data such as changes
in water level, soil chemistry and soil types. We can overlay those and see if we can work
out why it’s happening.

13. I’ve a feedlot next to your Daandine and Kogan North leases and you’ve recently
installed a monitoring bore out there. Not the sort of monitoring bore you’re talking
about here. If you look for groundwater monitoring bores on the government website
there are very few of them and they haven’t been there for very long. I think your
modelling is in the right direction and certainly consistent with what the other
companies are showing. We are all waiting of course for the Queensland Water
Commission (QWC) model to have the results independently verified.
I know the fellows in the Condamine Alluvium are going to keep you up to the task so I’ll worry about the others like the Kumbarilla, Walloons and the Huttons. We’ve got QGC out there drilling already and if you’d have been at the meeting it held yesterday you’d know that one guy’s lost a 15 megalitre a year allocation already and he can’t get QGC to come and investigate it.

If you take the Kumbarilla beds, there are lots of lifestyle people out there and they are the source of our employment and our friends and neighbours. The only water they’ve got available to them other than rainwater is from the ground, from the Kumbarilla beds and the Walloon Coal measures; you won’t get an allocation out of the Hutton as it’s been over allocated. You can’t get an allocation from the Walloons because it’s gone to the gas company. So what are you going to do to compensate for the 60m drawdown in the Kumbarilla? That’s 60m from probably 40m down anyway, so how are you going to compensate for that? How are you going to compensate for 75m of drawdown in the Walloons and 75m in the Hutton in areas where there’s not even a power supply? All the gas companies should be looking at putting in a rural water and power supply as a means of compensating this community.

I guess you’ve made a few statements there. The concern that you raise from yesterday’s meeting relates specifically to QGC and we don’t have any details on that so can’t comment on it. In relation to make good provisions and allocations, there are a number of discussions happening with DERM (now called DEHP) as you would probably know around this particular issue, specifically for those people taking water from the Walloons. There is an understanding that some of the measures that we take in terms of injection may offset allocations in other aquifers so deepening some of the bores into the other aquifers may in fact be an option that we can take. But when you are talking about stock and domestic bores they don’t need an allocation so it’s okay for those bores to be deepened to another aquifer.

14. But the water won’t be there.

It depends, it varies greatly across the region and the thickness of those aquifers is quite different and won’t necessarily impact everybody in the same way.

It’s worth remembering that a Hutton bore which is 900m deep in some places has an 800 to 900m water column. If you pull that down by a peak of 75m, there is still water above the top of the Hutton, above the confining layer in that bore, so you have the potential to add a stage to that bore to overcome the extra lift you have to take.

15. Yes but who pays for it? Who pays for the pumping power?

Arrow has a responsibility to make good.

16. No, no, you’ve got it all wrong. You want to hear from the community but my point is that nobody is listening and that was the point that was made yesterday, nobody is listening. To put a monitoring bore down 70m and one 7m deep beside a bore when I’ve already got one down to 143m and another one at 160m is a joke. You need to hear from people and I hope the government is listening.
We do listen to people and we have heard that. If we’ve had an impact on someone’s water supply Arrow has an obligation to make good and it’s at our cost. Bore deepening or changes to any infrastructure that you need for that is Arrow’s responsibility.

There are a number of different layers that we want to get data from. As St John mentioned there are 15 different hydrostatic graphic units in the Basin, so the 7 and 70m that you mentioned is to collect data from those. We are targeting those units in the area where your property is; in the future we will also undertake baseline assessments and we hope that in some cases we can come to an agreement where we can use some of those existing bores for monitoring purposes. It’s not the case that we would monitor in every location, every aquifer, we’re establishing a monitoring network and the network St John presented shows those that have been installed in the last six months, and included in the nine that were listed are two bores that are on your property.

17. I’m an engineer and a great believer in modelling. I can do groundwater modelling myself and take great confidence in your modelling. You know the result, you don’t have to monitor, Arrow can go and make plans to make good right now, that’s my point.

The regulatory process around that is reliant on the QWC Underground Water Impact Report to be released. It identifies the areas where the trigger threshold is predicted to be exceeded; more detailed assessments of bores in that area will be undertaken and the need to put make good measures in place for those will be determined on a case by case basis. I would have to disagree with relying solely on modelling as that’s not a practice that Arrow would follow. We would expect that all the modelling is verified by monitoring and purpose-constructed monitoring. You say your bores are down to 140 metres but we also want to get data from other units; we will put a dedicated network in for that purpose.

18. We are also next to the Kogan North and Daandine Fields although on the opposite end. To say we are an unhappy landholder is probably a gross understatement, but my question in regards to your presentation is if the Kogan North field has been pumping water for eight years...is that correct St John?

Sorry I’m not exactly sure.

19. I can confirm that for you so I’m wondering what change you’ve seen in your base monitoring levels for the aquifers in that area since 2004?

Sorry, I can’t quote those off the top of my head. We have seen changes in water levels in those aquifers; hydrographs of changes in those water levels are in the technical chapter of our groundwater modelling report in the EIS.

20. For those eight years?

I can’t remember the exact hydrograph but I think all that data does go from 2005.

21. So it was 2005, but they started actually pumping in 2004.

I can’t remember the exact date, I’d have to go back and look at the EIS, I can do that with you and we can look for that data.
Clarification: data depends on whether this question was in reference to the Kogan North Production Field or the original Kogan North Pilot.

Kogan North Production:
First water produced to surface in production process was June 2005 - field still running.

Kogan North five well pilot:
Started: 21/12/2002
Completed: 22/3/2005

22. Like a lot of other people in this room I know full well you can't accurately model something that you can't measure. From previous discussions with Arrow Energy it's my understanding that the aquifers weren't measured before drilling commenced in that area so I am wondering how you can accurately monitor it if you don't have a baseline level of those aquifers before you even started work.

23. Yes or accurate measurements, aren't you measuring the aquifers in that area now?

24. But you are not sure what change it showed?

25. Looking at your graph there I thought the rate of change can be quite significant over the first years, first decade, maybe two decades, is that right?

26. Well as we’re eight years into it I was just wondering what it showed.

27. But you have done some baseline studies from several years back?

28. Is your EIS based on the Arrow-only scenario, not the cumulative one.
29. So the mitigation actions are for all three scenarios?

Yes.

30. I noticed also that the three map scenarios aren’t in your handouts or in your EIS; I had a quick look then. Are they going to be published?

I believe they are in Appendix G the Groundwater Technical chapter.

31. I just had a look and they are not actually in the Groundwater Chapter.

They might not be in the summary chapter, but they are in the technical report.

32. Okay. Lastly just out of curiosity, you’re saying Arrow by itself is only going to drop the Condamine Alluvium by 0.1 to 1m and the cumulative impact is going to be 2.5m. Where are those two metres coming from?

It’s the cumulative effect of adding depressurisation signals from the other players which are generally west of us; there’s a cumulative add-on effect.

33. So there is definitely movement between the aquifers because they wouldn’t have a lot of Condamine Alluvium on their tenement?

That’s right, their pressure signal is going to migrate either up through the Walloon Coal Measures or maybe up through some of the sandstones. Then our pressure signals come through into the Walloons and that’s where that connection is so important to understand how the pressure comes through.

Just to clarify the point about the cumulative maps, you may have been looking at the Groundwater Chapter; there’s a separate chapter in the EIS for the cumulative assessment so those particular figures are in the cumulative assessment chapter which we can show you afterwards.

34. I’d like to know what the mad rush is to get all this gas? Anyone who follows commodity markets will know that gas is at its lowest price in ten years. There are a lot of companies in the US cutting down on production because they can’t make any money out of it. What are we going to do for our future generations? In 50, 100 years’ time, that gas will still be there, why is there such a mad rush to get it out now?

There is a huge international demand for gas and that’s what’s driving this. If you take Japan for example it has shut down all but one of its nuclear reactors so it is after energy. Likewise in other parts of the world they are after energy, that’s what inherently is driving this. Queensland has a lot of gas sitting in the ground, far more than Queensland uses and could ever use in many hundreds of years. That’s why there’s this ‘rush’. Yes I understand it’s all happening at once and I guess CSG is a relatively new energy source that’s been developed; in combination with this international demand it is driving the four companies. In terms of the price, Arrow is not exposed to the spot market or the sales market for gas. The owners of Arrow will take all the gas it produces, so we’re immune from the ups and downs of the gas price. You are right about the US, the gas price is very low there due to the Shale gas boom there but here our gas sales are secure.
We understand more generally your concerns about us trying to set up a gas business on private properties in farming areas. We're acutely aware of that which is why we have sessions like this. It's why we are doing environmental impact studies, we're doing trials to look at how we can minimise our impact. We're not rushing; Andrew said this morning Arrow is not rushing ahead with this, we're the last of the four proponents. We haven't taken a Final Investment Decision (FID) yet but it is not the once and for all decision point. If we say we're not ready FID can move although we are aiming for a decision next year. But we haven't reached that point yet so Arrow is not rushing ahead. It is taking its time to get it right.

35. Just a question on the background noise and noise generated by infrastructure, how does wind speed and direction impact on that? We all know that some nights you hear noises and other nights you don’t. Obviously wind carries vibrations so are your calculations taken on a still night ...or if something's 300m away on a still night and it’s at 28 decibels, what happens when the wind is blowing directly towards your house. Is it still 28 decibels or could it be higher?

What they do with the background noise is they monitor it over several days, typically over four to five 5 days and then again a month or so later. That’s in accordance with the guidelines from the Queensland Government about how you measure noise, particularly background noise. The reason is you are going to get a range of conditions over the four days, morning, noon and night and ideally you are going to experience a different set of conditions when you come back. Wind speed is recorded at the same time, and then they discount all noise that was subject to wind speed above a certain level. That's to strip out the noise, because wind masks noise. If you get a windy day, you’re going to hear less noise than you will on a day when you have the inversion and very gentle breeze because the wind breaks up the sound waves so you can't hear it as well. The times you are going to hear it most are when you have very quiet conditions. The background noise monitoring goes through a process of analysis where they strip out anything that could be masking it with the aim of getting back to the true background noise.

36. But if you have a well 300m from your house and the noise is 28 decibels when the wind is blowing towards your house is it likely to be say 48 decibels just because of the wind carrying the vibration towards your house?

When you get that gentle breeze you will get the maximum amplification carrying the noise from the source to the house. If it’s windier it will actually break down more quickly. With a gentle breeze you have the ideal conditions for noise to be preserved as it gets to the house so that’s why they model under those conditions, it’s the worst case you will get.

37. When you were presenting before lunch, you talked about compliance with state government regulations. Those regulations obviously address the type of property you’re talking about now, farming land in a very quiet rural area. Is that correct?

Yes that’s correct. Those values I had up there, they are built up from the background measured where you live. The way the noise guidelines are developed, they’re based on a very quiet background. If you’re in a city, there would be different guidelines.

38. Are you sure it takes in this area? It is very, very quiet,

It does...we recognise how quiet it is.
39. In the EIS you mentioned the various committees that are negotiating or in discussion with Arrow. The intensively farmed land (IFL) group etc, I’m just wondering what the spirit was like in those groups, including the irrigation groups, and whether you’re actually coming to any conclusions that may assist people like me in their submissions. I’m an agricultural consultant who has been working in the Cecil Plains/Brookstead area for 29 years and my sons are now involved in the business. So I have a very strong interest in maintaining the farming integrity in that area. I haven’t been part of those committees but would like your comments on it.

I will answer that only in part and invite Arrow to comment on its views of the success of the committees. I have presented the findings you see today to the IFL Committee. I presented it to them last year, and they were presented in an update we gave to the EIS earlier this year. Those findings have been presented again today. On each occasion, my company, Coffey Environments, which is undertaking the impact assessment for Arrow, has invited comment from anyone in the community as to any inaccuracies or omissions. To date the feedback has been that there are some subtle things we’ve missed, some management issues around things like the fact that the cotton bales are out now on the roads and the headlands so if you had a well there, you couldn’t access it. There’ve been some issues like that raised but to my knowledge there hasn’t been any disagreement with the key impacts, the key properties, the key concerns that I’ve listed up there today. Arrow can comment on the other part.

