

**RESUMED**

**[2.00 pm]**

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COMMISSIONER: Being 1400, we'll reconvene, and the issue remains on expansion and exploration of mining activities, and BHP have joined us.

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MR HANDSHIN: The next witness to give evidence is Ms Jacqui McGill of BHP Billiton. BHP Billiton is a global resources company which produces a

number of commodities, including iron ore, metallurgical coal, copper and uranium. Since taking over Western Mining Corporation in 2005, BHP Billiton has owned and operated the Olympic Dam mine in South Australia. Olympic Dam is a large polymetallic underground mine located approximately 550 kilometres north-northwest of Adelaide. It is the fourth largest copper deposit and the largest known single deposit of uranium in the world.

Jacqui McGill is an experienced resource professional with a broad portfolio of operational experience in the resource sector, include iron ore, coal, base metals and uranium. She is currently the asset president at Olympic Dam.

COMMISSIONER: Ms McGill, welcome.

MS MCGILL: Thank you.

COMMISSIONER: I noticed BHP gave us a very useful submission to the Royal Commission and particularly to the area that we're interested in today, the expansion of mining for uranium in the State, and the key recommendations, as I recall, were about reducing regulatory complexity and duplication between the States and the Feds, and also improving access to the body of learnings of extraction and exploration in the uranium sector. So we get to those two areas, because they get to the heart of the issue of what might we do, apart from the obvious, find more uranium, about expanding the industry. So that we have the context, could you give us a short characterisation of what's at Olympic Dam at the moment, how you mine it, and the sort of output that you currently have?

MS MCGILL: Most certainly. The Olympic Dam operation is an underground operation. We source around 10 million tonnes of underground material, which is hauled to the surface by the Clark shaft as well as truck haulage decline activities to the surface. Once the ore is transported to the surface, it's processed through a grinding circuit where the rock is ground to around a coarse sand material. That slurry then is processed via floatation processes where about 95% of the copper is recovered to a concentrate and that is then very high in grade in terms of copper concentration and also has the subsequent correlation of uranium in that concentrate.

Now, if we were to follow the flow of the concentrate through the flow sheet, the concentrate is then leached to recover the majority of the uranium prior to the concentrate being neutralised and sent to the smelter. The smelter then processes the concentrate material and produces anodes. Those anodes are then subsequently processed through our refining process to produce what we call OlyDa copper. So it's Olympic Dam specification copper in final cathode form. In total, we produce around 200,000 tonnes of copper from Olympic

Dam annually.

5 So that's the concentrate phase, which is around 5% of the total volume majority of the copper. If we were then to go back to the flotation unit operation and we take the tailings, the tailings from the flotation process is subject to a leaching process. So it's 95% of the volume and we leach that tailing to remove the uranium. We remove that uranium via an acidic elevated temperature leach. We recover the uranium into solution. The solution is then concentrated and purified using solvent extraction processes, and we also  
10 recover some copper from a solvent extraction process as well on that same volume. That material, the uranium liquor, then is processed to the uranium processing facility which recovers it to a final uranium oxide concentrate. We produce around 4,000 tonnes annually of the UOC.

15 COMMISSIONER: That production, is it directly linked to the amount of ore that you crush, or do you determine the market at the moment in relation to how much - - -

MS MCGILL: No. We process it as it flows through from the ore.

20 COMMISSIONER: It doesn't.

MS MCGILL: Yes. We don't control the output on the basis of market economics at all.

25 COMMISSIONER: And then that's transported to Port Adelaide where it's - - -

MS MCGILL: That's right, dispatched.

30 COMMISSIONER: There's been a lot in relation to the expansion of Olympic Dam. I'm not after any commercially sensitive information, but I'm interested in the broader prospect of what you're thinking about and has been disclosed about the mine and the broader time frames that you might consider. Again, I  
35 emphasise I'm not looking, and you wouldn't give me, any commercially sensitive information. I'm seeking to get a broad overview at this stage of the planning process that's currently underway.

MS MCGILL: Well, as you know, in 2012 we were proposing to do quite a  
40 significant expansion of the Olympic Dam facilities, which included an open-cut operation and then moving through full-scale upgrading and increasing of total capacity on the surface. So all of those unit processes that I described to you would've been increased subsequent to that slow-down in the economic conditions, challenges around the economic viability of that project.  
45 We've really done a review, and where we sit today is really reviewing our

position. Since Olympic Dam was founded we've probably accessed around 30% of the ore body. We have, in fact, that 70% of the ore body which is untouched.

5 So our current development program is around accessing that 70% plus of the ore body, which we describe is a southern mine area. Now, that southern mine area and the reason it's the same ore body - it's the same piece of the puzzle that if I was to describe to you - some people use a saucepan. I prefer a guitar in terms of the shape of the Olympic Dam ore body. So we've been mining the  
10 neck of the guitar since 1987 or five, the neck of the guitar, and right now we're working on the body of the guitar, and that's our southern mine area development.

