

**TRANSCRIPT**  
**- QUARRY PRESENTATION on GEOTECHNICAL REPORT**

**HORNSBY RSL CLUB – 21 June 2008**

**Dr Philip Pells**

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**Present:**

**Facilitator:** Sarah Brisbane (SB)

**Experts:** Dr Philip Pells (PP)  
Mr Derek Anderson (DA)  
Mr Larry Baron (LB)  
Ms Jane Baron

**Councillors:** Nick Berman (NB), Mayor  
Steve Evans, Deputy Mayor  
Janelle McIntosh  
Wendy McMurdo  
Garry Whitaker  
Nan Horne  
Mark Lyons  
Felicity Findlay  
Andrew Isaac  
Robert Browne

**Council staff:** Robert Ball, General Manager  
Max Woodward (MW), Executive Manager, Works  
Peter Hinton, Executive Manager, Planning  
Julie Williams, Strategy Division  
Rob Rajca, Works Division  
Gary Jewkes, Works Division

MW: I think it's now about five past 2. Ladies and gentlemen, I'll call our gathering to order and thank you very much for coming along this afternoon. My name's Max Woodward and I'm the Executive Manager in the Works Division at Hornsby Council and it's really great to see so many people here this afternoon who are interested in learning a little bit more about the Hornsby Quarry site and the geotechnical study that we've commissioned.

To kick the afternoon off, council's engaged the services of Sarah Brisbane as a facilitator and I'll have great pleasure now in handing over to her. She will introduce the councillors and other people present this afternoon and then hand over to Dr Pells and his team to carry out the presentation. Thanks very much Sarah.

SB: Good afternoon everyone. I feel like I'm on a show up here. It's a showroom and with a clap like that I'm not going to do a tap dance routine I promise. We've got a fairly full program this afternoon. We are going to wrap

up by 3.30. The focus of today is to hear from Dr Philip Pells on the geotechnical report and then to have a lot of time to have you be able to ask questions.

I do just want to clear up a few things in terms of introductions and housekeeping before we get underway. I believe the Mayor, Nick Berman, is here up the back and I've just been given a list of councillors, so please don't be upset if you're coming out last, it's just the list as it was given to me. Janelle McIntosh is here, Wendy McMurdo, Gary Whitaker, Steve Evans the Deputy Mayor, Nan Horne, Mark Lyons, Felicity Findlay, Andrew Isaac, Robert Browne and we also I believe have the State Member for Hornsby here, Judy Hopwood.

I wanted to also introduce some council staff. We have Robert Ball who's our General Manager from council here; Max Woodward obviously who was just here who's the Executive Manager from the Works Division; Peter Hinton who's the Executive Manager from the Planning Division; Rob Rajca who is the Manager for Design and Construction; Julie Williams is at the door, she is the Team Leader of Corporate Projects and Julie might also, unless anyone violently objects, take a few happy snaps or cranky snaps – whichever way the mood goes; and Gary Jewkes is a Designer at council as well.

And a few more introductions. Dr Philip Pells is sitting up here on the stage with me and he is a principal with a firm called Pells Sullivan & Meynink, and he was the principal author of the geotechnical report that we're going to be talking about this afternoon. He's joined today by a number of his team and his colleagues, and they are Derek Anderson who is an associate; Mark Eggars who is a principal with the firm; and Philip Clark who is a senior engineering geologist, and I described that firm about 10 minutes ago as blokes who deal with rocks and holes. They were laughing at me but I'll give you their proper introduction in a minute.

I also wanted to just acknowledge Dr Larry Baron who's in the audience, and his wife Jane. Larry is actually a research scientist and geochemist, has detailed knowledge of the geology of the quarry and the area and in fact many of Dr Baron's work and reports have been referenced in the geological report and I just wanted to mention this. I said to Dr Pells: Well how big is this thing, you know, what's the weight test? For those who haven't physically seen it which it came out in February 07 this is it, and as you can appreciate it's a fairly substantial geotechnical report. In the next hour and half the focus will be on the impacts and safety and risk issues on the northern boundary. So that's the focus of Dr Pells's presentation this afternoon.

The report itself obviously looks at what are the possible areas on the site, what could it take, what could it handle in terms of works and development. There's a lot of work in that, but today as I said the focus is on the risks and safety issues as relate to residents on the northern boundary.

I just want to give you a couple of little introductions to Dr Pells and then a bit of housekeeping and then we'll move on. Dr Pells trained as an engineer both in London and in Capetown. In 2003 he won the Australian Centenary Medal for services to Civil Engineering. He has been published in 73 publications and since 1993 he's been the principal of Pells Sullivan and Meynink. He is also an adjunct Professor of Civil Engineering at the University of New South Wales and he is obviously eminently qualified I think to prepare the report that council commissioned on the geotechnical issues of the quarry.