I mentioned to you previously that Arrow is doing some physical demonstrations. It’s always been the plan with the IFL Committee that we would start with the core hole and pitless drilling trials and proceed to ones more centered around production-type trials. There has been some discussion at the IFL committee as to the appropriateness of the Gilbert and Sutherland report and whether it missed some of the concerns that were raised. The IFL farmers have tabled a list of other concerns that we are now working through. We’re looking for feedback from them and also from Arrow to see who the appropriate people are to address those concerns and to get agreement from the rest of the community that those concerns have been addressed appropriately.

I think the question was more around the sentiment in those committees. Just for your information there are two committees, the Arrow Surat Community Reference Group (ASCRG) and, the Arrow Intensively Farmed Land Committee (IFL). I’m on the first one, the ASCRG, and Jonny is on the other. Members include Ian Hayllor as a representative of the Basin Sustainability Alliance, people from AgForce, the University of Southern Queensland, Cotton Australia etc. Those committees meet about every two months and probably have different dynamics.

The IFL Committee is obviously focused on a particular aspect of Arrow’s development and interactions with farming; the other committee is looking more regionally across the scope of our development and the issues around impacts on the community at a higher level. Its members also include landowners who have knowledge of strategic cropping land as well as irrigated broad acre type farming as well. The sentiment on the ASCRG is, I think, quite constructive; there have been good discussions and Ian may want to respond to that. The IFL Committee is generally quite constructive although it has on it landowners whose farms we would potentially be looking at operating on, so for them it’s very close to home. We have made great progress in developing standard operating procedures with their help and this
wouldn’t have happened if there hadn’t been a good tenor in the committee. By the same token, there is recognition from both sides that we still have work to do to address some of the concerns. We know we need to address those concerns and we’re grateful for the forum to be able to capture and address them.

40. Are there any interim reports from those committees as to progress so that our submissions on the EIS are better informed?

The minutes of those committee meetings are put up on the Arrow website so you can read them, consider progress and if you have any questions you’re always welcome to contact Arrow or some of the committee members you know to obtain their opinions as well.

41. My question is about the flood plain and the impacts of infrastructure, your roads, and when you go off the flood plain for your major infrastructure. As we saw 12-18 months ago, a lot of areas are flood prone so what assessment do you go through to ensure there is minimal impact on the natural flows across the flood plain to avoid the potential for erosion from a change of water direction or its speeding up. So my question is what are the infrastructure impacts on flood flows?

That issue is recognised but we can’t assess the impact because we don’t yet have a layout of tracks and wells to be able to say where the water might be diverted. However, Arrow’s intention is not to build the infrastructure in a way that causes diversion or impedence of flows because what came out loudly and clearly in this was soil/water content and the fact that the seasonal and overland flows are so critical to that. The feedback we’ve given Arrow, which is recognised in the objectives, is that it cannot impede overland flows in the way it develops. It’s up to Arrow to design the access with you to ensure that whatever Arrow does on your farm, it doesn’t upset that hydrologic regime and cause erosion or cause a part of your farm not to have access to overland flows. That’s how it was addressed through the EIS.

42. You talked about air quality but you had nothing in there for dust; how are you looking at mitigating dust, especially during the construction phase? In the construction phase, we’re going to have a lot of traffic going past houses because that’s generally where the access is?

We do model dust in impact assessment but we generally model it when we’re dealing with mines and big haul roads where there’s traffic all the time. What you’ll find is you get a cigar shape along the road where you will get, depending on the surface of the road and the weather, a pattern of how far the dust will travel before it naturally drops out and doesn’t become a nuisance. That is sometimes informative for mines, as they have massive haul roads but it’s not informative for construction traffic because it’s one of those issues that falls below the line where you have standard watering measures, surface treatments that can reduce the dust down, or gravelling. I know there’s an issue around gravel on black soils but there are various treatments and watering that can be used during construction in particular to keep dust down so it doesn’t become a nuisance and doesn’t become an issue for crops or people. In the standard management controls, you will see directions from the consultants to Arrow around watering and dust suppression and that’s how it’s typically dealt with. I know Arrow is trialling some surfactants on roads to try to stop dust development.
43. I guess it comes down to traffic management in a sense because a lot of people’s houses are just off the main road and that would be the main access point normally into the place. So you’re going to have the gravel going into that place, past the house or sheds or into their rainwater supply and, secondly, wherever you then go with the wells and construction you have to look at the topographical consequences in regards to the gravel. I’m gathering you would have to gravel anyway because you need that all-weather access?

I will let Arrow comment on access; however, the other thing Arrow can do is impose speed limits as part of those land access agreements. We know speed is a factor in dust generation from other projects we’ve done. If you allow vehicles to drive along at high speed, you’re going to get a lot more dust than if you slow them right down. It depends on the conditions, but generally speaking there is a relationship there.

In practice we often construct an alternative entrance with the landowner’s agreement and it would be the main entry for all activities, whether it’s for the well field or for construction. That’s normally sited away from the homestead and from the sheds and the farm.

44. The other question is with the lines going from the wells to your processing plants if you are taking them a fair distance across flood plains will you be using the road reserve for that or will you be using people’s properties?

It’s definitely an option that is open to us, and depending on the layout and where the facilities are it may be the most appropriate option. It’s a lot easier to get single access along one road reserve than to go through several properties. It really depends on the layout of those particular wells and where the facilities are located in relation to them.

45. If Arrow is moving east to west, especially to the north anyway, it’s going directly with the flow of the water so it will have to get everything really perfect to ensure any flow does not speed up along there.

That has been highlighted in terms of the direction of flow and pipelines by the IFL Committee.

46. In the EIS Arrow seems to be favouring electrical powering of the wellheads; is that correct? Construction would include having to negotiate with Ergon Energy or whoever is the provider at the time to see if there’s enough infrastructure there to power that as well as the farming operations? I’m assuming that these electrical pumps at the wellheads are sufficiently robust to be able to kick back in after the power returns. In summer we get a lot of electrical storms and pumps and other equipment on farms are continually being switched off and having to be restarted; irrigation systems kick up again, sometimes several times in one night. How robust are these electrical pumping systems, will they keep operating when they’ve been switched off?

The EIS considers two powering options and the base case is self-generation or at-site generation. That would be the wellhead motor which generates the power at the wellhead; at the production facilities it would be gas turbine generators or gas engine-driven generators so the power is generated at the site. The EIS also considers an option of partial or percentage use of grid power. If that were the case you would see a power line brought into
an integrated processing facility from the Powerlink network because of the voltages required, a substation at the integrated processing facility and then power distributed out to the central gas processing facility and possibly some wells. That’s still being worked through, and it’s why the EIS carries both those options. In relation to the latter part of your question, I will hand over to Tony.

I’m not the expert on this topic but with the pumps that we use the drives above ground and the pumps below ground are very robust, very well tried and tested not just here in Queensland but around the world. They are very durable pieces of gear. They have been through all sorts of weather events around the world, lightning strikes, power outages, and are designed to handle those things. In the Bowen basin where we also work we have a wet season with a lot of lightning strikes so I don’t doubt there’s lots of lightning around here too at times. It doesn’t worry the wells at all.

47. Is the power going to be above or below ground?

We’re looking at the whole power reticulation strategy or approach now. The power to our major facilities (i.e. the processing plants) would be above ground. There are options we’re looking at for power to the wells e.g. whether we generate electricity with gas onsite or whether we take power from the grid to the well. Depending on the specific site, we’ll look at whether it’s above or below ground; we haven’t got a single answer across the whole field yet.

48. You mentioned 500 baseline bore assessments in the presentation. How will you decide which 500 bores will be assessed? When will the assessments be done as it seems that nothing has been done up to now. Why would you bother on strategic cropping land if you can’t go there? If you are closer to the river, are you less likely to have infrastructure on your property?

We have to do an assessment of all bores within a 2km radius of our activities. Even if we are not doing any work on a particular piece of land the groundwater could still potentially be affected e.g. on strategic cropping land, so we still need to do those baseline assessments. Arrow has some assessments already. The baseline assessment plans have been approved by government. We have contacted landholders in the area and we are currently scheduling the assessments as we know where the 500 bores are. If you have not been contacted, or are not identified in that 500, we may still assess your bore at some stage as it just means you are not in the priority area currently, but may be affected later as the project develops. Over time all bores which potentially could be affected will be assessed although that could be ten years down the track. We will try to get as many assessed upfront as early as possible; it is a very large body of work to complete.

In regards to restrictions around rivers, the legal distance from the river to development is 100m but it can be more depending on the specific location.
1. **What is the actual drawdown of your worst case scenario? (see Figure 5 on page 7)**

   It’s 550 metres and it’s not very visible on the slides; apologies for that. Wherever there’s colour, there’ll be at least a five metre drop, and as you get closer to the middle of that dark blue area, that’s where that impact is highest. That will be around the 150 metre mark. If we look at the slide to the right, you’ll see that that dark blue has become less blue, and that simply means that we’ve reduced it to about 75 metres or so in a period. That continues to relax so it continues to improve after that.

2. **To confirm, is the one on the left after ten years.**

   It’s in 2024. Our operations will start in 2016, around about eight years after that is our worst point.

3. **What is it now?**

   At the moment in this area there’s no impact whatsoever that we can measure.

4. **No, but you haven’t started yet.**

   You mean what level is the groundwater? It’s about 40m below, but it varies a little bit. So it’s not exactly 40m everywhere. It’s in that order of magnitude; between 30 and 50m below the surface.

   By the way remember this is the impact of all the industry and it’s a worst case picture. Just as a comparison, this is our prediction for the Condamine Alluvium (see Figure 9 on page 10). If you look at this map, you’ll actually see that we don’t even have Miles on this map, so this is really just the area more or less around Dalby. The worst case we have there is about a two and a half metre drop. So what you see is that in the shallow aquifers the impact is nowhere near as bad as it is in the coal seams. We predicted that towards the western edge of that Alluvium, which are the soils with the sand below the river, the impact’s about two and a half metres, and that’s the worst case view, if you like.

   Then looking at the right, which is very similar, there’s only about a three or four year difference between those two. The reason is the peak in that aquifer comes much later. Remember that the peak in the coal measures was eight years from now or eight years from the start of operations whereas the peak of the impact in the Condamine will be around about 2060. In other words, in about 45 years from now will be when it’s the worst case from the activities that we’re doing now.
Again, the worst case assumption is based on if we don’t do anything to counteract it so I’ll come back to the sort of things we could do to make that impact smaller. Another aquifer is the Great Artesian Basin so this is one of the aquifers below the coal measures, and a similar sort of a picture. I believe that the impact is about 40 to 50m in the worst case on the left. There again the peak is much greater than it is in the coal measures; around about the 2038 mark. Again it relaxes slowly and it’s slightly better by 2061. So the basic message is that in the coal measures the drop will be quick because we’re drawing water directly out of them. In the sands above and below the impacts will takes some time, but after a while that situation will improve as a result of rainwater recharge and the other aquifers flowing into them, then those levels will come back up.

5. When you’re saying that they’ll come back, how do you know they’re going to come back to how they were before? How do you know you haven’t compressed them completely? How do we know we’re going to still have some water there when you fellows go?

First of all it comes back quite slowly and it takes a long time to come back all the way to where it might be. It may take in the order of 100 or 200 years to come back all the way to where it should be.

6. How do you know that it is going to come back to where it was?

I’ll show you an example of what rainfall recharge can do and an example of how we know that it does come back, and can measure it. I’ll show you why it’s so important that we do all of that measurement as part of the commitments that we make in the EIS so that we can monitor what’s going on to prove what we predict is real. The modelling itself is about how systems move back and forth. There are plenty of examples worldwide that this is how these systems work.

(See Figure 10 on page 11). Let me first summarise though what the overall impacts are before I go into what we can do about it. This is a summary of some of those numbers you saw before. This is the end case so this is the 2061 timeframe i.e. after 50 years. The first column tells us what the drawdown will be as a result of our activities, and the second column is the impact of the total industry. All the pictures I showed you were the total industry examples. I mentioned that the deepest drawdown was around 150m in the coal measures. If you look at that second column and look at the CSG you’ll see by 2061 it’s reduced to 75m. That’s the amount of bounce-back it has in that timeframe. In the deeper systems it’s 20 to 30m in the Hutton and 75m across the total industry. Then the shallow aquifer, the Condamine, is 2.5m.

