Darwin – Santos Ltd

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Speakers: Bill Ovenden, Tom Baddeley, Paul Wybrew, Geoff Atherton and Che Cockatoo-Collins

Bill Ovenden: Thank you, Madam Chair, and we thank the panel for the opportunity for Santos to appear before you again in relation to the inquiry. My name's Bill Ovenden, I'm accountable for exploration and appraisal activities at Santos. To my right - just for the sake of efficiency, perhaps if I could introduce everyone else - Paul Wybrew, who's a senior environmental officer with us; Che Cockatoo-Collins, who's a Senior Aboriginal Engagement Officer; Tom Baddeley, Public Relations with Santos; Geoff Atherton, General Manager of Drilling Operations.

Hon. Justice Rachel Pepper: Thank you.

Bill Ovenden: I too would like to acknowledge the Larrakia people, on whose traditional lands we meet, and I pay my respects to their elders past, present and future.

I guess initially I'd like to confirm Santos's belief in the gas resource potential of the onshore Northern Territory space and particularly the resource potential of the McArthur Basin. It's early days, but we believe it's a tremendously valuable potential resource for the territory in the future. And we'd like to confirm Santos's belief in the importance of gas in the Australian and the global energy mix, as an affordable component to a sustainable low-carbon future.

Again, initially, I'd like to congratulate Madam Chair and the panel for the excellent report that's emerged in the interim times of this inquiry. The terms of reference were very, very wide, in fact it's more of an inquiry into the impact of the industry than it is into fracking, but I think the report that you've produced here is a testimony to an enormous amount of effort in engagement with stakeholders right across the spectrum. And we'd like to just thank you for that state of play that you've provided. It's a really impressive document. Our purpose is to address some of the issues raised in that report as a precursor to a more formal written submission.

Hon. Justice Rachel Pepper: Thank you.

Bill Ovenden: The recurring theme, I think, in the report, for me anyway, is the requirement for a more robust regulatory framework in relation to the ... Is there something?

Hon. Justice Rachel Pepper: …….

Bill Ovenden: No. Yes. Good. Fix that microphone. Do you want to wait a bit, Madam Chair?.

Hon. Justice Rachel Pepper: Might just wait a moment, no worries

Bill Ovenden: Yeah, no worries.

Hon. Justice Rachel Pepper: Reassemble what I've broken.

Bill Ovenden: Yeah, no worries.

Hon. Justice Rachel Pepper: Thank you. Sorry about that.

Bill Ovenden: No, no problems.

Hon. Justice Rachel Pepper: Too much coffee.

Bill Ovenden: Yeah, I can sympathise.

The recurring theme in the report, though, is the requirement for a robust regulatory framework. That's the impression I take away. And we strongly support this position, actually. We acknowledge the shortcomings of the current regulatory framework in view of the potential for a large unconventional development in the onshore space. I guess, personally, when I read the document, my concerns arrive with some of the stated intent, perhaps, around the operationalisation of the precautionary principle. That is, the treatment of uncertainty with perhaps prescriptive exclusion or over prescription. It sends a little shiver of fear down my spine. We've got many challenges in front of us with these plays, and I guess my concern is that over-regulation could potentially dismantle any opportunity we have. That's my message for the panel. Basically our proponent would be: let's collect the data, and understand where we need to go.

Where do we support a prescriptive approach to regulatory change? We strongly support a prescriptive approach in relation to codification of well integrity management. There are many instances of industry best practice codified now in relation well integrity. Geoff will talk more about well integrity. But we believe there's definite room for improvement in the current framework in that space.

We support some prescription around land access. We actually strongly believe the current framework we've been operating under, all the principles we've been operating under and the framework we've been operating under are adequate but they're not in a legislative state. So we'd support a robust legislative land access position.

We'd strongly support the concept of exclusion or no-go zones. National parks, residential areas, urban areas, with buffers. We have no issue with that at all. Sacred sites, sites of cultural significance. These should be no-go zones and we strongly support it.

Where we'd argue that a prescriptive approach to, or an exclusion zone, say, around fractured zones, that's where things start to get a little more grey for us. We'll be acquiring our 3D, we'll be doing our critical stress modelling, we'll be letting the data tell us, perhaps. I mean, fractures are fractal, so they occur at many scales. Where do you stop? Where does the exclusion limit occur? We'd argue that that requires a much more risk-based objective approach, that sort of issue.

Where should regulation be objective and not prescriptive? Limiting the operating window would be a big deal for us. We think it'd have a massive negative impact on us over the long term in a large-scale unconventional development. Geoff will talk more about the efficiencies and the cost implications of limiting the operating window, but for me it would immediately impact on our intent for local contracts, local jobs, it would have an impact. We'd be expecting people to down tools for six months in Katherine or Tennant Creek or Daly Waters, and we'd just see that it would represent a real imposition to an efficient and sustainable development outcome. So again, we understand some of the intricacies of it, and Paul will talk to the water issues around that a little more, but we would argue against a prescriptive approach.

Dictation of well spacing, a prescriptive approach to well spacing. We understand that the US industry, the unconventional industry, it's transformed the States, it's rapidly evolving, technology's moving into new areas all the time. In the US now, they're drilling six-kilometre laterals. If we've got a 16-well pad, six-kilometre laterals, a 500-metre well spacing, and we've got an 1800-square-kilometre viable play area in EP 161 where we're the operator, then the capability of achieving that sort of lateral length would actually result in a much, much smaller footprint on the surface 50-square-kilometre spacing between well pads, focused infrastructure and gathering systems ... so again, we would urge that we don't take the prescriptive approach to dictating development footprints at this stage, and we let the early information tell us. We need to get the data, basically.

On water we noting clause 7.4.1.1 in the report that all the major companies with expiration permits have committed to not use surface water. Actually, it's not something we've committed to there and again we would argue against a prescriptive approach. It's not our intent to use surface water at

this juncture, we would ... and Geoff would talk to that as well ... but certainly we would argue we need an objective base position on that, and a risk-based approach.

On baseline studies and the whole data gathering exercise, Paul will talk more to it, but we recommend that baseline studies and we're already involved in setting up some studies that we believe are going to be really important in the long-term in monitoring the progress of our industry.

We would argue that those studies, which take time, occur in parallel with our expiration and early appraisal processes, because actually the expiration and early appraisal processes, is baseline studies themselves, they're baseline studies for information gathering on the rocks and on the fluids and on the geo-mechanical state of the earth. All that information ... we would argue that's a low-risk enterprise, and we would argue an objective approach.

We'll discuss other issues such as restoration guarantees and bonds etc. in our written submission, Hon. Justice Rachel Pepper, but I guess ultimately my message is: we strongly support the requirement for a more robust regulatory framework. We would, where it's possible, we would argue that that should be an objective and risk-based framework. And we just have that lingering fear that over and over-prescriptive approach and overregulation has the potential to seriously impact, and perhaps destroy what we think would be a great opportunity for the Northern Territory.

That's my piece, and I'll hand over to Geoff.

Geoff Atherton: Thanks Bill. Do you need this.

Morning Chair and panel. As Bill introduced, I'm Geoff Atherton. I am responsible for well engineering and well construction within Santos. And this morning I would like to discuss two main areas. Firstly, well integrity and secondly feasibility and pros and cons of operating all year round in the NT for well construction.

So we consider well integrity at all stages of the wells' life cycle including fracking, drilling, prediction operations and long-term isolation, post-abandonment.

So I'll go through those in sequence.