15 Now, that area we'll access via the same mining methodology that we apply on the northern mine area. So previously we were going to dig down from the surface and expose it via an open cut. Now we're going to develop it through underground developments and drives. We believe the economics are superior. It will enable us to access it over a period of time, longer than perhaps was originally planned, but in a way that's more sustainable. This then opens up  
20 new pathways for us for what the surface activity will look like.

Now, there are some options just to maintain our current flow sheet and configuration, exactly what we have today with some tweaks, or there could be the potential, which I'm sure you would've heard about, is the development of  
25 the heat bleaching process, and that provides, if you like, some simplicity and some benefits in terms of smoothing the variability of the ore when it's presented to the processing facility. So heap leaching would come before any milling process. We would crush and stack the ore, process the ore by using a very weak acidic solution trickled over the top of the stockpile recovered via  
30 irrigation capture methods, and then we'd recover that uranium and a small amount of the copper in that subsequent solvent extraction phase that I talked about.

35 Now, the elegance with this process is that that subsequent material, which we would refer to as ripios, which is a technical term to refer to the material after it's been leached by heap leach, could then - - -

COMMISSIONER: So contains copper, uranium, gold?

40 MS MCGILL: Uranium, and all the polymetallics. So we will have leached about 85% of the uranium out of that heap via a very long and slow process, okay, which is - - -

45 COMMISSIONER: It takes a year, I understand.

MS MCGILL: Yes. Up to a few years actually, by the time you prep the pad, you do the irrigation and you neutralise the pad. So that process could then be, once we finished leaching it, we could recover that material and process it via our traditional flow sheet. It would essentially eliminate all of the  
5 high-intensity leaching processes, CDC circuit, that we have on the surface today and it would enable us to continue to produce copper cathode through to a final product without the need to leach for more uranium out of the concentrate. So it actually recovers all of the uranium upfront, therefore opening up the flow sheet in the back end.

10 Now, why that's significant is that simplifies any expansions we do the smelter, because when you do that heap leach it actually improves the overall copper to sulphur ratio, which is important for the smelting technology that we apply at Olympic Dam. Now, the economics of this project are very dependent on the  
15 performance of heap leach and around the variability potentially for the ore that will present itself to the processing. That is the process we are working on now. So we are looking to refine and determine the overall economics of that to determine the best way forward for Olympic Dam.

20 COMMISSIONER: How sensitive is the price of uranium, noting that it's a by-product of this to your final decisions?

MS MCGILL: Whilst it's not immaterial, it is not a material component of the economics.

25 COMMISSIONER: Okay. And in terms of volume, does that double the output less?

MS MCGILL: It would depend on the scale at which we developed the heap  
30 leach. So it could be more, or it could be less or it could be the same.

COMMISSIONER: Sorry, you're - - -

MS MCGILL: Really dependent on the rate at which we – the size of the pad.

35 COMMISSIONER: Okay. And in terms of the timeframe for your investigation? Is this - - -

MS MCGILL: Well it is still, as I said very much in the test work - - -

40 COMMISSIONER: Mm'hm.

MS MCGILL: - - - scale, even though the test work scale is quite sizeable but we're probably looking upwards of five years before we make a final decision  
45 on the right technology to adapt.

COMMISSIONER: Okay. And in terms of tailings, does that increase proportionally the size of the tailing dams required, or is - - -

5 MS MCGILL: Well, again it would very much depend on the scale with which we applied it. It would perhaps change the nature of the tailings, if we were – so right now, the majority of the tailings, or essentially all of the tailings would come from the intense hydrometallurgical leach process.

10 COMMISSIONER: Yes.

MS MCGILL: When we – so that is as a result of that, they’re relatively – so while we neutralise them to a degree, they’re relatively acidic in terms of when they’re deposited in to the tailings dam. If we were to eliminate that process and adopt the flow sheet that I described, that – those tailings would be more neutral. So you float at more of a neutral pH. So the nature of the tailings would change but the volume would be very dependent on the scale, wouldn’t necessarily increase or decrease.

20 COMMISSIONER: I presume the price of copper is the determinate in terms of the size of the activity?

MS MCGILL: That’s very true. But also the cost that Olympic Dam incurs to process the material and our overall productivity.

25 COMMISSIONER: Okay. If I could – he gets paid for this, I’ve got to do all the work. That’s not exactly true. Can we move along, I want to understand your comment about regulation? Because clearly this is important. We’ve spoken with Heathgate this morning, in all of our miners, so I just want to get a sense of your comment about the duplication between the state and the federal legislation on this? Where you think improvements could be made to improve the productivity of the mining operation?

MS MCGILL: Yes, certainly. So our submission was - - -

35 COMMISSIONER: Perhaps you could start by just explaining – if you have it - - -

MS MCGILL: Yes.