This is an example of the sort of data that we collect; in this case in the Condamine Alluvium. Before we were just measuring flood impacts. As a result of the drawdown that the agricultural industry has placed on the Condamine, levels have dropped in the area between Dalby and Cecil Plains especially. The data isn’t easy to analyse but you can see that in the period between January 2010 and the end of 2011, there was some data for almost all the monitored wells showing an increase in the levels in those wells. It’s not a huge increase. As I said, these things take time but the average is about 1.8 metres. Just a flood event can recharge an aquifer. We’re talking about two years’ worth of rainfall - a lot of rainfall - so a
heavy rainfall period has a similar positive impact just as the impact we predict is in the negative. That gives you a way of showing how we can measure the impact on aquifers.

7. **Those details that you've given are more about the Condamine Alluvium down near Dalby. That recharge and the flood events that we've had wouldn't have the same effect on the Walloon Coal Measures that you're talking about.**

You're absolutely right, yes.

8. **Do you have any idea (obviously the big impact is going to be in the Walloon measures) how many current registered bores or users will be affected by that huge drawdown?**

Well, it depends on which piece of acreage you take. If you look at our tenure I think we're in the order of somewhere between 300 and 400 bores. It also depends on us going out to all those properties which is something that we do as a matter of course - those are the baseline assessments that we must carry out to see how many bores will really be impacted but the registered number is somewhere between 300 and 400.

We expect we'll probably find about 20% more out there when we actually go out and survey all the wells because not all the wells are necessarily captured in the database.

9. **The bores rose 1.2m or so over the last two years but 30 years ago we had the same rain and that was it! So if it's going to be dropping, if your statistics are relying on that 2010/11 data or even if you're not relying on it but it's a guide, then we'll all just sit around till 2041 and go “By God, he was right.”**

Fair comment. I should go back to one point which is that the different aquifers recharge at different rates. You're absolutely right; the recharge is in one direction. In another direction, if you have a few years of drought, it'll go the other direction. That's what this chart is trying to show. It's more than once every 30 years, however, because it's still rainfall that counts, not just flood events. As you can see, it goes up and down. I'm not pretending that the impact that we have won't be an overall negative impact that we should do something about. That's exactly what we are saying. Our impact will have a negative impact of two and a half metres, whatever the rainfall is.

10. **But will you slow down your extractions if it's dry?**

No, I don't think we will. We'll try to keep monitoring over time to see what the overall impact is. As I am about to explain, what we're also trying to do is rather than just leave the system to go dry, we're going to try to find ways of putting water back into the system. The method that we most prefer is to treat the water we're taking out of the coal measures and make it available to people who are taking it out of the ground now. While we are supplying water to those people they would stop taking it out of the ground. This means that rather than the current balance, which is rainfall versus extraction, all you'll have is rainfall coming in and any impacts that we have coming out. But you'll stop the farming extraction from being an additional drain on the system. That's what we call substitution of allocations.

Since we've got this water coming out of the ground and we're obliged to treat it, we'll be willing to give it to you and ask you to stop taking it out of the ground yourselves so that we'll actually have a positive net impact on that. The beauty of that is the impact happens the
minute you stop taking, rather than waiting the 50 years it will take the CSG to actually have an impact. We'll be solving the problem proactively which is what we would like to do. It won't solve the problem in the Walloons as we can't put that amount of water back in even if we substitute those bores. It wouldn't make any sense because then we'd be re-pressurising the very thing we're trying to depressurise to get gas out. It will allow us to take care of the aquifers above, especially the Condamine which is the shallowest one.

11. What if you're extracting from the other aquifers?

That applies to all the aquifers except for the Walloons as we can't put water back in there. We could substitute water if that was what you wanted but the one thing that will happen is the impact will stay high for some time. So substituting there will be more difficult, but it can be arranged. It really will depend on what you want as well. There are a number of things we can do. We can compensate you directly or we can provide an alternative water source.

12. You keep talking about the compensation. I'm wondering what timeline you have in mind...from the moment when our bores are affected? For example a 15,000 head feedlot which requires a large amount of water, how long would it take you to actually put in place something to compensate for the water to keep a 15,000 head feedlot going before all the cattle are dead? You know, you talk about compensation, but I don't think there's not much understanding of the undertaking that you're going to need to provide this water for somebody's operations.

As part of the ‘concept select’ work we’re doing just that. We’re trying to figure out how long it will take. The way the system should work, and I think will work, is why the Queensland Water Commission is involved to provide a third party objective view of where it stands.

The Commission will make a prediction of when it thinks your bore will be affected. I'm supposed to organise that make good deal with you before the impact becomes more than a five metre drop. Now, you can have a debate about when the five metre drop will happen, also about whether that will be enough for your bore to suffer. Remember that if your bore is in a slightly deeper aquifer, the groundwater level is typically several hundred metres above the top of the reservoir. So the five metre drop should not impact on you unless it's a question of reducing or lowering your pump.

As soon as that prediction is made and the expectation is that the five metres will happen within three years, I'm to make that deal with you even before it's happened as a guarantee that your business is not affected. Does that make sense?

13. It does make sense. The five metres sounds good, but you have a worst case scenario of 150m in some areas you know.

I know. But the point that I'm making is that we're obliged to come to you before the five metres is reached, let alone 150m. In the case of the Walloon Coal Measures you're right, the drop will almost certainly mean doing something very different than just deepening a bore but the obligation still sits with us to provide you with an alternative. If you want water rather than money, then you have a right to get it.

14. You've got all the wells and pipelines in place and you're saying 'Righto, we're only here for 40 years or whatever, and then in 200 years' time she's all back to hunky dory
again'. You're not going to do any extraction through the dry years. Well, as it replenishes, the boys are just going to get back into it again, aren't they? So really when the water level drops down, that's where it's going to stay for eternity because the bores will just keep going won't they?

It depends on whether there are extractions in that zone or not. So it's a simple maths sum if you think about it and the model doesn't do anything other than math. If you're extracting more than the rainfall then you're absolutely right; that level will stay exactly as low as it is. In the deeper aquifers that's not the case, however. In other words, based on what we've modelled we believe the rainfall exceeds the amount of extraction and it depends on each layer. In the shallower layers like the Condamine, I think the extraction level is probably at least as much as the rainfall recharge will be.

In that case there is an issue anyway whether we're here or not. What we're trying to do is monitor it both before we have an impact and while we're having an impact to show what our impact is and our obligation to compensate for that. If you let us put water back into the system indirectly through substitution, then I think there's a bit of a win-win. In other words, you guys benefit both because we help to recharge an aquifer that's been drained beyond what rainfall can recharge and at the same time we're already putting water in as insurance against the moment when our impact occurs. That cannot happen in the Walloons when we're obliged to provide an alternative water source. Does that answer the question?

15. Well, no, not really. If you're going to keep taking it and you're going to lower the deeper ones, I'm saying you've the infrastructure in place to keep lowering it. As it keeps replenishing over the years, you'll still maintain your operation, won't you?

No, that isn't quite how it will work. We don't want to produce water; we're in it to produce gas. The reason we take water out is only so that we can reduce the pressure in those coal seams to allow the gas to escape. Once the gas is gone, we'll stop extracting because there's nothing in it for us. We don't want to keep pulling that water out; that doesn't do us any good. Once we produce gas to the extent that it's economically feasible, we go away. That's when that water will start replenishing.

16. How long does it take the gas to get back to where it was?

The gas won't come back. Rainfall replenishes the water, but it will not replenish the gas as it comes from the coal. So the coal generates that over millions of years. Well, over hundreds of thousands of years at least. Once that gas is gone, it's gone for good.

17. A lot of what's in the cumulative impacts chapter is roughly similar to what I read in the Water Group's report to the Federal Minister and Geoscience Australia's 2010 report, except for the recovery of the system. You're saying 2061, 20 years or so. I mean they're saying centuries and the Water Group says up to a thousand years in some parts of the Great Artesian Basin. Now, if they're right and you're wrong, where does that leave the make good provisions for people who are losing their water or lose their water 40 or 50 years from now long after you've gone?

First of all I think the numbers are consistent because we're not saying it's recovered fully by 2061. What we've done is predicted how much recovery you'll have by 2061. My statement is that it will continue to recover. But you're absolutely right, the recovery is very slow. Again
remembering this is a worst case, I’m not pretending that it won’t take hundreds of years to recover in some places. But what we can do is provide those users of water with alternative sources in such a way they won’t suffer and also that the system eventually will recuperate. The question is where is the impact and how big is it? We’re talking worst case; I don’t think it will be this bad. If you allow us to substitute back in, it will be even better than that. But there will always be some residual impact; I don’t dispute that.

18. In the year 2080 when these guys’ grandkids are running the farm, where do they get their water?

Well, if it’s an alternative source of water, our preference is to drill into deeper reservoirs. The impacts there may be up to 50 or 75m, but that’s still well above the level at which the sand occurs. So that Hutton Sandstone, for example, you hit the first sandstone at about 500 metres. That means that even when the groundwater level drops to what it is now at about 50 metres to about 225m, it’s still well above the sand. If I drill a well deeper than what you currently have into that deeper zone, there’s no reason why you can’t keep taking water from there forever, just like the current licence allows you to do for the Walloons.

That’s our preferred solution. If it doesn’t work for you or Arrow there is an alternative which is to truck it from somewhere else or provide another water source and lay pipelines; that’s also something we’re looking at in case it’s the preferred solution. There’s a lot of water down in the ground that no one accesses because it’s simply too deep or too uneconomic to reach. If we give you that water, that water is still around. The percentage we quoted earlier of 0.0004 indicates that the amount of water is vast; the problem is getting at it. That’s why those shallow aquifers are much more valuable to use as it’s cheaper to get there than the deeper ones. The deeper ones are the ones where we could drill wells down there for you.

19. There was a question asked before that I didn’t think was quite answered; you’ve got a third of your project, the recovery of the water and heaps of those water problems are going to occur after you have left. How long are you saying that Arrow will be responsible to compensate people for water after the project is finished? Who’s going to compensate our kids?

If we do it right, the compensation will happen before the impact. In other words, you will have a guaranteed water supply if that’s what the compensation entails, or whatever other form the compensation might take, before it happens. We’re responsible for as long as it takes, that’s simply a matter of legislation.

20. Do you have a working knowledge of the Great Artesian Basin?

A working knowledge, yes.

21. Okay so you reckon the Great Artesian water i.e. the water that comes up out of the Great Artesian Basin, comes out of sand. It doesn’t come from holes in the ground like great caverns; is that right?

That’s correct, yes.

22. Well, how come all the bore drains aren’t filled up with sand?

Sorry?
23. I mean the bore drains. You said you’ve got a working knowledge; you know how artesian water works.

Correct.

24. Okay, have you seen it work?

I’m not sure I follow the question, so maybe my working knowledge of the system is different.

25. The artesian water comes up by itself under pressure into a pipe, then into a drain, and runs off down through the paddock. How come all the bore drains aren't filled up with sand if it's coming out of sandstone?

Fair enough. Let me try to divide that into steps and hope I can explain it properly. I’m sure you’ll hold me to it if I don’t. First of all in this area of the Surat Basin I don’t believe there are many artesian wells anymore. If you recall the picture I showed at the beginning the head pressure you have is higher than the flood plain. If it was, the water would come up by itself and that would have been the case a hundred years, maybe a hundred and fifty years ago when people first started drilling wells and started using the water. At that point the head would have been positive, in other words the recharge in the mountains would have pushed the water out of the wells and therefore you would have had it flow by itself.

I don’t believe that happens in many places in the Surat Basin anymore which means that the net water level is no longer higher than the ground being farmed. In fact, in many places it’s 30, 40 or 50 metres below as a result of the activities of people on the land, and that’s a simple fact. Farmers have already been draining more than the rainfall has recharged. The water down below is still in rocks so that doesn’t change. It’s in sand mostly and a very little bit of those aquitards and clays. It’s still in the little pores of all that rock, and there’s a vast amount of it below. There is still water there; it’s just that we have used more of it than has recharged. That’s how I could best answer the question; does that make sense?