So, if we consider geology in the NT first, particularly shale development, we don't anticipate significant well control or well integrity issues while drilling exploration, appraisal or development wells. We consider the geology to be relatively benign, and considering that currently the wells, the shales will flow without fracture stimulation, we believe we have a very low, well controlled risk.

The interim report questions integrity of structural strength of our conductor casing, or conductor casing of the well. And if it's affected by the sub-surface caverns that we may intersect.

I'll just summarise there how we design the wells, and then we can see how it is affected.

So basically we anticipate the well that we're drilling for shale to be similar well-design to what we run in the Cooper Basin. Now, Cooper Basin wells, and the anticipated wells appear, the surface casing, which is an ex-casing stream below the conductor, access below the cavernous sections, has sufficient strength to take the whole of the well loads without any structural strength requirements from the conductor casing. So in actual fact, the purpose of the conductor casing isn't to provide structural strength as you may have off-shore, it's to basically provide a conduit to lower to circulate drilling fluids, cement, while drilling surface hole and setting surface casing. And it also gives us the isolation of the aquifers whilst we drill down deeper to minimise contamination.

With respect to well integrity during fracking, later this month on the 20th August we have a 50th anniversary of our first fracking operations in Australia. During the last 50 years we have had zero incidents of well failure while fracking ... during fracking operations, or well failure caused by fracking later in well life. Hence, we don't consider it to be any well integrity increased risk by fracking versus not fracking.

I would also just like to make a few comments about long-term abandonment, which is a discussion point in the interim report, and where we stand on that.

Santos Management System has a standard for abandonment of wells. This is consistent with both API and Nordsoc, which is a Norwegian standard and generally considered to be the highest global standard for well barriers and abandonment.

In both the Santos and industry standards, there's a requirement to isolate hydrocarbons from aquifers. And in the shale plains there's a considerable depth, sometimes thousands of metres between the shale and the aquifer. So it should be ... and we have good ... we believe we have good hole conditions from the well we drill so far. So, with good hole conditions, good vertical separation, we don't anticipate problems isolating the hydrocarbons from the aquifers for long-term abandonment.

Additionally we, like most of the industry, consider cement to be the only long-term material used for abandonment and require a minimum of 30 vertical metres of cement to isolate different geological boundaries, aquifers, and casing strings. The cement that needs to be verified by tagging, to confirm the set-on depth, and press-tested to confirm pressure integrity.

So we are satisfied that with modern standards that we use for our permanent abandonments, will prevent future leakage or well control issues.

And on reviewing our well files, to my knowledge, in our history in the Cooper Basin where we have thousands of wells, we currently have no wells that have been permanently abandoned and are now leaking.

So although I'm very confident in our commitment and our ability to ensure good well integrity, and good long-term isolation permanently abandoned wells, as Bill mentioned, we are supportive of a code of practice similar to the other stakes, to ensure that the industry has a minimum standard for critical items like well barriers and well integrity during all phases of the well life, and that we manage that consistently throughout the industry.

Secondary, I would like to discuss is running ... some of the pros and cons of running well construction operations throughout the whole year. In both the wet and the dry season. And the interim report suggests an option to only operate during the dry season.

We and many other oil companies have run, and continue to manage drilling and production operations in the Tropics, particularly in Asia. In our last campaign in South Sumatra, we drilled 14 wells, we put six of these on long-term well test, we operated throughout the year and had no spills and contamination. It just takes a different level of planning. And I think with a sufficient level of planning, consideration of local terrain, weather and conditions, I think we can manage our operations here without incidents.

Some of the options we may need to take: we made need to cover tanks to prevent overflowing from rainwater, or seal roads and locations with matting or other products to allow safe movement of vehicle, and control runoff of rainwater to prevent flooding. We also can prepare the sights to allow full containment of fuel, fluids, chemicals, and separation of hazardous and non-hazardous materials.

Simon said we think we can manage all year around operations. We should probably just discuss some of the inconveniences and costs associated with restricting operations in the dry. To the dry, yeah. To the dry season. So if we restrict operations in the dry season, it will result in a cyclic work program. And restrict employment for locals, providing labour, support services, and any other support that we may need for operations, which I suspect will create local issues. We also consider that water is actually probably significantly easier to manage if we run all year round. If we run all year round operations, similar to what we do in Queensland today in our CSG operations where the rainfall is actually annually almost exactly the same as the daily waters Beetaloo rainfall, it allows us to recycle fluids. So it allows us to take drilling fluids, reuse them on the next well, the next well, the next well. So we'd have a storage and disposal area, which minimises waste, minimises the amount of fluids we have to remove from the sight, and allows us to take what currently may become a massive issue at the end

of the dry season of where do we store, where to dispose of reasonable quantities of fluids, we just reuse them and transport them from sight to sight, and in actual fact if we go to bigger plans, on a development case we won't even be moving them from sight to sight. They'll just be continually in the tanks for us to be drilling.

It also allows us to potentially consider using surface water as Bill said, because if we've got lots of water around us, it may be an easier and lower risk and lower cost option to take surface water rather than bore water to top up our recycled water. The other consideration of operation all year around is that if we only run during the dry season, we need to do something with the large amount of kit that we've got. The most likely outcome is that we'll be redeploying the equipment outside of the area. So if we look at the nearest spot that we would move large drilling rigs, frack spreads, and other operations, it's most likely taking the 3,000 kilometre journey back to the Cooper basin, and back up twice a year. So we estimate the additional cost of operating the dry season only drilling operation to be about 15 million dollars a year per operator during the exploration phase, and up to 50 million dollars a year during the development phase as we move equipment in and out, large piece of equipment in and out and have to manage the surface issues. This seems like an unnecessary burden to projects, and more importantly to local communities, and work forces and services that are supporting us.

Bill Ovenden: Not to mention safety and road safety, and whatever.

Geoff Atherton: So to close, with consistent practices, I personally see negligible short term and long term well integrity risks. I feel there are more benefits for managing operations year around than restricting activities in the dry season. I would like to hand it over to Paul to discuss collection data, health assessments, and groundwater.

Paul Wybrew: Good morning Hon. Justice Rachel Pepper, and members of the scientific panel. As Bill mentioned, my name is Paul Wybrew, and I have the privilege of hosting several of the …… last weeks. For those that I didn't meet, I lead a team of technical environmental professionals within Santos. Much of my team's work is on Santos's Queensland assets, wherever data acquisition or monitoring is required. Last time I review of the interim report, any information request that we've now received, I understand that some of you are manning work now relates to more vocation specific assessments, and hence the need for more location specific data. The panel throughout the report has noted the challenge around this, and that a limited Australian data set exists with Shell gas developments, and that's simply because there aren't any, and therefor I think U.S. analogues had to be used in your report.

So therefore today, there are three overarching themes that I would like to discuss. Firstly is the acquisition of the right data at the right time, and then given the early phase that we're in which is planning for exploration, how every opportunity is ahead of us to acquire that right data at the right time. The second I'd like to discuss, human health and ecological risk assessments,

and how that's actually interrelated with the first thing that I will talk about. And lastly, I'll talk about groundwater recharge and uncertainty, and then also how modelling and monitoring can manage the risk of those localised adverse impacts.

So firstly, data and I strongly believe that exploration is the right time for data acquisition and actually think about what exploration is, it is only done to acquire data. Obviously, the data is used for a range of geological and engineering purposes, however importantly data is also acquired during exploration for a diverse range of environmental purposes. Baseline data is acquired to identify environmental values on the ground and then used to inform environmental, social, and economic impact assessments. These are then used during ……. approval processes and then during development planning, should proceed onto that phase. Characterization data is also collected to inform human health and ecological risk assessment, and I'll discuss these more in a moment. Monitoring data is also collected to demonstrate performance and compliance with regulatory or statutory obligations. Therefore, much of the data to complete local specific assessments will be collected during exploration activities, and this is simply because some of the data can't be collected without drilling and testing wells, and that particularly relates to flow back and solace management and we shall talk about in a moment.