40 COMMISSIONER: - - the sorts of planning processes that you need to go through from a state perspective and also from - - -

MS MCGILL: I’m not sure - - -

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COMMISSIONER: - - - the federal - - -

MS MCGILL: - - - I have that level of - - -

5 COMMISSIONER: Okay.

MS MCGILL: I mean I will – it's part of the EPBC Act which - - -

COMMISSIONER: Yes.

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MS MCGILL: - - - is the federal Act, has a trigger, as soon as you mention uranium - - -

COMMISSIONER: Yes.

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MS MCGILL: - - - it triggers significance, which requires review from the federal level. And I guess our experience, we've operated Olympic Dam for a number of years, we believe that uranium mining and milling and processing, as we execute it and to the standards which are evident in society today, don't warrant that level of over – increased oversight. They should put – you put through the same level of rigour and challenge as any other mining and milling project is in Australia. So it's the additional trigger if you like. Now a lot of good work has been done in terms of the overall assessment process, in terms of streamlining that but the approvals process still remains multi-faceted process for any uranium operation in Australia. So we go through the state and also the federal process.

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COMMISSIONER: Because it's - - -

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MS MCGILL: Because it's listed as – because it's uranium. You know, if you have a mine that has low levels of uranium, and you don't actively recover it, it could still exist in your ore but because you're not actively recovering it and the material would be considered as norm, natural radioactive materials, doesn't trigger that threshold. So it's a nuance but it does create a lot of administrative hurdles which you challenge whether they add a lot of value and security to the Australian public for how the mining activity is conducted.

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COMMISSIONER: Is it a straight duplication of federal upon state, or state upon federal whichever way you want to look at it? Are we all doing the same things?

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MS MCGILL: There's a lot of similarity in the process. I'm certainly not an expert, I wasn't part of the approval process for Olympic Dam either through the expansion but my experience has been that when you trigger commonwealth and state, you go through a lot of the same stuff and have

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different signatories, different timescales and different timeframes. A lot of the time the recommendations are very similar and sometimes they're slightly different, depending on the perspective gained as part of that assessment process and approvals process.

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COMMISSIONER: We will follow that up with the state regulators clearly but do you have a sense of the amount of effort required for these additional processes?

10 MS MCGILL: From - - -

COMMISSIONER: I'm not asking for a dollar sense but - - -

MS MCGILL: Yes. You know, time is money.

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COMMISSIONER: Yes.

MS MCGILL: As we all know and whilst BHP Billiton is certainly resourced to be able to cope with that, the time burden is still significant. I guess I look at it from another perspective, I was a small player and trying to raise capital and there was – because it's not just the time, it's the uncertainty that having duality of processes create in the minds of investors. So okay, we've passed - how many hurdles does a company actually have to pass before they get a successful project up and running? So we can manage, it takes additional time, I've seen it take months, not weeks in terms of the parallel processing required.

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MR HANDSHIN: Could I ask, just on that topic of regulation and perhaps bringing it down to a state level, do you see any fragmentation of the regulatory process because of its division between the Department for State Development and the EPA?

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MS MCGILL: So I would draw you very significantly to our indenture and that really prescribes for Olympic Dam a framework that is – enables both the South Australian public and the government to have regulatory oversight of Olympic Dam but provides for us an aligned approach to our approval regulatory perspectives.

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MR HANDSHIN: What do you mean by that?

40 MS MCGILL: So we work through the Olympic Dam taskforce - - -

MR HANDSHIN: Right.

MS MCGILL: - - - and whilst we interact, the EPA has quarterly visits to Olympic Dam; you know the processes with which we operate are governed by

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the Olympic Dam taskforce.

5 COMMISSIONER: I might just move on now to looking at your second recommendation which is the broader recommendation about the use of information.

MS MCGILL: Mm.

10 COMMISSIONER: And this is particularly relevant to BHP and all of those other small miners. In your recommendations you mention that improving access to the body of learnings from extraction and exploration in the uranium sector is a means of cost effectively growing the sector. Can you just take us through what you had in mind with that particular recommendation?

15 MS MCGILL: Certainly, I will just find – so I make sure I work through all of the points. So there is the fascinating thing about the South Australian geology is the very deep cover.

20 COMMISSIONER: Mm’hm.

MS MCGILL: Which, you know basically mask the potential discovery of resources in the region. There is – now when exploration is conducted, the data is handed back to the government and in fact that data provides a really valuable database and resource for prospective players to comb through, to evaluate. We believe though there is an area of opportunity for the South Australian government to really mine the data, to extrapolate more information or potential insights about potential mineralisation and opportunities. You know, a number of my team have described that if we were actually able to map the crustal formation, enable to give us some insight to where – so you know, uranium is created from – so the uranium that’s being mined in South Australia is a mix of sedimentary and original deposits. So when we say sedimentary, it means they’ve transported from somewhere. Now what is the mechanism for that transport? What is the pathway that those uranium minerals have gone on and how can you best help identify? So if you know how like the Beverley deposit was formed and its source gives you other methods of finding future Beverleys or future Olympic Dams, if you actually understand: a) how they’re formed and b) how they could have been potentially transported, so there’s this intellectual property that exists or intellectual data set that exists within the state knowledge that could then be mined, actively developed and potentially on sold, if you like, to potential prospectors to create compelling cases for the teams to evaluate the data and potentially may find more deposits of this scale and size that we’re thinking about.