26. While you’re continually sucking it out of those aquifers down underneath, you’re de-charging. You’re de-charging; you’re taking water away from that Great Artesian Basin (GAB). In a hundred thousand years from now, are we still going to have water in that Artesian Basin? Are those people down in New South Wales still going to be able to rely on GAB as the only water supply for their stock?

The answer is yes, because I can measure how much water I’m going to take out in 20 years and it’s going to be a fraction of what we have taken out of the ground in the last 150 years. We’ll stop taking it out of the ground as soon as we have our gas and depart. We can finitely calculate the impact we are likely to have just as we’ve calculated it for you. It’s much, much less than one per cent.

27. And the lady just asked what you’re going to do in 30 years’ time. You just said you’re going to leave.

I said that we would go but we will compensate current users for the small amount they’re presently using, and even that is a small amount of the total volume that’s down there. So I didn’t say that I was going to compensate by putting everything back into the ground but said I was going to compensate by ensuring you have an alternate supply that’s as good or better than it was before.
28. And the next time we get a drought you’re going to make good with all the water?

No Arrow will make good for the water it impacts and that’s why Arrow does the monitoring to make sure of the size of the impact.

29. So you’ll compensate her feedlot, but not the rest of it? Who’s going to water those hundreds of thousands of head of cattle?

What I’m saying is that’s why we monitor it before we even arrive to later see if we’re the ones having an impact. If those groundwater levels go down as a result of our activities, we’ll know about it and we’ll be obliged to compensate you for that impact.

30. I imagine it’s pretty tough, gentlemen, to handle these kind of meetings in your position. I happen to be just a short distance out of Miles and I have one of those lovely bores that actually flow out of the ground running at about 45 to 50 pound. I know quite a number of other people that have them as well. One of my bores has recently started to lose a lot of pressure. We use it for crop spraying and it’s become a damned nuisance to us and we’re looking around to see who we can sort that out with, but it doesn’t look very promising.

I think what you’re missing is there’s been an effort here in the last 20 years that everyone knows about. There’s been a Commonwealth/State/farmer partnership of 40, 40, 20 to cap the bores right across the GAB. The reason we capped the bores was to look after the GAB because it was getting out of hand with the tiny bit of water running down bore drains.

What you guys are proposing is taking away the water from these communities for the duration of time, certainly till you and I are both dead. I really think there’s no answer you can give me. I know where you’re at with this as a company. I think that our communities have got to think really seriously about what we’re doing here and that we’ve got to work out how we’re going to deal with it. We need to hold our councillors and our councils to account. We need to hold our State and Federal Governments to account. This is a change in our environments, in our lifestyles. It is huge and we haven’t properly come to terms with it.

I can’t believe you can stand here and tell me there’s a possibility you’ll knock up to 150 metres off the top and we’ve just got to go away and smile. You must be going to stick a pump on my bore for the duration of time. You’ve got to be kidding me. It’s not even going to happen. You’re just going to pack up and go. I know what will happen. I know what the legislation will look like. So look I could go on. I’m really concerned. You’ll have a tough time selling this to us, but I just want everybody to remember this community has made a really serious effort to cap our systems so that we look after the Basin, and in the last few years we’ve made a complete U-turn and I really don’t understand that. Thank you.

You’re saying there’s only that coal seam where you’re operating now, so there’s no coal down low or anything else that you’ll be hunting for later on down the track?

Not in this part of the world, no. Those coal seams aren’t a single layer; they are a 300m thick sequence of sands, clays and coals, very thin coal layers, but a large number of them.
That’s the package of coal seams that we’ll be accessing. We call it the Walloon Coal Measures and it encompasses that entire layer. The aquifers above and below it are the ones that are either above or below that 300m thick sequence. And no, there are no coals further down. There are some very small coals in some of the aquifers above and below, but not enough to make them viable.

31. **How can we send anything to DERM? DERM is dead.**

   It’s DERM’s parent now.

32. **What’s the name now?**

   The Department of Environment, Heritage and Planning, DEHP, but the address shown in the published notice and on the fact sheets will definitely get to the right party, irrespective of the departmental change.

33. **Previous EISs that have been done by other companies like Origin and QGC, do they also show this sort of drawdown into the water level or is that something that this EIS is starting to show?**

   The drawdown in water levels has been reported in all the EISs. One of the issues with Arrow being the last developer or CSG proponent to propose a development is that we’ve had to assess the impact for all the other projects. If you go back to Santos when it did its EIS it was the first cab off the rank. The only cumulative impact Santos had to deal with was Xstrata’s mining and those types of activities. When QGC/BG came along, they then had to deal with not only Xstrata but also Santos’s drawdown as well. Origin came along and it had to deal with all of those. Arrow now has to deal with the cumulative drawdown of all proponents in the region. That’s the same for roads, social impacts, the whole lot.

34. **So if something like that was lethal to a project like this, there’s already been permission given to do the others. In relation to the cumulative effect where does it stand when something like this – to my mind this is just an unbelievable thing that’s going to impact on a lot of people. And how will it affect the ones that have been given the go ahead or that people hadn’t known about?**

   Well, it has no effect. Their EISs have been approved; they’ve advanced with applied conditions of approval as well as permitting. They’ve got their permits and as you know they’re now starting to construct. What has come in across the top of that, as Jeroen explained, is that the Queensland Water Commission (QWC) has identified that no individual proponent can manage this effectively and therefore there needs to be an integrated understanding and solution for what’s actually happening.

   The Arrow modelling that’s been done will most closely mirror what you see in the Commission Report because they’re both done a cumulative impact assessment effectively. What the Arrow modelling and work that’s been done has shown, is that in Arrow’s opinion it is manageable and in the view of the specialists who did the impact assessment, it’s manageable. Now the QWC will come in across the top of that and Arrow and the other proponents will be requested by law to input to that process.

   That’s an established process that’s been done in other parts of Australia where you have similar significant drawdowns of water within a basin or a region, and in all cases it ultimately
ends up in a government-facilitated regional groundwater monitoring forum that looks at what the actual data is saying, when the predicted impacts will occur and how to manage that (and there are various mechanisms to do so). It’s not a new phenomenon.

35. It seems to me that most of the discussion this afternoon has revolved around modelling. Modelling’s only as good as the assumptions that underlie it. For example, with the recharge model, it would depend on what period of rainfall you used in your underlying assumption and how accurate that’s going to be. In this district, the lowest decade of rainfall is somewhere from about 1912 to 1922, far lower than the 1990s. So if you’ve got a model based on an even worse case scenario using the 1990s, you’re likely to come unstuck because it doesn’t reflect historic rainfall patterns.

The other thing about this area is that it’s caught up in the Murray-Darling Basin and the legislation covering it. If you’ve got a flaw, an unexpected flaw, based on incorrect assumptions (and we assert your assumptions are flawed) then people in this area may be forced to look at damming creeks etc. That would bring them in conflict with the Murray-Darling legislation which could leave them with a High Court challenge under section 100 of the Constitution which says that the Federal Government cannot deny a resident reasonable use of water for environment and irrigation. We could come to a state scenario where the Murray-Darling Act gets challenged under s.51 because its preamble says that section does not override the Constitution. If your modelling isn’t accurate I think that somewhere in the future it is going to be one real mess. Who unscrambles that egg?

You’re exactly right; a model is only as good as its assumptions. The EIS process makes two important assumptions; the first is that we adopt the worst case. In other words, we attempt to understand what the worst case is by assuming inputs that don’t look at rainfall as a moderating effect on the aquifers although we know any rainfall events are beneficial for recharge.

We make a whole lot of assumptions that look at the worst case; the reason for that is we can, with a reasonable level of confidence, say it won’t be any worse. The other thing we do in cases like groundwater where it’s both particularly topical and an issue where there are some uncertainties, is we have it peer reviewed. The model’s parameters were peer reviewed by Dr Lloyd Townley who’s considered one of the foremost hydro-geologists in Australia.

36. The question was that if your modelling breaks down because the underlying assumptions are wrong then people in this region caught up in the Murray-Darling fiasco are forced to look for groundwater as an alternative. Who fronts up with the money for the High Court challenge to the Murray-Darling legislation?

Well, I can’t really answer that. As I said, a lot of effort has gone into ensuring the assumptions are not only right but are also ones any reasonable person in the industry would make. That’s the best we can do. Now, if they fall down or they’re proven in time to be inadequate, then obviously there’s a range of recourse people might choose to take.

37. You might be going to deal with this in the next session, so if you are don’t bother answering. But that thing you put up there with the very high to low graph is in the EIS anyway in various places. You indicated if you go into the top left-hand corner
you enter a very high risk area where you can’t do the development unless you can mitigate the impacts. When I read the Arrow EIS I didn’t see any area in it that was described as having a high risk-factor.

I’m just wondering what you’ve got to do to be in the high risk area. Surely good quality agricultural land on the Condamine floodplain which produces some of the best crops in Australia using the Condamine Alluvium water for irrigation is high risk country. And those cracking clay soils which are highly susceptible to salt and where they use highly scientific cropping methods and they’re absolutely precise and don’t cater easily for roads, pipelines and gas wells. Wouldn’t you consider putting gas infrastructure onto that sort of property a high-risk activity.

If I can ask you to bear with me, the presentation I’ll give after the break goes into considerable detail about how we determine the significance of that and I think you’ll find we do recognise it.

38. And high risk?

Yes.

Yes, I’ll wait.

39. I’m just wondering isn’t it still a matter of debate among the hydrologists, scientists and water scientists just where the recharge for the Artesian Basin is coming from? My understanding is that it’s still being debated.

There is always debate in the scientific community. There are a number of mechanisms that were identified through the EIS process by the impact assessment on how the aquifers charge and recharge. The Artesian Basin recharges off the Great Dividing Range. There are some small anomalies that Arrow has identified in its work on the interconnection with those aquifers. Some of the ongoing investigations are to understand how those anomalies work and whether the interconnections and recharge mechanisms are what we think they are.

40. I thought one particular view was that New Guinea played some part?

We heard that theory in other sessions last week but I can’t comment on it. It’s a vast system related to the interconnecting geology.

41. In thousands of years?

Yes, in thousands of years.

42. Was the vibration measured at the compressor station?

Correct.

43. I know people who are seven kilometres away from compressor stations (with no noise mitigation) who complain about the noise at night. Not noise, vibration. It goes right through their body. They complain about it incessantly.

That’s probably more correctly termed low frequency noise as opposed to vibration. Vibrations are shockwaves through the ground.
44. So what are the standards for low frequency noise?

They're published in the EIS. I'm sorry I can't reel them off the top of my head but you'll find in the EIS that the equipment does meet the low frequency requirements.

45. Why would they be hearing it at seven kilometres?

I've heard that phenomenon before. I've heard of it occasionally at longer distances than that but it probably relates to an alignment of a lot of factors. The experience I've had on other projects is that it sometimes relates to equipment not being quite in tune or running properly. And so you get aberrations where people pick up that noise at a distance.

46. Mate, are you going to fight us tooth and nail like the mine does down here on this noise problem?

Sorry, fight you tooth and nail?

47. Yeah, on the noise problem, like the mine does down here, has done for 18 months. Are you going to fight us on it?

Isn't it abiding by its conditions?

48. Are you going to be the same?

Well I can't comment on that as I'm not Arrow. It will have to describe how it's going to operate. The environmental authority sets out noise limits, and if you feel they're not being met, there are processes and mechanisms through DEHP to have that issue addressed.

49. Well we've provided it with the information. On the same subject there is a mine down there and has been for over 18 months, and we still haven't got anywhere. Is Arrow going to be the same? Will you fight us tooth and nail?

Essentially we're doing impact assessments now. We don't yet have the approvals to undertake the project but when we do there'll be conditions which we must meet. The approvals will also outline a range of options around working with the affected parties as well if there are some unintended consequences of our activities there. We will comply with any conditions that are issued and if we can't then we need to take additional steps in terms of attenuation or other measures to make sure that we don't affect you adversely.