So because of this, we provided links or references to baseline studies impacts assessments that we have performed for other areas in other jurisdictions, and the purpose of this was to show how we go about identifying values on the ground, what technology and methods are used to collect data, and how we assess risk. These documents also demonstrated on avoidance, minimization, and management controls, and provided details around ongoing monitoring programs when our projects proceed. I just want to link this back and note to Bill's comment on the precautionary principal, and how critical it is that a regulatory framework enables the acquisition of this data and allows these scientific assessments to occur over time, rather than simply ruling out something now in the absence of having such data.

So moving on to the human health and environmental risk assessment. So I note four areas where the panel is seeking localised or more specific information and data. These relate to flow back, spills, solids management, and then the health assessment. And the reason why I've grouped these four together for this discussion is that I believe they are all interrelated in the challenges that you'll have in actually assessing risk. So similar to the data acquisition that I just mentioned, some of this data we don't have now and much of the data will become available during exploration once we can actually test a well. So therefore, similarly, we have provided a methodology for performing human health and ecological risk assessments as part of our submission to your inquiry. The methodology described the characterization for both the flow back and the drilling cuttings, and then it showed how the data is incorporated and presented, and I emphasise the word presented, in the risk assessment reports.

The methodology also describes a range of best practise tools and models that are used to support these risk assessments, and much of those are coming from USCPA guidance. And then these are used to assess a range of things such as the risk from overland flow or from hypothetical spill scenarios, and the potential for migration through the …… I'd also like to mention that whilst we provided these reference to you in our submission, that all these assessments are publicly available on our website, and they have been since 2011 and they were made to be there now. They're updated as more data. So it's actually an intricate process of update.

Moving onto the last topic which was groundwater and recharge, and in particularly in the context of the uncertainty range that was presented in the interim report, the interim report stated that the published groundwater recharge rate's purely basedin rage between 100 gigaliters a year, and 330 gigaliters per year. The interim report also quantified the potential attack of groundwater from these aquifers by a potential Shell gas industry of an average of around 2.5 gigaliters per year. So given the take of water is in the range of 2 1/2% to less than 1% of these published ranges, it is important to consider whether that range of uncertainty is actually important or whether it's a purely academic question. That said, I also agree with the panel's interim recommendation that localised the modelling and impact assessments supported by monitoring and can manage such risks.

And I also wanted to note that following your visit last week to Queensland, and that unlike Queensland were a significant number of landholders source water from the actual target. Gas producing coal seems, no landholders take water from the target Shell gas reservoir in the basically basin, and in fact we believe it's like at hydras, that there is no water. But that's yet to be proven through data acquisition. And then any such inference, of similar or related impacts must be considered in this context, and I also understand you met with the OGI last week in Queensland. I'm sure they discussed how groundwater impacts assessment and management has undertaken in Queensland. So to close, given that we are at this very early stage of planning for exploration, that every opportunity is ahead of us to collect the right data at the right time, and for it to be used to inform risk assessment and the management controls that are needed to manage and mitigate such risks. And I clearly want to emphasise that point is that we do need to manage risk, but not perceived risks. For this reason, it's critical a regulatory framework enables the acquisition of data, recognising that some of this data will be collected over time. I'll now have another time to discuss access.

Tom Baddeley: Thanks Paul. Hon. Justice Rachel Pepper panel, with regard to the panel's comments and preliminary review on access in past releases, we make the following comments. We recognise the strong relationship between pastoralists and the land they lease, in some cases that connection stretches back generations. As we advised at the previous hearing and in our written submission, we have a long track record of respectful and constructive engagement with landholders. We don't think a right of veto is appropriate for the reasons enunciated at page 124 and 125 of your interim report. We note there is no statutory requirement to enter to an agreement, though

the department's guidelines are clear about the need for an agreement before exploration activities can begin. But as Bill flagged, Santos would support the panel's preliminary review of giving these guidelines legislative force. Santos would also support the panel's view that there needs to be a standard form of land access agreement. And we would also support the creation of an independent body, like gas fields commission Queensland, to facilitate communication between the stakeholders.

That body, let's call it the Shell Gas Commission, should include representatives from the land councils, the town councils, Charles Darwin University, the Cattlemen's association, and of course industry. With regard to the panel's view that gas companies should pay all legal fees associated with the negotiation of land access and compensation agreements, we note the gas field commission Queensland's very recent report on the lessons learned from the development of the CSG industry. In that report, the commission drawing on the Queensland experience of all relevant stakeholders says it should not be common practice to have lawyers representing a landholder's operational and commercial interest. It says landholders should be sufficiently informed through standardised agreements, to engage lawyers only at the end of the negotiation just prior to signing. The commission also says quite clearly that legal fees in this context should be kept, as happens in other jurisdictions like New South Wales.

Santos pays a landholder's reasonable legal fees to an agreed value, but does not support nor consider it conducive to constructive relations and obligation to pay all legal fees. Sadly there are law firms which take advantage of this situation. Capping legal fees will minimise the risk of what the commission described as the bullying of landholders by lawyers. I'd now like to pass to Che for some comments around aboriginal land issues.

Che cockatoo-collins: Thank you Tom. And good morning panel. Firstly I'd like to pay my respects to the Larrakia traditional owners, elders, and law people. So my name is Che Cockatoo-Collins and I work with Santos for many years. So today I'd like to address a small number of items from these specific chapters in the interim report. The contributions I shared today will be followed up in our written response to the interim report. So if you'll indulge me I'll refer you please to page 6. The second to last point with the heading aboriginal people and their culture. And I quote, " It is the panel's assessment that aboriginal people have not been given enough information about the potential risk and benefits of hydraulic factoring. So we offer the following response to that observation. We agree that the majority of Northern Territory's aboriginal people have not been afforded enough information, especially factual information. This is likely the case because the number of aboriginal people that are hosting exploration activities on their land is very small."

I would offer to suggest that directly impacted traditional owners, that are hosting activities, are very well informed. Not only are they well informed of the activities, they're active participants in the planning, are proving, and

delivering of work schedule activities, which insures the protection and integrity of culture. Page 89, we note that ……..the regulator of the …… in the submission to the panel indicated that they have limited capacity to assist, analyse, and interpret subsurface impacts. We acknowledge and respect the important role ….. play, however offered to share the process we follow in terms of cultural heritage clearances and approvals as an example of differing roles from the Northern laying councils from … It is traditional owners who have the authority to protection and know that this disclosure of sacred information also remains protected. For this reason, we engage with the traditional owners statutory representative body to carry out the cultural heritage clearance surveys with traditional owners on the ground.

We then received a report from the Northern Land Council, detailing exclusionaries, operating conditions, and any other requirements of the traditional owners. We then submit this report with our application to ….. Our view is that aboriginal people's information is private and should be protected. That is remained within the confines of its statutory representative body, in this case the Northern Land Council. And that the governing agency, or regulator's role, that is ….role, is to insure the compliance to the sacred sight act, which delivers protection to sacred sights and significant sights. Page 90, it is imperative that accurate information is provided as soon as practical to aboriginal groups likely to be affected by fracking. And the ….. bodies with responsibilities for carrying out this work, give the highest priority to ensuring this occurs well in advance of requirements for decision making. We agree? And this is the process.