45 COMMISSIONER: So that I understand it when you do your analysis of Olympic Dam for instance that data then goes back to the state government?

MS MCGILL: When the tenements are handed back all of that data gets handed back. After we've done the work there is a time frame with which the data is made available, but certainly at the completion if you hand back a tenement you hand back the data, which is really positive, that doesn't occur in every state of Australia.

COMMISSIONER: It makes sense. Is BHP part of UNCOVER?

MS MCGILL: Yes. We've participated in a number of the surveys and workshops and summits and we're a sponsor to the AMIRA project, which is the unlocking Australia's hidden mineral potential project, as well, so, yes, we have participated in UNCOVER.

COMMISSIONER: How do you assess that performance which is designed really to better understand what's underneath the South Australian cover?

MS MCGILL: I think it's making good progress. Unfortunately due to the scale of the state and the depth of the cover there's still investment that needs to occur in terms of the seismic modelling, so there's more data that needs to be added to that picture to liberate a lot of information, but early stages. When you come to researching the fundamentals of the geology that is not a quick process. This is trying to understand the earth in a very deep form.

MR HANDSHIN: How could the missing data, if I can put it that way, be efficiently collated? Would it be by way of government organisations undertaking further research or do you see scope for commercial participation in that process?

MS MCGILL: I think the answer would be, yes, to both. I mean I think there's certainly a level of fundamental work which is probably best done by long term research bodies like universities or groups like AMIRA or linkages, grants through the ARC. Potential commercial interests could be explored, it really depends on the time scale with which they'd be prepared to look at it and what would be in it from a commercial routine perspective.

MR HANDSHIN: One of the other programs that has been discussed in the course of some of the evidence today is the PACE program, the planning for accelerated exploration program.

MS MCGILL: Yes.

MR HANDSHIN: Do you have any views on the effectiveness of that program in encouraging exploration within the state?

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MS MCGILL: I guess I'm not really in a position to discuss that to any degree from BHP Billiton. I've heard positive things about it. From our perspective we're driven more by internal motivations in terms of scale and the size of the resources on our horizon.

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MR HANDSHIN: For junior or smaller operators it seems to be the case that there are some significant barriers to entry into the sector, namely the costs of exploration. Do you see any ways in which, from the perspective of those junior operators, they might be assisted in taking the steps and embarking on a course of exploration?

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MS MCGILL: It would be all about how you can simplify the process and how you can ensure that also that you protect state interests and public interests as well, so I think there's a happy medium to be achieved in terms of regulatory response and control. Again it's very much dependant on how the potential for the state to unlock the - which I think is a true issue, which is the level of - the majority of the deposits like Olympic Dam are called iron ore-copper-gold. They are actually all iron ore-copper-gold-uranium deposits, the uranium being a variable quantity. Now, the ability for players to find and discover certainly regulatory frame works, improving the process, access to data and improving those data sets is really important, but then it comes to what are the barriers to actually creating an operating mine, which is very much around unlocking how those players would treat the subsequent concentrates produced from those operations, so not all of them will be at the OZ Minerals level where there's negligible levels of uranium. A lot of them will have increased levels of uranium which will require processing prior to sale or further production and that really, if I was to look at it from a - exploration is one part of the story, but the big part of the story which would create jobs is really around how you would unlock that deposit through an operating mine and that to me is the barrier to entry that most juniors would come against.

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MR HANDSHIN: That being a primarily capital intensive barrier.

35 MS MCGILL: That's right.

COMMISSIONER: We might move on. One of the other parts of our terms of reference talks about safety and I'm particularly interested in the regime that BHP uses in the uranium part of the business and how it protects its workforce, the process that it goes through. I wonder if you could give us just a brief outline of the procedures and the processes that BHP use.

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MS MCGILL: Yes, I certainly will and I will say it's been developed in conjunction with a number of world regulatory authorities, as well as state and federal authorities in terms of the right management plan for Olympic Dam.