So just a couple of housekeeping issues. Today's session is being recorded, and the reason that is is because we want to capture the questions that are being asked and also the answers. The Q and A's from today's session will be typed up and they will go onto the Hornsby website under the Quarry section by close of business this Thursday.

The Powerpoint presentation that Dr Pells is presenting will also be made available on the website by close of business Thursday next week. I will talk a little bit more later on about the Bang the Table little card on your chairs – we'll come to that at the end. When we come to doing question times we do have two roving mikes so I would just ask that you put your hand up and then I can spot you and if you could give your name and your suburb just to put in a bit of context and use the mike. We are adopting a bit of a fair go style this afternoon which means one question per person and I will be fairly strict on that, just because we want to make sure that everyone who wants to have a say gets a say. And I think that's all on my housekeeping for now. We will have a wrap-up at the end from the Mayor in terms of next steps, but I think that's it from me.

I'd like to introduce Dr Pells now who will give about a half hour presentation. Again as I said the focus being on the safety and risk issues that affect residents on the northern boundary. So if you could hold your questions until Dr Pells finishes. Thank you.

PP: Don't trust me. I hope you can trust rather what we present as a team of quite a detailed study done, financed by the ratepayers of Hornsby, done over the period of a year or so. But the fact that I'm a slightly chubby, bald, geriatric expert is not the point. The point is what we presented, not who stands up here and presents it. It's like the game of rugby – you're only as good as your last game and judge us from the game, not on history.

The Hornsby Quarry is a pretty special geological feature, I'm not going to go into its full history. You know it was a quarry, it's now partly filled with water, it's a facility that – I'm not going to go into how Hornsby acquired it, why they acquired it, the politics behind it, the finances behind it. The job we were given was simply to evaluate the options or the constraints on developing the quarry from the point of view of geological, geotechnical and groundwater

condition. As part of that we obviously had to assess stability and risks and so on.

I speak here – there are two things I would like you to trust me for, believe anyway – the one is that I will talk the truth as I know it. If there's something that I don't know that's raised and raised I will accept that and take it seriously, but I will tell you the truth as I know it. The second thing is that all of us are members of the Institution of Engineers Australia and as members of that we have a code of ethics, and our first responsibility is actually not to people who pay us, it's to the public. If we know of anything that could adversely influence the safety of the public we have an obligation to do something about it.

This is not a game played on television between competing experts in the virtual world as is something safe for somebody or is it not safe – this is real. If we reached a conclusion that there was an area of the public that was at risk living in an area that was unsafe we would have to tell them to get out – or recommend that. And if you think that's just a theoretical thing – it was only two weeks ago I had to say to a family in a newly-built house right on the edge of a slope that I recommend that that night they get out, because they were living in an area which was deemed to be unsafe. So we're not playing games and I have no hidden agenda.

There's been recent media coverage that's raised the perception that the lives of some residents around the quarry are at risk. And therefore today, while there are lots of other things we studied, we want to look at some of the background about the quarry, we only have half an hour, we want to discuss the quarry walls and we want to answer questions about the risks of living around the quarry. That's the focus of today. There are some other issues about what land can be used for what. We're happy to answer questions about that but that's not what the presentation's about.

The presentation will look at how the quarry was formed. I'm not going to spend a lot of time on that because we've got two of the genuine experts on this topic in the world in Larry and Jane Baron whose geological bag spaces (??) for the quarry were used – questions I'll actually direct at them. We've used their information in the report, it's in the report. We look at stability of the quarry faces and particularly the areas along the northern and north-western side which are closest to the houses. We look at questions of likelihood of landslide affecting the houses and we look at the question of risk.

Now unfortunately when we start looking at likelihood of risk we introduce ourselves into one of the hardest areas to understand, which is probability, and I struggle with probability, and I'm hoping at the end of today if we achieve nothing else you'll actually understand probability. And that's a big ask but I think I can.

Before I start that – for a thousand years or more most of the world, other than a few people in one odd country, considered that all swans were white. The definition of a swan was it was white, that's how you knew it was a swan. It also had a long neck, but it was white. In 1897 in fact, a Dutch navigator bowled up in West Australia and discovered black swans. All swans up to that time have been white. The term 'black swan' has become used - and if you've read that recent book which is on the bestselling list called "Black Swans" – it's become a term to indicate things which happen in our world which are totally unexpected. And a lot of things that have affected our lives are things that nobody predicted, nobody thought of at the time, they're called black swans. 7/11 was a black swan. Afterwards we could work out how people could hijack aeroplanes, drive them into the World Square towers and collapse them. Beforehand that was inconceivable. And there are lots of other examples like that.