Page 91. The panel also notes that there is no basis under existing side protection legislation in the Northern Territory. For Aboriginal custodians to prevent work on an underground rock formation even if this is based on Aboriginal traditional beliefs as long as the works do not affect any feature of the surface landscape. The definition of a sacred site while broad appears to preclude this. The panel has sought the views of the land councils and …. on this issue.

We offer the following information in relation to this observation. I provided a brief summary earlier of the pre-work involved in selecting potential well site locations, and the necessary cultural heritage clearance works for those potential sites. It is during these clearance work surveys, on the ground, which allows traditional owners to identify and map sacred areas and/or significant areas of significance. Together with the expert advisors, which include anthropologists and/or archaeologists.

This allows for effective mapping of immediately-identifiable areas that are likely to be considered exclusion zones, whether they are at surface or whether they are at sub-surface. The operator, for example Santos, then incorporates this into its project planning and management plans to ensure site avoidance and protection.

If an area is identified and defined as an exclusion zone we do not operate in that area. The Northern Land Council's cultural heritage report would capture and report these exclusion zones and we would then include that in our application for other certification. This allows formal registering of sites and allows the agency to be able to regulate for compliance against conditions of desertification.

Pardon me. Page 119. We would like to respond to the following statement that: there can be no doubt that the absence of right to veto at the production phase places traditional owners in a difficult position at the exploration phase, which is that the only point at which they can exercise their veto right, because the information that is available with respect to the production at the exploration will be very limited.

This may be an accurate description under the Aboriginal Land Rights Act and may be the case for mineral resources. However, I offer the following information, which continues to ensure that free prior and informed consent for petroleum activities, both exploration and production, is legally provided for. Operators have an exploration agreement in place for exploration activities only.

I am mindful and respectful of the confidentiality clauses in this agreement. However, I can share clause 11 and its 19 subclauses. Require the negotiation of a production agreement, a summary of the version, is this: the operator shall not commence a production operation on the permit area until it has executed a production agreement in respect of such production operation for the avoidance of doubt nothing in this deed is or represents the native title party's consent to the grant of a production interest or the commencement of a production operation.

So, I would respectfully suggest, Madam Chair, that you request the support of the Northern Land Council to assist you in obtaining the consent of the exploration agreement parties, only the relevant clauses of course, for you to be provided copies of, only the relevant clauses, as I said before, to evidence that the organisations making these statements, as referenced from page 119 is not universally accurate. And I think you for your time.

Bill Ovenden: And we're happy to field any questions, of course. Madame Chair.

Hon. Justice Rachel Pepper: Thank you. Your exhortation that it would be a restriction or regulation I think was the word that he used that ... to ... preclude ... activity during the wet was that limited to ... just to production or was also included ... exploration, fracking, drilling?

Bill Ovenden: We would say, through the life cycle of the project, we would harbour a desire to have no limitations on the operating window regardless of the activity.

Hon. Justice Rachel Pepper: That's not the position of Origin, which says that it's, in light of the precautionary principle, that exploration, fracking, and drilling, that they would be content for that to be limited to the dry season. Why is your position different from Origin?

Bill Ovenden: Perhaps it's a reflection of Origin's operational experience, perhaps? We feel that that would be very restrictive and we feel that it would have a major deleterious impact both commercially and in terms of efficiency of operation through the life cycle of the project, that's our position.

Geoff Atherton: But-but I think it depends. It depends where you're actually operating. I think that if we, at locations, we wanted to drill in a flood zone then we would not operate in there. So we would consider in an area so large, we would want to select, exactly like we do in Queensland, select the high a points …….as well the high points to drill during the dry ... sorry during the wet ... and the low points to drill during the dry. So we would selectively manoeuvre operations to make them as efficient and as inconvenient as possible …..

Hon. Justice Rachel Pepper: -I appreciate that's what you would do, but I just don't understand why if this is not a problem for Origin it's a problem for Santos.

Bill Ovenden: We just see it as ... we have a completely different perspective. We think it will have a major impact on the efficiency of any development and-

Hon. Justice Rachel Pepper: -Is this something that will be covered in your written submissions?

Bill Ovenden: I'm sorry.

Hon. Justice Rachel Pepper: Is this something that you'll go into further detail in your written submissions?

Bill Ovenden: Yes, it is. Yes, Madame Chair. I'll add that, for the most part, that the Origin acreage is in a more low-lying aspect, so we do have some advantage, just purely by virtue of the geography of our position. You know, in the operations in the Cooper Basin, as Geoff said, whilst the rainfall is low, we have tremendous volumes of water running down major distributaries into the big lake systems into the southern part of the basin and we are managing that ... we manage the logistics of that, with, I would say with, with the benefit of experience.

Hon. Justice Rachel Pepper: You mentioned, Mister ….. that there were no instances of no wells leaking in the Cooper Basin. Over how long a period is that sort of measurement taken? ……. If we've only got a 50 year ... I think you said ... you're celebrating ... happy birthday ... or a 50 year anniversary. But I guess one of the criticisms that has been made frequently is I don't think Doctor David Close is on camera saying "Nothing lasts forever" in relation to cement and

well integrity because one of the criticisms made is, well, we don't have sufficient data to understand what the likely lifetime is of well integrity.

Geoff Atherton: That is true. I mean, we have wells. The first wells were drilled in the Cooper Basin in the '60s, late fifties. So the expiration wells that were drilled in the sixties are still sealed, I mean that's about the best we can say. And I would say over time, well abandonments and well integrity management has improved, so you know, we've got the last however many years that is, 60 years of history, 70 years of history to go at of which we have no issues at all. Now so, I think you've got to look at it and say, it's not even the old wells when the standards were not as great, you've got to balance the risk of the leak in the first place. So we've got normally pressured reservoirs which we've got up here as well so that would restrain some flow and also, you now, the science behind the cement is you know how they put in particular lots and lots and lots of laboratory testing, and you only need a matter of a metre or two metres of isolation to give you significant pressure isolation.

So if we're putting thirty metres of cement, that is a huge volume of vertical cement. So we have yeah, seventy years of history of which we have no isolation issues and as time has gone on we've increased the quality of abandonments as well.

Hon. Justice Rachel Pepper: What sort of testing occurs, how do you monitor the leaking laws again, this is a question that comes up frequently with the public.

Geoff Atherton: So it's a really, really good question and it's really good to take ……to the Cooper Basin. So our general principle is we abandon a well that it's going to stay abandoned forever. Now we are lucky that we've been operating the same field for the past sixty years. So we've got lots of wells that are within accessibility. So we have an integrity program, we go round and test every well, we have all our wells ranked, we test them on a frequency of risk essentially. And although we don't have an active abandonment program we do visit those sites randomly I would say, of where the abandoned wells are. And we haven't had any incidence of-

Bill Ovenden: We monitor pressure at the well ……..

Geoff Atherton: Yeah so on the wells that are producing wells or that are suspended, we have lots of wells that are suspended, we have a continuous monitoring program where every well gets visited within six to twelve month period depending on the risk of that well, and we monitor pressures, do annulus top ups and we monitor valve exhalation as well.

Hon. Justice Rachel Pepper: Just in relation to the number of well pads has been a great discrepancy between what the department has envisaged this industry might look like if the government chooses to lift the moratorium versus what I think the estimates that you've given and other industry players have given. Can you give us any further information on that, the reason for that discrepancy? It is again a matter of some concern to us and indeed the public.