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Our radiation management plan is reviewed and submitted to the state on an annual basis which has transparency in terms of reporting, in terms of dosage levels and impacts, potential impacts. Our view is, and certainly the view of the industry worldwide, is to focus on the principle of ALARA, which is as low as reasonable achievable, and that really, if you like, doesn't use the annual regulatory limit to establish the dose we allow our people to have, but it takes a look at it, so how low can we reasonably get it, so the annual regulatory limit for dosage in terms of millisieverts is 20 millisieverts per annum. We do not meet – we're about 40 per cent of those. Our maximum value in terms of our radiation dose over the life of a – certainly for the last number of years is about 40 per cent of that and that is the basis which we manage our radiation exposure, so we effectively measure the different causal pathways which people would be exposed to radiation, so you have gamma dose which we measure and monitor, radon decay product dose which is primarily received underground as a release of radon and in the decay products from the radon gas and then there's also dust, in the dust dose that people can potentially - so we measure the potential exposure via personal as well as area monitoring devices and we submit these results to the regulator set on an annual basis. We also provide transparency in reporting to our employees and we ensure there's effective communication and education about the hazards associated with radiation and if I remember back in my history the first uranium mine I worked at, and I came from a gold mine, and I walked in and I did a tour of the plant and I said, "What do I have to watch out for with radiation?" My boss looked at me, and I think it's the best advice I can give anyone who goes to a uranium site, just have really good hygiene. Wash your hands and face before you eat and drink and sometimes it's that simple advice that in fact provides the right level of protection for our employees, so we have limits of where people can smoke, we have limits where people eat and drink and we ensure we have adequate hygiene facilities across our sites as well, so we apply really good practices in that regard. That, as well as the engineering controls that we have in place, as well as respiratory protection all provide a really good and safe level of exposure in terms of the radiation dose well below the annual regulatory limit for the workers.

35 COMMISSIONER: In terms of the line operation is there any requirement for face masks to be worn?

MS MCGILL: There is depending on the area of activity, but the requirement for them is not particularly for radiation.

40 COMMISSIONER: For dust.

MS MCGILL: It's for dust. It's for diesel particulate matter, as well as potential exposure to dust from radioactive products.

45 COMMISSIONER: But I'm assuming the safety requirements are just as

stringent as if it were - - -

5 MS MCGILL: Absolutely. In the packing shed we operate with positive pressure when the uranium ore concentrate is packed. If the people have to enter there they wear airstream helmets which are fully encapsulated helmets with a pump of fresh air through a filter. In other parts of the plant people wear dust masks, in other parts of the plant that is more associated with the potential gases from the smelting process people wear respirators, so if you like we have a full gamut of respiratory protection, of which part of it is associated with  
10 managing radiation exposure but it also covers a very broad range of other potential risk factors in the workplace.

15 COMMISSIONER: And as I understand that, what you have described relates to the measures that you take to improve the safety of your workforce, what steps does BHP B take in relation to the broader community's exposure to radiation coming from the site?

20 MS MCGILL: Yes. Well, we also have a range of radiation monitoring that cover potential exposure for both the local community and the surrounding environment. And these controls are again, the information are captured and reported and part of our radiation monitoring plan. I mean this work is also, as part of the EPA's quarterly visit to site, they do a visit, as I said every quarter and they actually determine what it is they look at and review on that basis.

25 COMMISSIONER: Do the tailings facilities, and in particular bearing in mind the arid conditions that generally prevail at Olympic Dam, do they present any radioactive risk to nearby communities?

30 MS MCGILL: No, we have – see the way we control the risk presented by the tailings is in terms of radiation exposure to the community, there is quite a few but first and foremost, at 50 metres away from the tailings there is no gamma dose. Okay. So your best engineering control is separation and the location of the tailings facility at Olympic Dam is not near any local community. The town is on the other side. We also ensure that the tailings, when they are being  
35 deposited and when they are being stored actually have a level of water cover over them, which minimises the dust removal. But we also have active monitoring, as I said, on the tailings storage facilities as well as the Olympic Dam site to manage the level of exposure.

40 MR HANDSHIN: Perhaps whilst we are on the topic of tailings we could deal with what risks have been identified in relation to the tailings storage facilities at Olympic Dam and what steps have been taken to minimise those risks?

45 MS MCGILL: Certainly. We believe there's four main risks associated with the storage of tailings at Olympic Dam. First is embankment stability, so they

are dams. They have walls. So ensuring the integrity of those walls to minimise the risk of unplanned release of tailings as a result of the embankment failure. There is also potential for seepage. We monitor this and ensure that seepage is controlled and the impact on the environment is  
5 minimised through seepage collection activities. We also monitor the level and the potential interaction of the groundwater with any potential seepage. And we have maintained a distance between the groundwater level and our tailings seepage to the degree that there's been no interaction between those. The other impact is the fauna interaction, particularly avian fauna but as well as terrestrial  
10 fauna. So the potential risk. We are in an arid climate; bodies of water of any kind attract wildlife. On the ponds, we do have fences around the ponds and we implement a number of bird scaring and noise and sound and light to minimise the impact of avian interaction on the tailings. There's also the risk of spillage. We transport the tailings from the plant through to the tailings dam  
15 and there is a potential for the pipes to fail. Those – and we manage that risk by having a bund around that pipeline to ensure any leaks are captured and effectively remediated on that basis.