Where we come at risk – and I guess reading that book has changed my perception of engineering, because one of the things that comes out of it is we never get it wrong because we get the averages wrong, we get it wrong because of the far extremes we don't think of – the black swans. So when we're looking at risks we're looking at extreme events, and we come at it from the point of view of not starting in the middle and working outwards to where it may be extreme, start way out there, start way out from the levels, start looking for the black swans, because that's what will kill people, that's what will cause the Westgate Bridge to fall down, that's what would cause the Thredbo landslide – the black swans, the thing that nobody thought about.

We'll talk about landslides today, and I just wanted to show physically what we mean. This is a landslide in an open pit mine in Borneo, but we're talking about a slip and debris material falling down the bottom. When you're talking about landslides in rock, the mechanism that is always controlled by structures that are in the rock - joints, bedding ???, faults, shears – it doesn't fail just through the rock because a rock is incredibly strong. And that's a very important thing to understand in terms of Hornsby Quarry: we're not talking about soil, we're talking about rock. You want to look what the rock looks like, there's diamond drill hole core here. The reason why they have a quarry at Hornsby Quarry is because it was strong rock, not because of weak rock. That's why they made a quarry there.

Now risk. This is an analogy, and out of this you will understand probability analysis. There are lots of restaurants. This particular restaurant gets eggs delivered to it by a supplier. Unfortunately one day once in 10 years all the eggs delivered are contaminated with salmonella. So this restaurant gets all the eggs, one day they got salmonella in them – once in 10 years on average. The chance of it happening is 1 in 10, or what we write as .1.

Now, granny doesn't get out often but once in five years she goes to that restaurant and eats eggs. So the annual probability of granny visiting that

restaurant is 1 in 5, or .2. Now if you eat salmonella eggs you don't necessarily die, and how many people die from salmonella poisoning? About one in a thousand. The question, now this is the question, this is probability: What is the probability of grandma dying from salmonella poisoning because she goes to that restaurant? And this is probability. If you understand this you've got everything. You can leave, you're qualified as a probability specialist.

It's simply this: it's the probability of the eggs arriving at the restaurant with salmonella multiplied by the probability of granny being there, .2, multiplied by the probability of somebody dying from eating salmonella eggs. The eggs is .1 x .2 x .001, which is that number, which is 2 in 100,000. Or if 100,000 people go to that restaurant, which would make it a very popular restaurant, two of them could be expected to die from salmonella poisoning every year. Okay, that's probability analysis.

Later on in this talk I will show the analogy that the eggs is the landslide, granny going to the restaurant is the person in the house and the probability here of the landslide killing granny, and we'll end up multiplying three different numbers to get the probability. So that's the analogy.

The New South Wales Department of Planning has said that for residences that are in the vicinity or affected by either current or past industrial work, the probability of death should be less than one in a million. They mainly wrote this in terms of people down in the Botany area living near ICI and so on, but it applies to all industrial development. So this is not my rule, this is the rule of the Department of Planning which is an extremely conservative rule. They've actually got a 99.99999% chance of living which is not bad, considering that if you just live in your ordinary house you've actually got only a 99% chance of living and dying from just household accidents. If you happen like me to have to drive on the F3 freeway back to Gosford, you're lucky to have a 94% chance of getting home. So this is actually a pretty tight criteria the Department has put on.

Let's look at the site in geology. Larry will talk to this theme and your questions, but all I want to say about this is what a diatreme is, and all I want to say about a diatreme is that if you imagine not very far from here, just down the hill where the Hornsby Quarry is, there was an explosion an awful long time ago that would make Hiroshima atom bomb look like a firecracker. That's the scale of what we're talking about, and I'm not exaggerating. It blew a chunk out of the earth into which was created a diatreme. The rocks were of a particular structure, of a particular type, and we don't want to dwell on that, Larry is the person to talk about this more than anybody else. They formed these trumpet shaped things, and if that's the east wall of the quarry, it's Larry and Jane's interpretation that behind that is another one of these diatremes exactly like the quarry – this huge trumpet shaped thing that came out through the base of the earth. That's what is the Hornsby diatreme.

As a result of our study, and this is an aerial photograph of this, we divide the quarry into four parts – the central part, part 1, is the actual quarry area, part 2 has become called the eastern area, part 3 is where the old crusher was, part 4 is down in the valley where quite a bit of waste was dumped out of the quarry, and part 5 is natural bushland.

Today we will not just be concentrating on the quarry area, but primarily on the north and north-east face because this is where the houses are, around the top there. The outline of these diatremes or this intrusion down at rock level is something like that, so inside that blue line we have this rock form material called volcanic breccia that was just blown out of the ground, and outside it we have sandstone, which if you live in Sydney you have all grown to love. Sandstone, which is one of the superb foundation rocks on earth. The picture on the left is in CBD, the cutting in sandstone with a high rise building above it, the picture on the right are the foundations for what was the Regent Hotel and now some other hotel down in the rocks. But that is the sandstone that's outside this intrusion – they quarried the intrusion – the sandstone is outside there. All the houses are on sandstone and well away from the edge of the intrusion. That's probably enough geology.