Geoff Atherton: So I think the wells of spacing to be quite honest with you if you turn the clock back ten years and you say what is the well spacing you can have if you wanted to drill horizontal wells, technology would have said "your longest horizontal section you're going to be able to drill is 1000 metres, and your longest step out is 500 metres to the start of the horizontal". You know, if we move to where we are now, operators are drilling long, long step outs as Bill mentioned like 6km step outs, and as time goes every day gets bigger and bigger and bigger. So I would say that what we think is the well pad spacing today will become ... we will have less and less pads as time goes on because of drilling technology will move on so that sounds really vague ...

Hon. Justice Rachel Pepper: I'm just wondering does that mean that your estimates that you've given us in your submissions are effectively or maximum estimates and we can assume that the number might be that, or less?

Geoff Atherton: Yes-

Bill Ovenden: I would say that that's the case and you know, as Geoff said the technology's moving fast. It's our intent, it's in our interest to reduce our surface footprint, it's in our interest to focus our gathering infrastructure etc in the event of success and development. Last time in front of the inquiry I talked about approximately 100 well pads, being realistic, our submission has more. In fact today I've talked about 36-50 well pads potentially emerging from the statistics that I quoted around well spacing. It's a moving feast. And we shouldn't be prescriptive and I think the public should perhaps take some encouragement in the advances that are occurring in the states in terms of surface footprint of these developments.

Hon. Justice Rachel Pepper: So does that mean the Department's wrong?

Bill Ovenden: I think what the Department has done is looked at the area of the …….. and said that if we develop the whole ……..area and we did it on this spacing and I'm not sure that the Department will have it's own perspective on how things have developed perhaps, we differ a little, but they seem to have generated numbers out of a lot more concentrated surface expression and a much broader area. So our sweet spots in our play in our area, we think it's about 1800 square kilometres, we've been consistent in that number and we'd be working towards minimising our surface footprint.

Hon. Justice Rachel Pepper: Okay one last question from me before I hand it over which is just in relation to ... I'm pleased to hear that you think that standardised contracts are the way to go, how is it envisaged that the compensation would be calculated? What sort of factors would you be looking at in the calculation of compensation?

Tom Baddeley: Paul you might help me here from the Queensland experience but drawing on that I think all aspects are considered in those discussions Chair-

Bill Ovenden: But it's quite formulaic.

Hon. Justice Rachel Pepper: Okay.

Bill Ovenden: And there are established standards and we'd be happy to share them.

Hon. Justice Rachel Pepper: That would be of great assistance in due course because that causes some degree of difficulty. I'll just start with Dr Beck thank you.

Dr Vaughan Beck AM: Just some follow up from the questions from the Chair. In terms of going from 100 wells down to 36 wells does that mean you're still expecting the same level of production, I think it was 400 terajouls per day was in your previous submission, has that number changed or-

Bill Ovenden: Dr Beck when I say 16 well pads-

Dr Vaughan Beck AM: 36 I thought you said-

Bill Ovenden: Yeah 36 well pads-

Dr Vaughan Beck AM: -well pads-

Bill Ovenden: So if we're drilling 16 wells but we can do it on one pad.

Dr Vaughan Beck AM: No I understand but the question was are you still expecting the same level of production? Which I think in the previous submission mentioned 400 terajouls per day.

Bill Ovenden: Yeah the submission discusses 400 terajouls a day, it's a model. What can a single wellbore produce? What's the benefit of a longer lateral and more fracks? We really don't have a great handle on that at this stage and that's the next foray of exploration for us. What's the deliverability of these rocks, what can we extract from a frack stage of a certain scale. So we have to investigate that at the moment, we have a model.

Dr Vaughan Beck AM: Okay I understand. Thank you. Just some related follow up question if I may. You mentioned the laterals potentially six kilometres, what's the maximum laterals that Santos have been involving in drilling, in Australia obviously, well sorry you've got overseas operations but let me say in Australia.

Bill Ovenden: Yeah we haven't drilled many laterals off-shore-

Geoff Atherton: Well now about 2000 metres.

Dr Vaughan Beck AM: Right

Geoff Atherton: Is currently what we've done both in Asia and in the Cooper Basin is about our limits at the moment.

Dr Vaughan Beck AM: So it's a long, it's a significant extension to go from two kilometres to six kilometres.

Geoff Atherton: It is but some of it is because of rig limitations as well.

Dr Vaughan Beck AM: Yes I understand.

Bill Ovenden: And pressure.

Geoff Atherton: But because the further you go out the more horse power you need, so that would change over time as opposed to being a drilling limitation.

Bill Ovenden: And Dr Beck I use that as an example of where US technology is taking the industry perhaps. And it may be very specific for certain players but as Geoff said the Geology is pretty benign and receptive to good hole conditions over long sections. Our initial expiration plans involve a 1000 metre lateral. If we can extend that, there are real efficiencies potentially-

Dr Vaughan Beck AM: Yes.

Bill Ovenden: -and real rate benefits.

Dr Vaughan Beck AM: Right.

Bill Ovenden: Potentially, and we'll write benefits.

Dr Vaughan Beck AM: Right. Just one last question. In terms of the collection of data, monitoring data, for the abandoned wells, is there any, I think you said that there's no linkage, but do you collect data, and is that data publicly available, or is it retained by Santos?

Geoff Atherton: We don't routinely collect data from our abandoned wells, so our general principle is abandoned wells are abandoned, and if, essentially, if we do a drive-by and we see something, which, to be quite honest with you, doesn't happen. Well, the drive-bys do, but the leaks don't happen. Then we would address it.

So our principle is very much, we do the abandonment correctly. We have a lot of faith in our abandonment standards, capability, the way we verify that our plugs are in place. They're on depth, they're the right size, the right volume, and that convinces we've got isolation. And remember, it's not just one plug, so if you go from the bottom of the reservoir, routinely the Cooper Basin abandonment will take four or five cement plus to isolate various geological ….. That's a lot of cement in the wells, so we believe if we do that correctly, and if we don't do it correctly, we redo it, there and then. So we will not leave a well half-abandoned. We will continue until we're happy that we've got the well, that the plugs are in place, they've been tagged with the right consistent with the cement sector, and we've pressure tested the final abandonment plug before we come off the well.

So that's our general principle is that we satisfy ourselves that it's permanently abandoned before we depart the well.

Paul Wybrew: And that's the opportunity that's ahead for the Northern ….. should they wish to get the right experts together and actually define that code and what those outcomes need to be.

Dr Vaughan Beck AM: Because I just note that drive-bys are a fairly course way of trying to detect leaks, given that methane is invisible.

Geoff Atherton: The principle is we do it right. Our basic principle is do it right and then don't worry about it later.

Dr Vaughan Beck AM: Thank you.

Ms Jane Coram: Thank you for the presentations. I'm just wondering if we could talk a little more around faults. They frequently come up as an issue of concern to the community as a potential conduit for contaminants getting into aquifers and leaking to the surface. Faults can be conduits and they can be various depending on the geological setting, and I was just wondering if you could elaborate based on your experience in ENT what the behaviour of faults is that you've witnessed and how you deal with it in your well construction and your fracking operations.

Bill Ovenden: It's probably me as the geologist on our side. First of all, I think Origin were perhaps even surpassed in their lateral experience and the way, Origin are not imaging that section well because of its surface volcanics, and this comprises the sub-surface imagery, the seismic imagery. What Origin encountered when they drilled their lateral was a whole series of small structural perturbations, and actually when we interrogate our current 2-D seismic, we interpret a very similar structural setting, and these appear to be small offsets that are confined to the …..system and likely the product of the original generative state, oil and gas generation state, from the …. So the faults that have actually fractured the system as the oil and gas matures in situ and then emerges from the reservoir system in part. So they're confined.