20 COMMISSIONER: Is there likely to be any difference in the approach to tailings if the expansion of Olympic Dam proceeded?

MS MCGILL: If the flow sheet remains the same, then the tailings approach will be the same. If the flow sheet changes, deposition method will probably be very similar but there may be less or fewer need for I guess, concerns  
25 around exposure to – in terms of it won't be as acidic, so the acid concentration or the pH of the water will be less aggressive than perhaps it is today.

MR HANDSHIN: If the flow charge were to remain the same, are the current tailings storage facilities adequate to accommodate an expansion, or would you  
30 need to build new ones?

MS MCGILL: No, and as part of our environmental management plan, we regularly apply and continue to extend – raise the heights of our dams, increase our overall storage capacity. So we don't – it doesn't – it's never ending, you  
35 have to continue to grow to develop them. So if there was expanded along the current flow sheet, there would be a need for an expanded tailings facility.

MR HANDSHIN: What are the heights at the moment?

40 MS MCGILL: The maximum height that we're going to is 40 metres.

MR HANDSHIN: Right. And where are they currently at in terms of - - -

MS MCGILL: So, 30.  
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MR HANDSHIN: Right.

MS MCGILL: Thirty.

5 MR HANDSHIN: Okay. Could I just go back to a couple of the matters that you raised a moment ago, in relation to the tailings facility and you mentioned, as part of your first point, the embankment stability and in particular the integrity of walls. What do you do in that sense to ameliorate the risk? What engineering or other controls have you got in place?

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MS MCGILL: Well, first and foremost they have to be designed to the appropriate standard and in fact it's that compliance to design and construction which is paramount in ensuring the stability of the dam. We also manage the level of water sitting on the top of the pond. You do that to ensure that you don't get erosion of the walls with the lapping and the action of the water. So we monitor and maintain that. We also, as we're depositing the tailings, maintain a maximum rate of growth increase. So you do it in a very staged way. So the maximum rate of tailings in the dam was two metres per annum. So that it's done, allowed to dry, stabilise and then you continue to grow over

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20 time.

MR HANDSHIN: Can I just interrupt you there and ask you - - -

MS MCGILL: Yes.

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MR HANDSHIN: - - - how that particular control measure works with natural rainfall events? Have you got built in tolerances to deal with those kinds of scenarios?

30 MS MCGILL: We do. We actively model rainfall and the potential impacts of extreme rainfall events to ensure that we have adequate water storage facilities to manage that process. Yes.

35 COMMISSIONER: When it hasn't worked, when there has been spillages from the tailing dams - - -

MS MCGILL: Mm.

40 COMMISSIONER: - - - I assume that there have been - - -

MS MCGILL: We have had leaks on the line and on the embankment and there has been incidents where seepage has been detected but there hasn't been wall failures to my knowledge.

45 COMMISSIONER: Okay. What have you learnt from those processes? Is it

a question about engineering the walls, or have you learnt - - -

MS MCGILL: Well, certainly from the pipeline perspective, it's about maintenance strategies and ensuring the acid integrity is of the right standard.

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COMMISSIONER: Yes.

MS MCGILL: As technology continues and improves and we have more real time monitoring which will give us early warning, so of potential leaks - - -

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COMMISSIONER: Right.

MS MCGILL: - - - and issues that we can actively remediate them, that's a reactive mode. In a planning mode we actively condition monitor the state of those lines to ensure that they're the right standard and we have, in terms of seepage, we actively monitor the points where we know and we've modelled there could be potential issues and we actively establish what the monitoring programme, if we see any areas of concern will increase the frequency and the monitoring of those processes. We also have the ability to – because we have got a few tailings dams, we can move between one to another if we need to manage that.

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COMMISSIONER: And is this a recent occurrence, or is this something in the past?

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MS MCGILL: What?

COMMISSIONER: Problems with the tailing facility? What - - -

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MS MCGILL: So - - -

COMMISSIONER: Seepage or?

MS MCGILL: So the nature of the tailings facilities is that the lines are carrying an aggressive – it's like pumping sand. So you will get wear on the tailings lines. The seepage is an issue that we're actively monitoring; it hasn't been a particular issue, we've never had interaction with groundwater, it's just one of the operating parameters which you're aware of when you operate a tailings facility.

35

40

COMMISSIONER: Okay. The groundwater - - -

MS MCGILL: Mm'hm.

45

COMMISSIONER: - - - what's the quality? I probably should know this?

MS MCGILL: It's quite brackish.

COMMISSIONER: It is quite brackish.

5

MS MCGILL: Yes.

COMMISSIONER: Okay.

10 MR HANDSHIN: What's the mechanism through which the seepage is – or the seepage risk is monitored?

MS MCGILL: Mm'hm.