50. Just let me get this clear now, those noise levels that you had up there. They were from the compressors is that right?

No they are noises in the atmosphere.

51. I've got a little four horsepower generator that's a kilometre and a half away. I'll tell you what, during the night you can hear that like nothing on earth. As soon as the wind goes away, the noise will go, then as soon as the wind comes up, the noise comes to you.

I'm not saying you won't hear the noise. Everyone has a different sensitivity to noise and, as you said, there are conditions where you will hear noise. There are development guidelines for assessing noise and you can see that even if you take into account the three decibels,
(it’s a bit harder to relate the measure to the actual deemed value) there is a difference that some people will detect on occasion. When the noise impact assessment is done long term weather predictions are done (including 365 days of data, 24 hours a day in hourly increments). They look at the times of the year when those conditions might eventuate, when there is an inversion i.e. a gentle breeze, when you will hear the noise…not at a level above 28 decibels but you will hear the noise. That’s what we call worst case. Technically we find that occurs about five to ten per cent of the year. The rest of the time it’s either too noisy, or there’s other activity going on that will mask the noise. So there’s a percentage of the year when you will hear things. It doesn’t generally occur all at once. It might occur, as you said yourself, for a few minutes or a few hours. Then you won’t hear it until it comes back perhaps in a few months but you will hear it. We’re not saying you won’t hear the compressor station, there will be occasions when those conditions align and you will hear the noise. The regulations require that Arrow ensure that that noise, when you do hear it, is not above 28 decibels.

52. Who came up with the criteria?

The Queensland Government; there’s a set of processes by which the noise standards are set throughout Australia, formed in part by World Health Organisation (WHO) research. Then the Australian Government and the various state governments adopt levels based on their own and Australia-wide research to establish the levels.

53. And it differs for every sector? As in the building sector…mining, agriculture?

Yes. What you’ll see are the guidelines set for this type of industry. Different environments have different guidelines, but these are the noise control guidelines for development in regional Queensland.

54. Is that for the CSG industry?

Well there’s additional work being done, there’s a guideline being published on how to measure and model noise in the CSG industry, but this is basically developed on development within what we call a rural environment. It’s taking into account the very low background noise you experience in the first place as opposed to people at Ipswich or Brisbane.

55. Yes but is it specifically designed for the CSG industry?

No.

56. No…so this could broaden out hypothetically into other industries?

Yes, it could. It could be applied to mining operations and other ventures. If you get a big commercial production plant here, it would apply to that because it’s a noise guideline that applies to a rural environment irrespective of the type of development.

57. Why do these motors have to run 24 hours a day? Why can’t they be turned off at night?

I might let Arrow answer that question. Basically, it relates to the time and amount of water they need to lift.
58. And will they run all over Christmas, all over Easter and all over Anzac Day?

As you know Arrow has a range of activities from drilling and exploration right through to production. When we get to the production phase and we turn the wells on, they will be running 24 hours a day therefore you need to have the compression stations and all the other infrastructure running to maintain that. That’s the reason why they run every day. The CSG industry is different to conventional gas. It is not easy just to close a well and then start it up again in six or twelve months or three years later. Amongst other problems the wells will re-pressurise. It’s an industry that’s designed to continue running unless you decide you’re actually going to shut a well and abandon it.

59. Over holiday periods when we have friends or relatives come to stay at our house, it’s not very nice to have a motor running at night, and people come to you the next morning and say ‘I didn’t get any sleep’. We have no control over that. No control whatsoever. I think consideration should be given to it.

I take exception to the six to ten evening thing up there. Everybody in this room lives on properties. We all know at 6 o’clock at night there’s hardly a sound at all. That’s the time when we sit down to have a beer, when all’s gone quiet. The birds have even stopped singing, they’re nesting down for the night and there’s not a 40 decibel reading anywhere. I take extreme exception to that 40 decibel reading.

Perhaps that is something you could put in your submission.

60. That would be a city decibel level, that one, a city or a town but nothing to do with us. How do you measure the area? How do you get to the wells? And how do you get to the gathering lines? Is it 75 x 75m or 10 x 10m?

A well is 75 x 75m because that’s the construction footprint. That’s rehabilitated back to 10 x 10m for operations, then for the workover they need to expand it out again. The well goes through periods of partial re-use of land. The gathering lines, once they’re trenched or ploughed in, they don’t need to be surfaced so they have a construction impact of around 20m right of way for the length of the system. Then when it’s finished it’s rehabilitated.

61. That right of way persists doesn’t it, all the way through the line?

Yes, the right to have the facilities there and to operate them

62. ...And to service and operate them?

But once it’s rehabilitated it can be used for the pre-existing land use. It’s recognised through the process that there are some residual impacts that are long lasting and may not be effectively managed. They relate to things like changed operations. If the gas well is inserted into a cultivation paddock, even if it’s on the side as you would have seen in the EIS, it will involve some rearrangement of the ploughing or the cultivation runs, and so that will be a long term impact until the well is decommissioned and removed, and the land returned.

There’s the ability to develop and modify the farm plan. There’s also the potential for diminished productivity; in other words, if the property is not successfully rehabilitated you will see some diminished productivity across the right of way. We recognise the effects may
take some time to reveal themselves which is why in the EIS one of the management measures is periodic monitoring until it’s agreed with the landowner that previous or agreed land use has been re-established. This last one is in relation to the production facility, particularly the integrated processing facilities where (because they are quite substantial developments i.e. engineered clay pads) we can take all the equipment away, we can take out the padding, but we might find that we can’t take it back to arable land, and therefore it will become grazing land. That might be a long term effect of the project.

63. My question is more aimed at wanting an answer not so much to the rehabilitation because I know there’s good rehabilitation and bad rehabilitation but just what Arrow’s rights are. A well might be rehabilitated back to 10 x 10m but isn’t it true Arrow can then come back any number of times through the project life to re-size it back to 75 x 75m because it’s always got that right of way, including on the pipeline corridor?

It really comes to the agreement reached with the landholder, and the way those activities are described. If the explanation of the activities is that we’re drilling one well, we’ll be there for a certain amount of time with 75 x75 and then at a point in time will reduce it to 10 x 10m. If there’s no option in that agreement to return and workover that well or anything like that, Arrow would have to return and renegotiate if it wanted to do anything else. It’s the description of the activities that dictates what can be done.

64. With your access do you have to specify whether you have right of way at 75 x 75m or 10 x 10m?

So how wide, for how long and is Arrow allowed to revisit? Those things would be covered in the agreement. The EIS talks about three periods; the establishment period which is 75 x 75m, the operational period, which is 10 x 10m, and then the workover period, which goes back to about 70 x 70m.

65. Getting away from the farming for a bit, what about forests? How are you going to rehabilitate forests?

In the same way we do in other circumstances once we remove the activity. We certainly don’t want trees growing over gas pipelines because we don’t want root invasion. Arrow will usually allow ground cover species to re-colonise the easement. If necessary it is slashed and will self-generate. If it doesn’t then usually it’s assisted with some plantings. Basically we re-establish the ground cover, and eventually when it’s decommissioned we encourage trees back.

66. Do you have a time line on that?

Do you mean in terms of when it comes back to ground cover?

67. No, back to its original condition.

Arrow will achieve the guidelines around reinstatement of native vegetation. We talk about a period to achieve what is called remnant status which is when the government deems the number of trees and structure have reached sufficient maturity to be self-sustaining and will then move on to full maturity. That’s usually measured in five or tens of years but the actual maturity of the eco-system might be a hundred years. Some of the eco systems out here
take a hundred years plus to actually reach maturity. The point is that Arrow, in rehabilitating the area, has reached a point where it will continue to function and be self-supporting and mature over time.

68. I'll be long dead then.

Most of the projects I've worked on are in the same boat.

69. Regarding the easement is it true that once those easements go in Arrow can return and use them whenever it likes?

That's correct. An easement entitles the asset owner to occupy the land and to maintain the asset.

70. And the landholder doesn't really have any option but to allow the easement to go in?

It's by negotiation. As Carolyn has pointed out, the process moving forward is that Arrow will conceptualise its field layout, and where it would like the wells. Then there is a process of negotiation with the landowner on how those wells might be moved or rearranged on the property to reduce the impacts on the property and how the flow lines or gathering systems might be laid on the property to reduce the impacts on the property. There's a whole process that you as a landowner will work through with Arrow to try to reduce those impacts on your property in laying out the wells.

Arrow has given some examples of how that might happen and there's an example in the agriculture fact sheet on how wells can be moved around. Arrow is looking at multi-well pads which might remove the need for five wells; instead of having five wells and gathering systems on your property, you have one well pad, albeit larger, and one set of gathering lines out from that well pad. There are a whole lot of things that are being worked through to try to reduce the impact on agricultural land.

71. I think this question relates to Arrow. Just today I heard that a landholder had a contract to sell his land and when the final search was done he discovered Arrow had a type of caveat over that land allowing it to eventually buy it. The landholder had absolutely no idea.

There's not really enough detail there to understand what you're actually asking, but obviously if there is a concern we're quite happy to talk to that particular landholder if you want to refer him through to us. It does sound very unusual in terms of what you were describing. We're happy to talk to landholders if they're concerned about us, we do encourage them to give us a call.

72. Does Arrow make it a habit of taking water from anywhere, or are there specific places it has to take water from?

I had this question the other day as well. We have an obligation, just as anybody else does, to take water from either water service providers or people who are entitled to give us water. We can't just pull up anywhere and take water. The same rules apply to us as they do to anybody.

73. And you've never taken water from anywhere else?
I don’t believe so. I don’t know historically, before these rules were in place, whether Arrow did or didn’t, but in recent times the practice is that we don’t.

74. What do you call recent times?
Three years...that’s how long I’ve been in the organisation.

75. When Joe asked the question in Chinchilla and you said you definitely don’t take water from other sources, he told you that somebody in the room could verify it. Is that right?
He said he believed there were cases where we had.

76. Do you want evidence of that?
If you want to talk to us afterwards, certainly we’re quite happy to engage with you.

77. That truck was taking water from the stock route on Ryalls Road and it was taking water for Arrow because that’s the drill site the driver was working for.
That is an Arrow drill site but I’m sorry I don’t have the specifics around that.

78. Well you should have, because I contacted DERM about that, and it should have already been on to you.
We have a lot of dealings with DERM and also obtain a lot of licences from it in terms of taking water.

79. I don’t think this was licensed. It came out of a creek, a little baby creek on Ryalls Road on the stock route.
We have had some approvals to take water from creeks as we have from landholders themselves. Again, I don’t know about this specific case but I’m quite happy to talk to you about it if you’d like to do so.

80. Well I’m just saying you reckon it doesn’t happen – there it is, it’s happened.
Again, you don’t know the specifics of what’s involved in that project either, so...

81. Yes, I do – they were stealing water from the creek! I took those photos, it was on my place.
I think the point Carolyn was making was that there may have been some approvals given. She can’t say without more detail.

82. There weren’t any approvals. The bloke who was doing it was openly nasty.
I’m not sure, but you need to talk to Carolyn about the specifics later. It’s really not the place to do it from five rows away.

83. The saline water that you are pumping from the wells and then containing in the rim tanks, does the EIS address what will happen to it after you purify it with your reverse osmosis, does it address the residue?
The answer is yes. We’re looking at different ways of dealing effectively with the left over salt or brine. We’ve got treated water which we would like to substitute for existing use. You’re absolutely right, roughly 10% remains of brine which of course is more saline than the original water was, roughly five to ten times more saline.

What we’re trying to work towards in Surat together with two of the other CSG companies is to build a processing plant that actually processes the salt so we can sell it. There will always be some residue, and that will then go into landfill. If that doesn’t come off, in other words if we don’t manage to agree to do that, our default case (which is the worst case in the EIS) is that we bring all of it to landfill at the end of the project. So starting roughly 20 years from now we would start bringing that brine across to Ipswich to a landfill facility there.

84. It’s near Ipswich?

Yes, Swanbank is the regulated waste facility we’ve chosen. It’s called mono-cell disposal because you don’t dump it with all the other landfill, you create a separate cell which only contains the brine residue; that’s regulated as are all other salt facilities across Australia.