There are some very major structural features that limit the system. Generally, we'll be not focused on those systems because they're taking the reservoir to a pressure and geo-mechanical state where we would not be that interested, but until we have 3-D imagery of the sub-surface, and until we've done our critical stress modelling and put all our three dimensional earth models in place, there's a lot of uncertainty around the system.

I would say generally, in a more overall sense, the reason that the gas is still preserved in the sub-surface after 1.4 billion years is because it's a passive system, and there's very little inter-connection through major fractured systems to shallow aquifers or to the shallow sub-surface. I hope that answers the question in a reasonable way.

I imagine that fractures, they occur for many different reasons, a critical stress state in the ……and the original hyrdo-carbon generation phase is what's caused perturbation in the sub-surface. We hope to image that. We will direct our drilling with our imagery, and I think we have a lot of confidence that we'll be able to very much confine our stimulation and the propagation of faults right through the system to the surface is a very, very low probability, and it's a very low-risk enterprise.

Ms Jane Coram: So just to summarise, you'd be aiming to avoid the faults once you've got the 3-D imagery, and you'll be drilling to avoid faults?

Bill Ovenden: My point is that we will never be able to avoid the smaller faults. It's an inherent part of the ……system. We will direct our drilling to optimise the landing in the various fault compartments that we expect to encounter, and we would argue that 3-D is a critical component, imagery is a critical component of viable exploitation of the reservoirs. There are some major faults that have been rejuvenated through time that have been passive at least since the Cretaceous, probably since the Cambrian, so 540 million years ago, so the rejuvenation process is intermittent, at best, and typically we would argue that there is very little fluid flow along those faults because they've been passive for a long time.

Ms Jane Coram: Professor Priestly.

Professor Brian Priestly: Yes, thank you for clarifying Santos's position in relation to site-specific health risk assessments for the various projects. I was aware of the health risk assessment that was done across the ….. and Bowen Basin in Queensland, although I was reluctant to cite that in the report because the copy I have was marked commercial and in confidence, so I was interested to hear you say that those reports are actually on the website. Unfortunately, I haven't been able to access that website the last couple of days for some unknown reason. It may be something to do with the internet connections available here, but I will check to see that.

Now the comment that you made about being able to undertake health risks assessment in some of the newer projects that are coming up may depend upon getting reliable data. I would have thought that you'd have quite a bit of useful data that you could do at least a preliminary risk assessment around spills and so on and around the chemicals that you're planning to use, and also about VOCs and so on from those sites. Is that a reasonable assumption?

Paul Wybrew: We will have that data. We haven't done the work yet because we aren't actually planning, or are in the early planning for those activities, so we have an indicative fluid system, we have the indicative chemical additives that are required. We've worked on the hazard assessment ……what we haven't done yet that is looked at geogenic chemicals, dissociation products, bio-decay products and so on and so on. And then what we expect to come back in the geogenic components, we haven't taken that through. Should the ……

be lifted and should we actually get on the ground and do that, that is the work that we've done to support those activities. Then of course we get the comparable data, feed it all back through again.

Geoff Atherton: But to answer the question, so if we look at phase one, if we just, the next couple years of exploration, the answer to your question is yes. So we know reasonably now what chemicals we're gonna use are similar to those in other operations, and we base our risk-assessments and our spill management plans and geo-management plans and all that type of stuff around that activity. So we're basically saying, next phase of work is a couple of exploration wells, however many. After the exploration wells and frack, this is the scope, and flow back a bit. So we basically know everything plus or minus on that, except for the missing bit is when we flow back where they're gonna flow. So the risk of course, so the …….the drilling, the fracking, the running the completions, all that.

In turn, the drilling, the fracking, the running, the completions, all that type of stuff is not that dissimilar to what we're doing elsewhere. We know exactly how, we know reasonably how we're going to do it. We build a risk assessment. We build the plans around that and then we build enough plans around the flow back to basically prevent spills and ensure containment. So, then we use the information to build a development plan.

Professor Brian Priestly: Thank you.

Hon. Justice Rachel Pepper: Professor Hart, then Dr. Andersen.

Professor Barry Hart AM: I note that Santos supports that potential establishment of an independent body entity. What did you call it? Shale Gas Commission, but I think, if I understood you correctly, I think, you really equated it to the Queensland Gas Fields Commission, which is a land access, very heavily focused on land access. You see any advantages in that independent body taking additional responsibilities?

Maybe take it on note.

Bill Ovenden: Can we take that on notice, Professor Harp? It's a big question and I've emphasised the concerns we have around overt prescription.

Professor Barry Hart AM: Sure.

Bill Ovenden: Everyone being involved all the time, in all the decisions.

Professor Barry Hart AM: I appreciate that, but we're obviously getting a number of people who are mistrustful of the government and government regulations and one option is an independent. However, you make that independent. I'm just exploring

with the panel wishes to explore how limited that should be, could be, how wide could it be? It could be an authority that looks at the whole strategic roll out of the industry. It could go a long way. I'd be really appreciative of those.

My second comment really comes to the base line information and I seek a comment on whether you're all going to do the same thing, Pangaea, Santos, Origin, whoever else might be involved in the game. I suppose we see some advantages in a coordinated, a bit more coordination approach. If we're just talking about the Betaloo between, at least, the three players here, what's your response to that?

Bill Ovenden: I'll actually answer that, Paul. Right from the outset, we've connected with the other operators who we feel would have similar objectives to ourselves, not just in gathering data, but in terms of facilitating operational and logistics efficiencies, etcetera. We have an operators body. We meet regularly. We compare information within the bounds of confidentiality and we would work closely with the other operators going forward, particularly in relation to baseline studies and we are working with them.

Professor Barry Hart AM: Okay. One other, which relates to the potential for recycling flow back fluids and so forth. It's pretty vague in all of the submissions, at the moment, commenting perhaps on what's happening overseas, which depends on the shale play, etcetera etcetera, have you got any more information you could give us, in terms of what you think are the reasonable percentages of flow back? Means a fairly large difference in terms of the need for ground water.

Geoff Atherton: I think, it depends on what the fluid is. If you frack down, if you say the flow back is only frack fluid and forget about whatever fluid comes out to the reservoir, then our general gut feeling is we could recycle about 50 percent of that, roughly is kind of the gut feeling. I mean, we need to see what comes back, because we gonna ...

The frack fluid, we'll probably be fracking with what is basically, essentially a clean water system, so we don't think it will have the chemicals in it that we have in the Cooper Lake Wagam …….type stuff. So, it should be cleaner coming back. It should be easy to break. We'll just have to see what comes back, but our gut feeling ...

We want to recycle as much as we can, obviously, because it means that we don't have to withdraw, transport, or dispose. So, the more we can recycle the better. The gut feeling for our planning is about 50 percent. We think we'll be able to recycle.

Professor Barry Hart AM: Thank you. My last question is, again, I know you've made comments about management of waste waters and well integrity and so forth, but a lot of community is still concerned with what happens if the Cambrian Aquifer is contaminated. Can you give us just a little bit of an insight, if there was contamination. This is a hypothetical. What are your options for remediating that?

Geoff Atherton: To be quite honest with you, we are working on prevention. We don't actually think there is a risk to contaminating the aquifer at all, because we think we can drill through it and get it isolated, before we drill ahead and get good isolation between ...