15 MR HANDSHIN: What's the actual mechanism? What do you do? Is it onsite inspections? Are there - - -

MS MCGILL: So we have – yes, so we have onsite inspections, we have regulatory checks by the EPA, as I mentioned. At our pre-discussion, the EPA was actually out at the TSF in May. So yes, it's part of just a routine process that's actively prescribed and controlled as part of our environmental management plan.

25 MR HANDSHIN: The use of liners in the tailings storage facilities, is that common to all of them?

MS MCGILL: No, the liners are used in the ponds, rather than used in the dam. The dams are used with the clay and a geotech manufactured base.

30 MR HANDSHIN: Okay.

MS MCGILL: The tailings themselves would erode the liner.

MR HANDSHIN: Right.

35

MS MCGILL: Okay?

MR HANDSHIN: So in the ponds, the liners are placed in the base of them in the centre?

40

MS MCGILL: No, the whole pond is lined.

MR HANDSHIN: The whole pond.

45 MS MCGILL: And then we have under-pond drainage to check if there's lead

- we call it leak detection. It's a very fancy name for a pretty simple process.

MR HANDSHIN: The measures that you spoke about as deterrents to the local fauna, when were they introduced? And I'm thinking in particular about the  
5 bird-scaring devices you mentioned.

MS MCGILL: I couldn't tell you the actual year, but they've been in place for a number of years. We in fact just implemented the random light disco out there. That's been more of a recent innovation, but we had the bird scarers and  
10 the guns - literally gas cannons for noise, not anything else. I'll just be very clear on that. But they've been in place for a number of years. You know, we actively try to minimise the impact, yes.

MR HANDSHIN: Some materials that have been received by the Commission express concerns with a number of bird deaths, particularly earlier in the 2000s. Have you seen a progressive decline in the number of bird deaths since all  
15 these measures have been adopted?

MS MCGILL: Yes, we have, yes, over a period of time, and that information  
20 is available from the environmental management plan as well.

COMMISSIONER: Can I go back to the expansion to get a sense of the time frame and how sensitive that is to commodity price?

25 MS MCGILL: Very sensitive.

COMMISSIONER: So if there was a return to perhaps more buoyant commodity prices, there's a potential to accelerate this process?

30 MS MCGILL: The constraint really would be solving the technological risks associated with the processing. There's only so much you can speed up. So there would be some acceleration potentially, but it really will be dependent on the successful application of the technology.

35 MR HANDSHIN: In relation to the heap leaching trial, have you identified any potential environmental risks from the use of that process, and if so, what are they and how are they being dealt with?

MS MCGILL: I think as we step through in terms of scale, there will be  
40 opportunities to ensure that we have adequate levels of protection. The heaps are quite large, potential for dust lift from the pads - - -

COMMISSIONER: Can I interrupt? I do understand what a heap is.

45 MS MCGILL: Yes?

COMMISSIONER: So is this just a concrete pad with a hole?

5 MS MCGILL: What you usually do is you do multiple liner. So you put a  
rubber base down, a polyurethane base. You put collection points in to collect  
the liquor. So you would put, like, drainage down underneath the pad, and then  
you would stack ore that's crushed to around 8 millimetres, slightly  
agglomerated, so you would put - it would sort of like the mix from cement  
10 before you added lots of liquor. So it would look like the reo - that sort of  
material. And then you would stack it on a heap. Now, these heaps - probably  
the best scale I could refer to you is our operation in Escondida where we  
operate these facilities and have, you know, over 20 years.

15 These heaps can go through a stage of multiple lifts. They can be up to 30 to  
40 metres high. They could be kilometres long. And what you do is you  
basically use, like, a sprinkler system over the top of that rock that you stacked  
and slowly drip - drippers, if you like, that you put under your tree, your  
almond tree. You would drip that material down through the ore. The solution  
20 would collect in that collection pond at the base and you would pump that  
liquor through to the plant to recover it by a solvent extraction.

COMMISSIONER: And presumably what you don't use gets pumped back.

25 MS MCGILL: Yes. It's a very elegant process. You recover the uranium.  
That liquor then goes back into the heap in a circulation process. So you don't  
actually exist the liquor. You just keep recirculating it after you've removed  
the uranium.

30 MR HANDSHIN: And what is it that's applied to the heaps to facilitate the  
percolation?

MS MCGILL: An acid solution, a weak acid solution. So it would be like  
lemon juice, 1.8 pH.

35 MR HANDSHIN: What is the acid that's used?

MS MCGILL: Sulphuric acid.

40 MR HANDSHIN: Is it apply by drippers or is it sprayed on by some other  
means?

MS MCGILL: Drippers mostly, because evaporation is a real problem,  
particularly in an arid climate like that. Yes.