*Additional information: Arrow has now committed to not transporting salt to Swanbank.*
**WANDOAN**

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<td>Venue</td>
<td>Wandoan Community and Cultural Centre, 6 Henderson Road, Wandoan</td>
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<tr>
<td>Presenters</td>
<td>Tony Knight, Vice-President Exploration, Arrow Energy</td>
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<tr>
<td></td>
<td>Barton Napier, Senior Principal, Coffey Environments</td>
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<td></td>
<td>Jeroen van Dillewijn, Water Manager, Arrow Energy</td>
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<td>Facilitator</td>
<td>Jan Taylor, Principal, JTA Australia</td>
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1. I want to be clear. You’re talking about a 20 year recovery and water comes back into the coal measures in that period of time? Some national bodies are talking about centuries for that recovery.

   What I tried to show is what happens if we currently assume that in all these aquifers the amount of water farmers are taking out of the ground is the same as the amount of rainfall going in. We’re assuming a balance. For some aquifers there is a suggestion that maybe there is less recharge happening than extraction. In the Condamine we suspect that it’s the other way round i.e. landholders are taking a little more out than the rainfall is putting back. Those are the trends that we are trying to measure and those organisations are not always able to agree.

   If we stress the system more of that rainfall makes its way down. That recovery is indicating if there is a balance now then that recharge will happen as per our model. How much recharge you will see over 20 years is what you see in the model. We could run the model for another hundred or thousand years but you’re quite right, you never really reach the exact same point. Of course a lot of other things may change in that time, including how landholders extract water from the system. What we’re trying to show is that if we allow for the fact there’s a balance now this is the net incremental impact we will have at given points in time.

2. So within 20 years there will be a substantial recovery of the Huttons and the Walloons?

   Yes. As you saw, the recovery is fastest in the Walloons, slower in the Hutton and slower still in the Condamine by virtue of the fact that it’s further away from the pressure impact.

3. Could you tell us what happens to the salt and how much there is?

   There are estimates of the amount of salt, and it will depend a bit on the average water quality. Currently we don’t have good data on water quality across the whole region, but as we drill more monitoring wells and gather more data we will have a better idea. On average the salinity is around 5000 parts per million (ppm). This translates to about 4,500kg per million litres of water extracted. At our average production of 25gL that results in about 125,000 tonnes of salt produced.

   In regards to what we do with it, Arrow is still in consultation with a number of its industry partners to see if it can find a way of dealing with the salt beneficially (i.e. to find another use for it). If we manage to do that, and it’s all about scale, we will be processing the salt to sell it for industrial use mainly but even potentially for table salt. It all depends on the quantities
available as even those 125,000 tonnes per year may not be enough to allow us to compete with the guys who produce salt from seawater as seawater is so much more saline than the water we will be producing. If that doesn’t work, our default or worst-case scenario is outlined in the EIS and would involve allowing water to sit in evaporation ponds so that the water evaporates away and then sending the salt to registered or regulated landfills.

4. Where would the landfill be?

The landfill that we have nominated is near Swanbank as we know it would take it so it is a possible solution. It could be sent elsewhere if that makes more sense but there is no suitable landfill here so it will definitely be taken out of the Surat area. If we take this option we would only be landfilling quantities that are not too dissimilar to the amount of waste salt that is produced by companies which produce salt from seawater.

Additional information: Arrow has now committed to not transporting salt to Swanbank.

5. I did a calculation which meant there would be around 4,500 B-doubles full of salt going between here and Swanbank.

In the traffic study we looked at the issue of what the impact of the transport of the salt would be on the roads. The CSG development takes 30 years to reach its peak; by the time Arrow is getting towards the end of the project some of the facilities will be retiring so the cleaning out of the ponds and the salt removal would start about 10-15 years before the end of the project. What you will then have is salt being moved from the Surat to landfill over about a 20 year period. When you look at that it equates to about four to six B-doubles per day when the salt is being moved. It won’t be all from one area, the facilities are spread right across the region so those four to six B-doubles per day will be spread across the area.

6. 125,000 tonnes per year? In the EIS it said up to 190,000 tonnes?

That’s correct, at peak. We have modelled the worst-case in the EIS. The data is not in for the whole field yet and may be less, so we’re assuming a worst case scenario. When you work that out, along with the period over which it has to be moved, it equates to around four to six B-double movements per day. That still adds up to a few thousand truck movements over a year.

7. That seems like a terrible thing to do with our landfills, filling them full of salt.

If Arrow sells the salt it still has to move it.

8. But that’s just not going to happen. It’s produced cheaper out on the coast, hundreds of thousands of tonnes per year.

That’s true, although it’s not just table salt that we would produce. There are also more valuable salts which could be sold.

9. How many conduct and compensation agreements (CCAs) do you have to get signed? I think you said 660 have already been signed, but how many more do you need signed?

I don’t have that information to hand, but I think the timeframe is important here. There is quite a long timeframe for this project so we’re not trying to get them all in place on day one;
it’s something that will happen over 20-25 years. There will probably be around 1200-1500, but not multiple thousands. Bear in mind that a lot of our gas will come from the Bowen Basin; property holdings there are much larger so we’re a bit different from other proponents in that too.

10. But you hold some of the most closely settled areas too.

Yes, so it’s a mix. They average out between the Bowen and the Surat so we don’t need to have 10,000 access agreements in place for example.

11. In regards to noise monitoring I’ve heard from some of the companies (incidentally I deal with twelve of them) that ground noise varies enormously from site to site. On one of our places there is virtually no existing noise whereas where the pumping stations are going to be we’ve got a feed-lot with tractors and things running continually. Will your noise be monitored above the noise we make? The aggregate of our noise and yours could exceed the acceptable level, is that right?

That's correct. Noise is additive but not in the strict sense so if you add 19 decibels to a 34 decibel noise source you don’t get 53; but it does have an additive effect so it might be 22 or 23. The purpose of this was to establish the background noise and then that’s included in the modelling to demonstrate that we can meet the 28 decibels limit. So the modelling takes into account what will be added to the background noise by the CSG facilities. This is based on typical modelling and is a requirement under the Environmental Authority process. Arrow will have to physically measure the noise once it develops a facility to ensure it complies. If it doesn’t, Arrow will need to apply more noise attenuation to the facility to achieve the 28dB.

So irrespective of what’s happening out there now, when Arrow develops the facility it will have to demonstrate the criteria has been met; it will take into account the feedlot and other things that are happening. Does that adequately answer your question?

12. Yes, I’m fairly happy with it but I’m finding it a little difficult to come to terms with how much actual noise one, two, three, four or five of these compressors will make.

Arrow’s project is not to have what we call inline compression. Arrow’s proposal is to have compression at these facilities, that’s where the gas will be compressed and then there will be no compression all the way to Gladstone.

13. Nowhere in the world have we seen 42 inch pipes so this is a new ballgame to Australia, Queensland and our backyard. There’s a little bit of scepticism on just what the effect will be. I’m on the Queensland Government’s gas consultative committee and there are so many things that just don’t come out even in a presentation like this.

My friend over here might have a requirement to have markers along the pipeline eight feet high so he doesn’t gallop into them with his horse. If you put it on my place where I’m growing wheat or sorghum and I’ve got spray equipment etc. well that might be a different story. There are so many things we don’t really know because the companies and the landholders are still learning really because none of us have a mental picture of what it will look like. I guess that’s where I have such a lack of affinity with the Drew Huttons of the world, I believe we’ve got to cooperate or we’ll never get an end result...strictly a comment.
I understand and hope through these forums we can try to help you visualise and understand a bit better what it’s going to look like. I know Arrow has arranged site inspections for some of its infrastructure for the people down around Dalby so they can get a feel for what it actually looks like. One of the things that I’ve learnt that seeing is believing. It does help to visualise whether you are working on a mine, a pipeline, power line etc. what it actually looks like, and what it means to build one.

14. This question isn’t specifically about the presentation but generically about your operations in Wandoan, not Condamine or Miles, but Wandoan. Firstly, how many employees do you currently have in the Wandoan area? And by that I mean in a 50km radius of Wandoan.

We have no employees here; our current operations are domestic gas supply and managing fields close to Dalby so our base at the moment is there. Come the commencement of the project, we will look at developing other bases across the area in towns where we might operate. So today there’s no one in Wandoan, or within a 50km radius, except for exploration crews which are usually between three and six people and they do not stay long.

15. At peak construction in this area what is the projected personnel?

What the EIS reports is that Arrow’s intention at present is to locate the bulk of its workforce with the integrated production facility when it’s built so the camp will be with the facility. There will be three or four facilities from the top of the tenement to the north of here and then as you move back down towards Chinchilla. Across that 150 kilometres there will be three or four facilities; over time there’ll be construction camps at each of those major facilities (or perhaps one camp for two facilities depending on how close they are together) so you’ll have about five to six hundred workers at a camp for that facility once the site is chosen. That’s the model around what the construction workforce will be. You’ve got your drilling crews on top of that, around four to six people per rig. Then there’ll be the operational workforce and the EIS indicates it will be largely located in Millmerran, Dalby and Chinchilla although there may be smaller depots in places like Wandoan and further south. That’s the workforce distribution as we understand it at this point in time.

16. My interest is what the social impact on the town will be from the personnel if a camp was to be placed north of Wandoan here. Has a site been selected in the Wandoan area as yet?

No.

17. If that camp was selected north of the town, the only sort of ballpark figure we could be anticipating is possibly 500 people in that one camp?

Yes that’s right. I’m guessing the camp would be south of town because we’d want to locate it midway between where we’re developing. North of Wandoan is outside our area so it would be south but we haven’t determined exactly where. As Barton said, a camp will be constructed at the same location as our processing facilities; there are about ten of those spread from here through to Millmerran and in the area between here and Chinchilla there are about three or four of them. We would locate the camp near those processing facilities and they would have a pretty short life of a couple of years.
18. Do you provide all the services or are you still heavily reliant on the town?

The camps are largely self-sufficient but there would be contract services for food deliveries and supply, cleaning services, water, sanitation, laundry, all those things. There’d be help and support through Arrow’s contract and procurement functions for local suppliers or those who need to step up their capacity. If something just doesn’t exist in this area then we’d have to find providers or maybe bring them in somehow. I guess that’s a level of planning we haven’t got down to on an area basis at this stage.
1. **What is fr accing?**

‘Fraccing’ is an abbreviation for the term hydraulic fracturing. It’s a way to artificially enhance the permeability of the coal seam. The permeability is what allows the gas to flow through the coal; sometimes the coal doesn’t allow the gas to flow so people have worked out ways to increase it artificially. Very briefly, what happens is you drill a hole or a well into a coal seam, you then pump water down at incredibly high pressure such that it fractures the coal in a radius around the well of about 100 to 200m into the coal seam. You then pump sand down into the cracks to keep them open. Effectively that’s what hydraulic fracturing means, it allows the gas to migrate from the cracks back to the well and the surface.

2. **How do you pick where that line is on the risk matrix between high and low risk? (See Figure 11 on page 11)**

We might have an ecosystem whose sensitivity could be very high because it’s intact, nearly pristine, and it’s holding a threatened species or endangered community. We can look at what the magnitude of the impact would be. Obviously if it’s high, and the area is highly sensitive it’s going to be a major impact. Therefore we would probably avoid that; we would design the process so it’s not affected, and you can do that in various ways. An example is the McIntyre River here; if there was a reach of that in a pristine state, Arrow could trench across it to put a pipeline in and affect the ecosystem or it could drill under it in a horizontal direction and avoid the impact on the ecosystem. That’s what I mean when I talk about designing-out. It all feeds into addressing how you deal with the uncertainty associated with where and when.