Let me talk about preliminary well design, alright? Preliminary well design is we set a casing stream across the Cambrian with several hundred metres of isolation below, it to allow a really good cement bond. It's like 200. I'm picking numbers out here, so it might not be super accurate.

Professor Barry Hart AM: Sorry, can I just interrupt. I know all that. I think we all know that well. It's really attempting to related a community concern. If you say those and that's fine, but if it happens, and I know it depends on how much and all the rest of it. If it happens are there options, for remediating that.

Paul Wybrew: Go back to Professor ….. comment before. So these risk assessments that we make publicly available, and we have to go through the process, have a whole range of tools for failing transport modelling, but also looking at do the chemicals actually persist in the first place and the answer to all of those is no. They've actually got very short half lives or by decay. The first question is are they hazardous in the first place? How long do they persist in the environment? Then, what is the potential for them to actually reach a receptor, such as, to groundwater? We can quantify those using existing risk assessment tools and that's part of that process that we said that we do. We do make that information publicly available. We just haven't done that piece of work ...

Professor Barry Hart AM: That assumes that you manage the risk, in terms of spills and so forth to ensure that it doesn't get contaminant filling and then so on.

Paul Wybrew: It's prevention.

Professor Barry Hart AM: What if there is contamination? Are there any mitigation methods?

Paul Wybrew: The mitigation is done at the surface.

Professor Barry Hart AM: Mitigation of a inadvertently becomes contaminated aquifer?

Paul Wybrew: Then you're looking at remedial methods ...

Professor Barry Hart AM: Yeah.

Paul Wybrew: Either containment, so manage, contain, or active remediation and there are various technologies to either pump and treat ……. barriers and so forth.

Bill Ovenden: Professor Hart, you're posing a really, really difficult question and we acknowledge it's a difficult question. I think, the first thing, that if we had evidence of some catastrophic leakage into a shallow aquifer, our first ...

There are many natural mitigants: recharge, dilution, half life deterioration, etcetera, and reduction of concentrations, but we would monitor the spills. So, we would try and track the progress of the spill and we would seek to, perhaps, deplete a small portion of the aquifer, if it was a focused spill. If it's not a small portion of the aquifer, then we're probably diluting very rapidly into a situation where the hazard is perhaps mitigate. It's a very difficult question.

What do you envisage, when you talk about contamination of the aquifer?

Hon. Justice Rachel Pepper: We do have to move on. So, perhaps this can be dealt with in a written form, Dr. Andersen.

Sorry, I should just say, we will go through 'till ten o'clock today. I appreciate that that means that we're running behind time, but if we need to continue onto through the morning tea, we will do so. So, that nobody following on will be shortchanged their time.

Yes, Dr. Andersen?

Dr Alan Andersen: Two questions. The first one goes back to the issue possibility of setting prescribed distances between well pads. You talked about how the change in technology means that the further and further extensions of horizontal ...

Further extensions of the horizontal drills means that well pads are more likely to be expanded, but the issue is setting minimum distances. It's in the context of avoiding possibility of having well pads so closely together…..

Bill Ovenden: That they're polluting the landscape.

Dr Alan Andersen: -that it really does transform the landscape, which I don't think anyone wants. Obviously it's with that technology, and technologically it doesn't need to happen, it's still an issue I was concerned about, so my question is: what would you see as a reasonable minimum distance between well pads that takes into account both the amenity issue, landscape transformation issue, but also the technology realities? What are your thoughts on that?

Bill Ovenden: We've, I'm sure, got plenty of thoughts but we probably should talk to the engineers working on the development plan and the modelling. So if we can take it on notice and I assure you we'll include it in our written submission.

Dr Alan Andersen: My second question is about well integrity, and the panel's heard views of sort of this effect that yes, even if we could guarantee integrity over the 50 years, 100 years, let's accept that we can guarantee that, but then the wells are there forever. What's going to happen in 500 years? A thousand years? So let's take the very worst case scenario of a thousand years times, we

have a complete loss of integrity of the cement plug, in that worst case scenario, what would the consequences be for the aquifers that have been drilled through? What would actually happen?

Geoff Atherton: So I think you've got to look at the individual well and any barrier you've already put in place between the aquifer and the reservoir. So it's not just going to be one cement plug, you will have multiple casing strings, you'll have multiple cement plugs, so the risk of that happening is really, really low. The other thing is, you've got to look at the pressure regime of the basin and say, "How would you physically get gas that's probably depleted at a low pressure from 4,000 up ... say 2,500 to 4,000 metres up to 200 metres when this is higher pressure than this?" So the chances over 500 years of a field that's been depleted for its life are actually going to have the carbons to flow from deep to shallow is incredibly low, even if you have no barriers in place whatsoever.

Bill Ovenden: Actually another point I'd like to make is that hydrocarbons in specific points in the subsurface actually potentially even moving in through these aquifers today naturally and it's not a destructive force, if you know what I mean. In fact, when we ... at some point between 400 and 500 million years ago, we estimate that something in the region of 55 billion barrels from our area alone, 55 billion barrels of oil has been mobilised to the surface, yeah? And we're still here. Hydrocarbons are moving through these systems all the time and so our impact relative to the natural impact, I would say, is probably comparable in some ways. There's hydrocarbons moving through the system all the time and it is not destructive. It's a component of the system.

Hon. Justice Rachel Pepper: Dr. Jones?

Dr David Jones: Just following up from that particular one, I think the concept that many people have is leaks are still under pressure after decommissioning and if the cork pops out they come gushing up the well bore and this is a concept, which I think everyone needs to work on articulating much more clearly. This is type gas, it's not a conventional pressurised reservoir where you can get residual pressure so that's an important concept, which, I think, we as a panel need to address in our report and you as an industry perhaps need to address more clearly as well.

Just following up on Professor Hart's question about residual flow back water, one thing that concerns me is when you say we'll use 50% of the flow back fluid, 50% is a relative measure, it's not an absolute measure. For example, when they tell us they say up to 95% of the flow back water is now recycled, well it's not all the flow back water that actually comes back up. So when you say that they recycle 95% of their water, that's really meaningless in terms of the water demands. So when you say 50%, do you mean 50% absolute of what goes in or 50% of what comes back?

Geoff Atherton: It depends what the product is. So it basically depends on what ... we know we can re-use the front water because it's basically what we've already

used. Now on the assumption that the produced water is similar or is in massive, massive volumes of some product that we're not expecting, then I would anticipate we could use the bulk of that as well. We just blend it with our ... I mean, that's what we do today, current fracking uprise, flow-back the frack fluid, whatever comes back with it gets re-used in respect to whether it's coming from the reservoir or whether it's come out of the other water sources. Without knowing what the water volume's going to be and the water quality on production, it's kind of difficult to predict well the number 50%. It could be 95% or it could be ... and we could have 100% more water back or almost nothing so I think until we actually frack and test a well, it's pretty difficult to predict.

Dr David Jones: So that's based on your indicative water balances and your submissions are still very rubbery?

Bill Ovenden: Very uncertain.

Dr David Jones: Just a second quick question about offsets and no-go zones, the two are related. So for example, in Queensland, there's a two kilometre offset from an urban area, which is defined, I think, as about 200 people or something like that. That's one type of offset. Another type of offset would be from a sacred site for example, or from a productive water bowl. What are your feelings about these zones? Are they just arbitrary figures or do you have some quantitative assessment of what it should be?