45 MR HANDSHIN: Given the use of the pads at the base of the piles and the

other drainage facilities that you referred to, do you contemplate that there might be a risk of the contamination of the subterranean surface?

5 MS MCGILL: There would be always a risk. It's how you engineer and ensure those risks aren't delivered on. As I said, these operations have operated really successfully and quite safely. Where there's been excursions that is around failures of the engineering controls and potentially, you know, massive rainfall events that the sites were not capable of managing. So you'd have to be sure you had the right level of pond storage, that your water balance was correct, and that you had the right monitoring under the base of the liners to ensure that you didn't have leaks.

10 MR HANDSHIN: At the moment are leach tanks used for this part of the process?

15 MS MCGILL: That's right.

MR HANDSHIN: And again, and to the extent that you can comment on it, would those leach tanks still be used in the event that you went to a heap leaching style of operation?

20 MS MCGILL: No.

MR HANDSHIN: They would be completely circumvented.

25 MS MCGILL: Yes.

MR HANDSHIN: Can we perhaps move on to another topic, Ms McGill, and that is site remediation and closure, particularly in the context it's being consideration, namely, an expansion of mining activities. Are you able to give us some information on what is currently required, what closure plan BHPB has, and in particular how that accommodates the tailings storage facilities over the long term?

30 MS MCGILL: Okay. So I'll talk firstly about the BHP Billiton process for managing closure. Part of our annual planning process requires that we update our closure plan and we make full financial provisionings to ensure that complete closure is captured in our financial models. As I said, this is done annually. We also have an internal audit process where people external to Olympic Dam attend Olympic Dam and verify the levels of closure provisioning and the closure requirements that we captured.

35 COMMISSIONER: Who are those people?

45 MS MCGILL: So they're from BHP Billiton group or they might be people

external to Olympic Dam - - -

COMMISSIONER: To your - - -

5 MS MCGILL: My unit operation, a more global perspective. We also have an annual audit done by KPMG, which includes the scope - the scope of the closure planning is also included to ensure that we meet those closure provisioning. Now, in 2011, when we apply for major development approval for the open pit expansion and our EMP, we also submitted to the State  
10 government for its review a copy of our closure plan as associated with the approval, and the indenture minister can request a closure plan at any time. The closure plan that we submit to the State government doesn't include detailed financial information.

15 So they're all the requirements that we comply with. Most of those requirements are done on the base of our internal controls and ensuring that we are financially viable to cover all of the requirements with closure, as well as any State requirements as described by the State.

20 COMMISSIONER: So that provision is on BHP books? It's not money actually seconded to the State or Territory?

MS MCGILL: No, that's right. I referred to the Indenture Act. It applies for Olympic Dam.

25 COMMISSIONER: Presumably that's a provision that would be available for review on BHP's annual accounts, the extent of which - - -

MS MCGILL: Excuse me, I'm not - - -

30 MS .....: (indistinct) be - - -

COMMISSIONER: The quantum.

35 MS .....: - - - valuable? The quantum. So - - -

COMMISSIONER: The quantum for the provision, I am assuming, would be separately identified on BHP's financial statements.

40 MS .....: Correct, yes.

COMMISSIONER: So individuals who would want to see what the extent of the provision - - -

45 MS .....: I would assume so.

COMMISSIONER: I'm not expecting you to have that off the top of your head.

5 MS .....: I'm sorry, your Honour.

MS MCGILL: I mean, a scale the size BHP Billiton, whether it's truly able to be - this is Olympic Dam.

10 MS .....: I think it's - - -

MS MCGILL: Certainly the overall provision - - -

15 MS .....: Consolidated (indistinct)

MS MCGILL: - - - consolidated there would be available, but would it apply to the majority of our operations rather than specifically Olympic Dam?

20 COMMISSIONER: Yes. That might be a question we ask later on.

MS MCGILL: Okay.

25 MR HANDSHIN: The only other question that I have in relation to site remediation and closure concern what would actually happen to the plant at the Olympic Dam site in the event of closure? Is that something that's dealt with in the closure plan?

MS MCGILL: It would be. I don't have detail right now because - - -

30 MR HANDSHIN: Can I just raise one more matter if that's - - -

COMMISSIONER: Of course.

35 MR HANDSHIN: It just relates to the topic of water consumption. In the event that heap leaching were to form part of your operations, would that have any material effect on the site's daily consumption of water?

40 MS MCGILL: It's certainly a key component of what we would review in terms of the viability of the project, but I wouldn't assume it would essentially use more. It would depend on the scale of the operation. To give you an example, you know, in any tank it's 50% water. In a heap leach you're trickling it through a stockpile. So it doesn't necessarily consume more water than our current unit processes.

45 COMMISSIONER: Thank you very much for your evidence. We'll adjourn

at 1450.

**MATTER ADJOURNED AT 2.50 PM UNTIL  
THURSDAY, 15 OCTOBER 2015**