3. **I can see a slight adjustment of that line can have a major effect on the percentage of high in the lower section to where we’ve got that line at the moment. Does that mean the percentage of high in the standard management measures is lower because of where that line is positioned?**

Yes, they don’t go into the bottom. This line is basically saying that if it’s moderate, low or negligible, these apply. If it’s high or major, these apply. We don’t try to split highs across the line. I guess I should have drawn a staggered line. If it’s high or major it needs to be designed out through specific management tools. If it’s below the line we deal with it procedurally. When we see the impact assessment by a specialist reports a high impact we know it’s above the line and needs specific management. If it’s moderate we know we’re dealing with a procedural environmental control.
4. Tony, at the start there, can you clarify your comment that the area which will be affected is 40 km north-west of Goondiwindi and by 2013 there should be an announcement as to whether it will go ahead? Is that the only area where Arrow has an interest in this council’s region?

That’s correct; the closest point now is 40 km north-west of Goondiwindi.

5. So those landholders in the area will know at the end of 2013 if Arrow is to continue in the area and, if not, will you be handing that tenement back to the government?

Well that area is still an exploration tenure so we’re doing exploration work there. If that tells us the area is not so good we’ll give the whole thing back but if we find there is a portion that we want to keep, we'll convert it to a Petroleum Lease which would be defined next year.

6. When you were talking about water management you said Arrow does purchase properties or land; is it your intention to try to purchase land in that area?

We would buy the land for those processing facilities we talked about because they are quite big; there are a couple of hundred hectares required for those facilities. We will buy that land because the facilities are long term i.e. with a 20 year life. There would be about ten of those across the region from Wandoan to Millmerran.

7. You mentioned you’re going to use the water you produce but you said in other areas you’ve used the water on properties that you’ve bought. I guess the question is how do you use the water? Do you intend to buy properties to use that water on?

No, we have two properties we own where we are trialling use of our treated water. It’s a research-type activity to confirm there are no ill effects on crops that are grown or on the land itself but it’s not our intention to buy properties or use water for farming activities.

8. I was wondering about the risk analysis in the EIS and how much attention has been given to council roads. We’re hearing about the massive activity two hours to the north, similar to two hours to the south. Operators other than you are significantly impacting on the availability and safety of roads, maintenance required, and road maintenance systems. Does that impact statement take into account the other companies in the area? Or were you referring purely to Arrow activities?

It does take it into account. One of the things you will find in the Arrow EIS which you won’t see in any of the others preceding it is that we have to do a cumulative impact assessment as part of the EIS. Arrow has had to look at the cumulative impact of all the other activities in the region on the flora, fauna, roads, community, everything. There is a specific section in the EIS called cumulative impacts; if you read the road section it’s referring to Arrow only but if you go to the cumulative impact assessment it talks about what happens when the road networks will be subject to all the projects about which we can get information.

We looked at the EISs from the other three CSG proponents, and from Xstrata. Their road data was used by the traffic engineers to model the overall impact on the road network. What we see in the cumulative impact section is that there are a number of roads, more into the top of the area than here, that are going to experience some high volumes of traffic as a consequence of all the projects. As the cumulative impact assessment says, there’s a
process now that must be worked through with council, the Department of Transport and Main Roads (DTMR) to decide how we are going to deal with those roads.

9. Does that cumulative impact account for agriculture? We’ve a massive agricultural area here that relies on the road system as we’ve a failed rail system. Are agricultural movements included in that cumulative section?

Yes it’s represented in the background traffic data used. The traffic counts ideally reflect what’s happening in the agriculture sector as well as normal transport activity in the region. The specialists apply to that a predicted growth, based on DTMR and council data on traffic growth. On top of that they applied Arrow, Origin, BG and Xstrata as well as some of the rail projects.

10. The other question I have is about reinjection but you probably need a couple of hours to try to explain that to everyone, so I’ll leave it for you to describe later on if you like. There are a lot of concerns out there about it. I just want to understand the concerns you have as there are opposing viewpoints. For some communities all they want to see is reinjection because they believe it’s going to have a long term benefit in restoring the aquifers. Then there are others who do not want to see it go forward at all, so there is a mixed reaction. Basically, we’re looking at injection as a means of mitigating some of the impacts. If you look at the Precipice Sandstone for instance where we have people who use water from the Walloon Coal Measures, we know it will be impacted by our activities. If we inject into the Precipice this may make an additional allocation available from it into which we could deepen existing bores as an alternative water supply for them to provide them with that security into the future. From that perspective, it’s a positive thing in terms of managing the water and making sure people don’t lose their water supply.

There are other options that we might be looking at e.g. injection into the Condamine Alluvium is something that government and certainly people in that community would like to see. It’s a trial that we’re considering doing. Our preference obviously is to bring that water to the surface, treat it, and supply it to a third party who actually has a current allocation from the Alluvium. That is easier than trying to mess with that whole system and bring it back in, with somebody else taking it out again.

That’s a much more straightforward way to go. By providing it to them, they would leave their allocation in the ground and that way it could naturally recharge over the time of the project in that particular layout. There are a number of reasons why we want to do it, and government at this point in time is mandating that companies demonstrate it’s not feasible before they can entertain any other option of managing their water. It’s becoming more and more difficult not to go down that path.

11. I just think we don’t have enough information about whether it’s harmful or not. Is it good, is it bad?

Injection has been done around the world for many, many years so it’s not a new technology…

12. That doesn’t mean to say it is right. You said before that some communities want it, some don’t. All I’m saying is the people haven’t enough information to know in
layman’s terms what the harm is. If you take water here then put it back it sounds feasible but what harm is being done, that’s the question?

That’s why you need to do the trials, to gather more information about the site-specific geology and other factors. If it’s done properly, which we believe it can be, there should be no risk.

13. I’m confused. What water are we injecting back? Are we injecting back treated water? Obviously when you treat the water, you get good and bad water is that right?

That’s right.

14. At the moment the bad water sits in settling ponds?

You get two separate streams; the treated water which would be used for injection and the concentrated brine stream which contains the salts and other elements taken from the water. The brine is held in a storage dam and the plan is to beneficially use that salt stream for an enhanced crystallisation process which produces commercial salts such as table salt or soda ash for which there are currently huge markets. That’s how we plan to deal with the brine stream; for the treated water stream, we’re looking at options including injection but also supply for third parties as well.

15. So what you are talking about injecting at the moment is the good water?

Yes.

16. What I’d really like to know is what is going to happen with the bad water? What’s your plan for it?

That’s the brine stream I just mentioned where we want to have an enhanced evaporation process as part of the salt production process. It could be either a thermal or heat process which would make the crystallisation of the salt accelerate over time so that we can generate the salt, remove it from the site, and preferably use a commercial arrangement to make industrial salt which we can sell to the market. It’s probably not a business that Arrow can do itself; we’re talking with the other proponents at the moment about attracting a company to do the chemical treatment and deal with the salts in that manner. I think that’s the best opportunity for the four CSG companies to collaborate in terms of managing some of the impacts.

17. What is happening with the salt at the moment?

At our treatment plants, it’s going into a dam containing just the brine stream so it is concentrating in that dam while we’re investigating these other options.

18. And are those dams sealed or open.

There have been new standards in place for the last 12 to 18 months, so they are properly lined dams, they have polyethylene (PE) liners in them and they also have leakage detection systems. The standards required for the CSG industry in terms of dam structure, and particularly for a brine storage dam, are far above what’s required for any other industry. The specifications are very, very high.
19. I have a similar question about the salts. I’m a bit concerned that over the time of your 20 or 30 year drilling program the volumes of these salts are going to be substantial. It seems to me that you want to take them somewhere, and crystallise and sell them. We’re talking hundreds of thousands of tonnes are we not? That’s a lot of salt.

That’s right.

20. You could supply the world with salt by the sound of it. It just concerns me where this crystallised stuff is going to be stored. In terms of the industrial salt and soda ash market, what if the market drops and there is no more market for industrial salt, what happens then?

I don’t think that would occur. There are a lot of manufacturing processes that currently utilise those products. That won’t change for a long time and there’s quite a large international market as well. Australia currently imports a lot of products that we could be making locally if the salt was available. We do have a base case presented in the EIS for the removal of salt from the landscape and transported to a regulated landfill site i.e. a facility purpose-built for storing salt but that will only occur if we can’t do something better with it.

21. Where’s the facility?

There are some facilities that will take it now but in the future additional facilities may be needed. That’s another business opportunity a company would take up at that point in time.

22. How big a waste water dam do you need to satisfy an area like that, and how quickly does it evaporate? I just can’t get my head around getting rid of all this brine.

The size depends very much on the facilities, and right now I can only speak from the basis of the impact assessment. They’re not sized on the assumption they are going to be there as evaporation dams. In addition you need to make an assumption about the storage capacity the dam needs to have for a buffer period. If we have a shut-down period for the plant we still need to be able to produce water. There will be wet weather events and that needs to be accommodated in your design as well. The dams aren’t small, we’re not hiding that. But because we are planning to use the water and salt beneficially, the size of those dams isn’t as large as they could otherwise have been. We will not continue to build new dams throughout the project life as we’re not doing anything with water so that allows us to minimise the footprint. I’ll ask Barton to talk about the basis of the impact assessment but also some of the concerns about the salt and its transport as I heard earlier some concerns expressed around that.

The EIS assumes that an integrated processing facility where the water treatment takes place will have between three and four dams. They will be what we call raw water dams as that’s the water brought up from the wells to liberate the gas and get it flowing. The water from those dams will be run through the reverse osmosis (RO) plant and into two streams one of which is the pure water stream from the RO plant which is treated water for injection, substitution or other uses. Then there’s the brine stream which goes into a brine dam. Depending on the yield, because not all the wells produce the same volumes and yield, there may be one or two dams. Probably more often than not there will be two brine dams to enable them to cycle between the two dams over the life of that facility. If the processes that
Carolyn has outlined in terms of processing the salt and using it beneficially are not available, then about ten years before the end of the facility we will start to remove the salt from the dam. It will be trucked; the case that’s put in the EIS is to the registered landfill at Swanbank, where they will build what we call a mono-cell which is only for salt. That’s the default case.

23. Does Swanbank know about this?

Well there’s a registered landfill at Swanbank now.

24. But do people who live in the area know?

We have to get a permit to dump into it. It’s currently taking all the hazardous materials from around the Brisbane region and hinterland. So far as I’m aware every capital city has one or several. Melbourne’s facility is at Lindhurst and Swanbank is where the facility is in this region. That’s what we would assume would be the default case, as Swanbank could take that volume of salt. We have about 125,000 tonnes a year for the whole of the development area so that is ten-odd facilities. The EIS has considered that about ten years before closure Arrow will start to remove the salt if it hasn’t already been removed and treated through some other process. That equates to about four to six B-double truck movements a day from across the whole project development area in that last ten to fifteen year period. Because those facilities are dotted right through that arc, it will only be from some of them periodically and as I said that equates to about four to six B-double movements per day heading down to Swanbank.

Additional information: Arrow has now committed to not transporting salt to Swanbank.

25. Is that just Arrow?

Yes, so if you wanted to loosely multiply it by four you might have up to 24 to 30 truck movements for all the companies. I can’t comment on what their proposals were, but that’s Arrow’s. The reason we looked at that was to work out how it contributes to the traffic load through that period as construction will be finished so the traffic peak will have reduced. There will then be an artificial traffic peak when we’re removing the salt, if that’s indeed what happens. Again, the EIS is trying to look at the worst case. If we adopt the option to have it treated and used beneficially, then you won’t have that scenario.

26. The question I had was the actual drawdown in the aquifer? A lot of the properties west of here rely very much on the Great Artesian Basin (GAB) for their farm and domestic water supply. The drawdown you’ve shown is a huge depth. Fifteen to twenty years ago the state government had us cap our flowing bores because we were losing pressures in them. That pressure hasn’t returned to the level where it was previously. You’re saying it’s going to recover when you stop doing it. But what happens if it doesn’t recover? Are you going to continue to assist those people with water? If we don’t have artesian water west of here there won’t be any agriculture.

Yes, we’re obligated to ensure you have supply well beyond our project if we have an effect on your bore. We’re responsible for whatever time it takes.

27. When we capped our bores, they were testing it and taking samples. They used to say that water was basically taken from the dinosaur era as that’s how long it took for that
water to reach there and come up. It could be hundreds of thousands of years until it comes back again.

There are still a lot of people researching and understanding the GAB in its entirety; what we are looking at is a subset of that, feeding into the other work that is being done as well. We will continue to improve our understanding of how that works, and how the systems migrate over time.