Bill Ovenden: Paul, would you like to have a go at that? Or, I mean, I ... They are arbitrary but they feel like a comfortable ... two kilometres feels like a comfortable buffer, but Paul-

Paul Wybrew: It appears like we put a lot of work, a lot of consultation into those buffers and I understand you have been talking to the Queensland government, perhaps they can provide more information about how they derived those. I think New South Wales has similar numbers, if not the same numbers, and I understand they went through a consultation process as well.

Dr David Jones: It would be good to hear in your written submission, more on that aspect.

Paul Wybrew: We'll take it on note, yeah.

Hon. Justice Rachel Pepper: Thank you. Yes, Dr. Ritchie?

Dr David Ritchie: Thank you. Just a few quick clarifications. Most of your work is going to be on pastoral land, is that right?

Paul Wybrew: Yes. Largely on one pastoral ace.

Dr David Ritchie: Yeah, one pastoral ace so when you talk about traditional liners, it's just the term we use for main title culverts that you would be negotiating with them to end up with an indigenous land use agreement, which would encapsulate

an agreement for all of your operations. That would then include the cultural heritage protection, is that, how I understand it, what you were saying?

Paul Wybrew: Yes.

Dr David Ritchie: Now, you were saying that you would then basically take that into the actual area's Protection Authority and that they would issue a certificate under the provisions of their act that allowed them to issue a certificate on the basis of an agreement such as……..with proponent. Would that be more or less the process rather duplicating two processes like I gathered from what Shay was saying, is that broadly the situation?

Bill Ovenden: So, you'll find that there are processes that are duplicated with both ……and the land councils. However, that's onerous, it's time-consuming, but we are assured that all of the ... we're assured of sacred sites and aboriginal people, traditional owners in that region of activity are consulted with and their cultural needs are met.

Dr David Ritchie: No, look I'm absolutely-

Che Cockatoo-Collins: No, no. That's fine, but there is a process but I think, if I'm reading your question correctly, I think that applies under any tenure so you'll go through a process but our ... the way it works for Santos, our preference is to go again through the statutory body that protects the traditional owners. Then they go out themselves without us, but they have an established process already in place to cover up all their traditional cultural requirements, and we are left out of their process. And, as I said before, it's returned and then we're able to apply the sacred site certification, post that evidence.

Dr David Ritchie: Okay. That might explain it. I had a look at some material that they gave us with their submission. I think the certificates that were applied for, and I'm pretty sure it was included, your stuff was in the exploration phase. In nowhere in the actual proposed work or use bit of that application did it actually talk about the fracking process at all. So it was all basically drill pads on the surface and verticals. I'm very interested in your comment that there's a matter of your own internal method of operation that you would be quite happy for exclusions to the subsurface, as well as the surface. And, I guess my followup is, would you mind, in that case, that being regulated?

Che Cockatoo-Collins: That's our position.

Dr David Ritchie: Okay. So a change in the sacred sites act to allow that to become part of the way that act operates. I'm not saying you have to say yes or no. You consider it.

Bill Ovenden: It's a case by case situation as Che said. There are many sites of cultural significance I understand, at least from my limited understanding, where the subsurface is in irrelevance, there may be a site or a trajectory that has subsurface significance. Are we crossing a particular icon that has,

Hon. Justice Rachel Pepper: Sunlight.

Bill Ovenden: Exactly. ……or

Tom Baddeley: I think if that was identified by the TEOs in that search process, then that could be accommodated on the existing regime.

Dr David Ritchie: I suppose I could just be specific on it, we've heard evidence that the panel's heard that it's about importance of groundwater, which is pretty obvious. And the need to maintain natural flows and springs, that sort of thing. So, given that your operations are unlikely, even by your own operating approach, to effect those then you'd, I could see you had no problem with that you know having a restriction based on keeping a spring operating.

Bill Ovenden: I think the really important thing is the conversation and the interaction that we have and the transparent nature of, you say we haven't indicated that we're fracking anywhere. We actually have, every bit of our program is discussed openly with the NLC and, if it's the NLC.

Dr David Ritchie: I mean, we have a very transparent process here and in return we expect to understand their position on ……. exploration phase. So you wouldn't necessarily do it. I'm just saying,

Bill Ovenden: Yeah.

Dr David Ritchie: that particular bit hadn't been consulted about.

Just to be clear, you would be at least comfortable with the idea of the protection of subsurface features being considered as part of the regulatory environment that,

Bill Ovenden: Yeah, I think we'd have to say we would be.

Che Cockatoo-Collins: Could I comment on,

Hon. Justice Rachel Pepper: Yes, no please.

….. would like to comment.

Che Cockatoo-Collins: Dr. Ritchie, I think it's important to understand that through the whole process, the traditional owners in those regions and activities, what is determined as a sacred site, both surface and subsurface, is determined by them. They know their land very well. They are very conscious of downstream and upstream ramifications for people on the other side of the language border or other language groups.

I think when we hear evidence of people, other traditional owners, saying "I don't want this to happen because it's downstream or it's connected to a spring." What that does is it disempowers the traditional owners who know exactly what's happening. Who are, again, are part of the activity, active participants in managing, organising, and essentially engineering our work program to be compliant under The Land Rights Act and The Sacred Sites Act.

And you'll find that those people, very small amount of people, extremely knowledgeable and not forgetting that aboriginal people in the Northern Territory have been dealing with resource companies for decades. And so, I think that also applies into the unfortunate basket that we are here to protect traditional owners because they don't know any different. And I am troubled by that. I'm troubled by third parties going out and in a perceived paternalistic manner telling people that think these particular things are going to happen.

I looked at, or viewed, yesterday, came in and also viewed it on live stream, both just as good, and one of the traditional owners and participants unfortunately said, "It's going to poison my children." And these are the types of unfortunate misinformation that is being disseminated through. We can only do what we can do.

We are certainly constrained, and we respect those constraints and restrictions that the land council applies to protect traditional owners and their land, and so third parties and even organisations such …….., and could be any other resource companies, must abide by those rules. We will not willfully trespass. We will remain compliant and the traditional owners will, in the areas of activities, will always be active participants and we'll be compliant under both the Sacred Rights Act and the Land Rights Act.

Hon. Justice Rachel Pepper: Thank you.

I might take the ……for one last, I guess, more comment than anything else. ……..you said that you didn't want overregulation to destroy the great opportunity for the Northern Territory but given that the social licenced operate for this industry is tenuous at perhaps best. …… here and NSW …… Victoria, ……in Tasmania and elsewhere, surely a degree of perhaps robust, if not, overregulation may well be the price you pay for operating in the Northern Territory.

Bill Ovenden: You know, moratorium, all product, we acknowledge we have an issue with social licence where the ……Are all moratorium, the product of our lack of social licence or the product of populous policy? I'll pose that question.

We are strongly supportive, and I've said it, of a robust framework. My fear is in the face of uncertainty we overprescribe or exclude and we take a robust regulatory policy to a place that is uninhabitable for the industry. That's my fear. And I just caution us against it. I just wish it to be taken into consideration. We support, we strongly support robust regulatory policy.

Hon. Justice Rachel Pepper: But isn't overprescription perhaps better than under prescription, which is, on one view, what we saw occur in Queensland? Overprescription can then be wound back in a lot of good industry practise and safe operating practise.

Bill Ovenden: Overprescription can also completely take away any vision to a sustainable future. And we're making big investment decisions early in our processes.

Hon. Justice Rachel Pepper: Thank you very much for answering our questions today. It's certainly appreciated. We appreciate the time, we appreciate the detailed submissions. Thank you very much to Santos. I'll now invite the next speaker who has been patiently waiting and we appreciate his patience as well. Thank you.

Bill Ovenden: Thank you very much.