28. If we consider there are existing landowner bores in pretty much all the aquifers that you’ve mentioned there, you’re going to depressurise whole zones around those. There is obviously going to be a hell of a lot more gas coming into your wells and those of landowners. How do you handle that, is it all worked out somehow?

The primary area that would happen is in the Walloon Coal Measures because even as a landholder producing water from the Measures over time, you will create basically a gas well. There have been people throughout the region who have experienced that for quite a long time. It’s a phenomenon we’re aware of and that’s where we need to make sure that any make good arrangements recognise the current levels. If we’ve impacted on them, we need to establish that your bores are deep enough so you’re not getting that gas. We also need to establish if there’s another way of mitigating or making-good that supply to you, either by going into another aquifer or obtaining a surface supply of water or a compensatory measure; there are a number of ways we can make sure you are protected in terms of supply. The best option has to be agreed one-on-one with the person who owns the bore. We don’t ignore the fact it can depressurise and gas can come up, particularly for the Walloons. It’s our plan to understand that as well.

29. In terms of Arrow’s performance in the past I’m curious if Arrow has any outstanding compliance issues or obligations under environmental authorities?

The short answer is no, although there is always a ‘but’. If you have any understanding of how the environmental management framework works, conditions are changed frequently. When Arrow is given a new environmental authority, there are no transitional provisions, and theoretically they apply immediately. But there will always be a point in time where there’s something like a management plan which wasn’t there on the day that the new requirement came in so technically that’s a non-compliance. However, we work them through with the environment department so they understand some changes cannot be made overnight. Apart from matters like that there is nothing outstanding.

30. I’ve got a heap of questions on the road thing but it might be easier if you just go back to that slide because it appears to me that you’ve totally neglected the border region i.e. the cross border issue with the extension coming through Narrabri. Two years ago our agricultural producers in the west estimated that a B-double would have to leave every forty five minutes to move the amount of wheat required for one year.

Yes, I understand what you’re saying and that probably is a deficiency…

31. I’m concerned there’s no mention of any of the roads in our district here. Our Barwon, Leichhardt, Gore and Cunningham highways are severely impacted with road transport issues.
This is also an issue in Gladstone where Arrow will have its LNG plant. One of the issues Arrow is considering is revisiting its logistics on how it moves materials into the region (the base case is by road). You know the sort of volumes that will occur there over that period of time so there are various options being considered. As Carolyn pointed out, the CSG proponents are getting together to deal with the salt; perhaps it might be better to pipe the brine rather than truck it. I know Arrow is looking at that as it’s a possible option to take the bulk of its cargo off the road network.

32. They’ve just rejected a second range crossing for Toowoomba although the range was closed for about four or five hours earlier this week. What a ridiculous situation.

That’s understood. We’re frequently asked what we are doing about this. Arrow’s neither the road authority nor health or education provider in Queensland. However, within the social impact management plan and the traffic impact or management studies Arrow has committed to provide the government with its data as soon as possible so that government has it in advance and hopefully it can facilitate government planning for service provision.

33. I live west of the Leichhardt Highway on a farming property. I’d have expected an immediate impact on our road from perhaps Origin or Arrow but my biggest issue is with the Artesian Basin water extraction. Carolyn mentioned more monitoring bores that the Queensland government has installed in the last twenty-five years. We’ve been asking it to monitor bores to measure pressure loss and salinity and other things so I guess that’s great. But to whom does Arrow report the results of its monitoring? Is it only internally or does it have to report to government or to the Great Artesian Basin (GAB) authority or to whom?

There are a number of bores put in for different purposes, some of which are a requirement of the Queensland Water Commission. We collect all of the information into one database and we agreed previously to making that information available and sharing it. It’s important for everybody to really understand what’s going on there and for that information to be available.

34. Is that for government?

Yes, to government. We’re maintaining all that information and making it publicly available. We will be developing interactive software to make sure it’s available and accessible.

35. Will there be anything on the Arrow website?

We haven’t got that far. If there’s a tool that is interactive it will be web-based and something that we could provide.

36. If it’s something that’s going to be so technical probably only government water people are ever going to be able to understand it anyway. But putting it on the website would be great although it’s not us that will be looking at and understanding it.

It’s interesting when we go out and do a lot of these sessions and talk to people who are living and breathing agricultural businesses that rely on bore water supply, they’re actually very well informed about how these systems work and have a lot of technical knowledge. So there are a lot of people in the community who it will be very meaningful to and others not so
much. The challenge for us is to make sure that what we provide is something that can be easily digested by anybody.

37. Can I ask another question while Carolyn's there? I don't understand your make good provision. The GAB is mysterious to so many scientists. No one can ever tell us the recharge time, indeed they don't even know where the recharge areas are. If these gas wells are permeating various aquifers and pressures and the levels of water are dropping how will you make good when in twenty or thirty years Arrow Energy is going to be gone. You're going to have to make good for ever for the loss of water pressure and levels of water and I don't understand how you can do that.

We do have to make good for the duration of that impact so we need to find a solution. Make good is about offsetting impacts or relieving impacts to particular users. We won't necessarily have impacts on everyone in your area. It's about understanding where that's going to occur. If you start to think about the volume of water we will extract over the life of the project while those numbers might sound large, when you put it in the context of the entire Basin (and more specifically around the Surat Basin and components of that) then it's not really that significant. We're not actually de-watering any of the aquifers.

38. But they don't really know where the water is. They don't know how much water is in there for a start. They can't tell you. In regards to our bore it's piped to twenty-seven users where it used to service three. If our bore pressure goes down sixty metres, how do you qualify the impacts of that? I just don't understand how you quantify the impacts to twenty-seven different users now.

There's now quite a bit more known about some of these things than people appreciate. But that's the other reason for installing more monitoring bores so we can understand the geology and different sequences and understand what those pressure differentials are to improve our modelling and our understanding of the extent of the impacts as they might occur. We don't want to be in a position where we're suddenly finding you've got an impact when we could be out talking to you and working through any issues and concerns and maybe changing the way that we're developing our field in response to what we're seeing out there. All that early work, understanding and researching and doing all those things as we go along will help us manage it before it becomes a real issue.

39. I think what we're probably concerned about out west of here is the cumulative impact of all your operations, yours and the others, ten years out. We don't know that yet.

If I was in your shoes I'd be equally concerned because it is something that is generally quite poorly understood. There is a lot of work to do to ensure we can continue to improve our understanding and also implement the knowledge we do have, and use that to improve the way we develop the project and the way we manage those impacts or prevent them from occurring.

40. I hope your research brings greater knowledge because we've been telling governments what's happening for years and we get told there's little known about it. Hopefully your research will open up more possibilities for us on the land too.

Because of the CSG industry and the focus that's now been placed on the Great Artesian Basin in general, but more specifically the more localised area that we are operating in and
may impact, there will be so much knowledge gained through the process of volume monitoring over the next couple of decades that it should be a very well understood groundwater system.

41. Every time we pull a bore up we make note of the depth of the water and the amount and things like that. We’ve got hundreds of years of information amongst the lot of us and yet government continues to say it knows better.

That’s something we found difficult as well i.e. getting hold of the information. DERM (now DEHP) has more information than we’ve been able to use and it hasn’t released it all because it believes some of it is actually confidential to the landholders. Hopefully that data sharing is something we can improve on over time as we come around to do our base line assessments. In areas where we haven’t done a lot of work with landholders (because we’re new to the area for instance) we can start to gather more local knowledge and learn from that as well. People like yourself have voluntarily come up and said ‘I’ve got all this data and information can I send it to you’? For us that’s a really valuable thing. The more information we get the better off we are.

This diagram might help answer your question (see Figure 12 on page 12). It’s in the EIS and is the cumulative impact of all the groundwater drawdown by Arrow and the other three proponents, so it’s trying to reflect what it would be for all of them. This is in the Precipice in the Great Artesian Basin systems; as it says up here the peak drawdown occurs in 2039, about fifteen years after Arrow starts developing. As you can see it’s quite discoloured; the brown area is the project development area, then you can see the discolouration and the reason it’s biased towards the west is because that’s the effect of the neighbouring tenements with Origin, BG and Santos. That line is the five metre drawdown trigger that QWC has specified for this aquifer system. Once the drawdown goes beyond five metres, as Carolyn’s explained, Arrow has to make good. The intent of the QWC report that’s coming out next week is to provide predictions three years ahead of any impact occurring so Arrow can start make good arrangements three years in advance of it actually being realised. As I said, it’s going to take nearly fifteen years for it to reach five metres in this area.

42. That’s our recharge area?

No, for this one the recharge is here on the Great Dividing Range.

43. So where do you draw most of your water out of our recharge area?

That’s taken into account in the modelling.

44. You don’t think taking water out of our recharge zone is going to affect our bores?

I’m not saying it’s not going to affect them. What the model is showing is that the effect will be right out to here by 2039. The important aspect is the extent of the effect; if you look at the values Carolyn put up earlier it’s around thirty to forty metres, but when you’re out on this western edge it’s less than a five metre trigger. In 2061, potentially twenty years after operations have stopped you can see the contours are relaxing as the water starts to rebound. And that’s for all developments.

45. I’m very sceptical of that.
There’ve been a number of people who’ve raised that same concern but this model is the closest you’ll see to what QWC will probably bring out next week because it will model everyone’s impacts. Arrow has been the last and has had to model everyone’s impact; QWC is doing the same thing; it’s modelling all the impacts and has a much more expansive data set. In a couple of weeks’ time you’ll see how closely QWC reflect this.

46. Interestingly those diagrams just stop at the river; our aquifer here in town or around this district (particularly north Goondiwindi) has sandstones that flow under the river. When those New South Wales people irrigating from the Great Artesian Basin, which they’ve been allowed to do for the last ten or fifteen years, turn on their centre pivots and draw water out of that aquifer on the south side, it actually affects our bore pressures to the north of Goondiwindi. Those are the people who are going to lose their water pressure for years because of the extraction effect on the New South Wales side, and yet that map conveniently just stops at the Queensland border. It doesn’t show any impacts in New South Wales.

The reason is that this is based on geological structures. If you look at the geographical information system, the first part of the groundwater impact assessment was to identify the geological structures with which the aquifers are associated. So that area of the modelling domain which is way out here was considered to be representative and encompassing all the structures that would be affected by Arrow’s operations. It’s not saying it’s not here but in terms of the structures Arrow’s operations will impact that model boundary was chosen on to be outside of those. It wasn’t intended to cut them off, but to be outside of the structures Arrow will impact on.

It’s also important to note that the drawdown case we’re looking at here is for the deep aquifers; you’re basically talking about irrigation from the alluvium or the consolidated aquifers which are the shallow ones.

It does very much depend on the aquifer you’re characterising. The model is made up of a number of layers and has been built on the basis of those geological forms from ten thousand wells or bores across the region. The thickness of these aquifers varies greatly across the region, but the model has built into it the different permeability, or those characteristics which allow us to produce these predictions. The reason they stop in certain areas isn’t because we choose to stop it there but purely the impact it has on the particular aquifer in that location.

47. I understand why you stop at the border I’m just suspicious that the impacts will actually extend into New South Wales?

If we were to show the Condamine Alluvium, for example, and the predicted drawdown there, the cumulative impacts for the western-most portion of the Condamine are where we expect the peak to be. Over time we see how that basically recovers as well. Because it’s the Alluvium, because it has a lot more recharge, it’s an unconsolidated aquifer which behaves quite differently to some of the others that are modelled. The way we would manage the impacts on that are quite different to the way we would manage the impacts on some of the other aquifers. We particularly focussed on where the water is a resource, so they will be key areas we will be monitoring much more closely as people such as you
heavily rely on it. We need to understand more about characterising those and how the water moves, and basically getting trends over time to see what may or may not happen.

**48. So it might be Origin we should be more worried about, not Arrow?**

Quite possibly...when the QWC Report comes out it would be worth having a good look at your particular area. I’m assuming it does go out as far as where you are so we will start to ask questions about that. The QWC will be coming out to do some information sessions in the next month or so. It will be a great opportunity for you to obtain a better understanding.