Let's look now at the profile of the north face. The water in the quarry's down there at the bottom. Here we have this intrusion, this diatreme breccia material, which includes in it great big hunks of sandstone that got ripped off the side of the hole as it was intruded, and we found those by bore holes drilling down through there – we will drill through breccia then a big piece of sandstone and then breccia and then sandstone and then breccia, till eventually we get to the country rock, the sandstone. And the houses, as I said, are sitting up in the sandstone. That's the context of the north face, and that's to scale.

Just a picture of the north face – this is looking from the western side. The quarry and water is down here on the left, the houses are way up behind there on the right. This was the active part that was quarried. And the water is diverted around here and back down to the creek. This interesting part here, which is this slope up above there which keeps going up to the boundary fence of the quarry and it looks as if that slope is actually a soil slope, or maybe even a fill slope – it isn't.

Right towards the end of CSR's operations when they had some problems with a small landslip just in there, they decided to trim back this whole quarry face. They started at the top and they just sliced off a piece which was about, I guess about 15 metres thick or something like that. And that piece they sliced off there they then put on the eastern side. Right at the very top out of this photograph there is some fill, because they built a sound bund early on which is right at the very top there. But the whole side, while it may look to you like fill material, isn't. It's actually sliced where the basalt is in one big face.

Now stability and likelihood of failure. We have to look at this on a scale size, and for simplification we have called small and medium scale at the moment. Small scale are literally things from sizes of bricks to cement bags to a car size, which fall off what we call benches – these quarried faces. There's a high risk of that happening. The quarry was created to quarry, it wasn't created for safety for public. All the quarry people wanted to make sure was that they could get their trucks in and out, and these benches weren't part and parcel of where people and trucks moved and there was no problem to them if pieces fell off from time to time. And that's the small size.

Medium size is the scale where you can get a failure like the one that occurred during quarrying operations, that goes through several benches. That scale was about 30,000 tonnes. That's small and medium scale.

Those have no impact on properties. They're within, not just the boundaries of the property, they're actually within the walls of the quarry. That's the scale of the small to medium. Now the scale drawing – sure it's a cartoon version, but it's a scale drawing – that's where we're talking about – smallish is bench scale, medium is taking out two or three benches. The scale we've really got to concern ourselves with is a scale that can take out the houses.

The factor of safety for these bench scale things – I'll talk a bit more about factor of safety or factor of certainty – it's quite low. The likelihood of failure is high, medium to high, of these bench scale failures. We've gone around the whole perimeter of the quarry, and in the report there's a report which shows the rest level of these small to medium size failures all the way around the quarry. And there's actually a high risk up here on the northern side where there is an area of the old bund wall, the old fill wall, it's up there. But the important point is that this is a risk diagram of the small to medium scale. Nothing that goes even outside the boundary of the quarry. What we're concerned with is the big one.

The big one to reach a house would have to be about – over a million tonnes, 600,000 cubic metres of rock would have to move to affect the house. We've expressed our analytical results in terms of computed factor of safety, which happens to be between two and a half and three, but I'll turn that into probability and granny eating eggs and salmonella in a moment. But that's the scale we're concerned about, that's the one that I'm here today about. The one that has been in the media about affecting the public.

This little graph here is the only technical one I'm going to show, but it's a plot of what we call factor of safety versus probability of failure. That's a probability of failure of one in a million. That's the New South Wales Department of Planning requirement. If a slope has a factor of safety of only one, there's actually a 50/50 chance of it failing – that's what a factor of safety of one means. If it has a factor of safety of one and a half, it's got about a one

in thousand chance of landslide occurring. If it has a factor of safety of three, the probability is actually meaningless. That number up there – Derek worked it out after great difficulty as trillion, trillion, billion, squillion something or other – but it's a meaningless number, it's just mathematical gobbledygook. These sort of graphs have no real meaning anywhere above this sort of level. Probabilities of that sort of number mean nothing to human beings, they mean nothing to our real lives. They are a mathematical artifice if you like. The one in three billion is the number that we calculate for that very very big landslide that could affect the house.

So let's now go back to the probability thing. The landslide is the salmonella eggs. The probability of the landslide including the house is something like three in a billion. Granny is in the house on the edge of the landslide. Now you say: Why did I choose granny rather than grandpa? Because most grandpas, of which I am one, are dead. There's far more grannies than there are grandpas around. But when it comes to being serious for a moment, in these houses up there we've got to look at the person who's most at risk, and the person who's most at risk is the person who's there most of the time, and granny – other than the fact that we know she goes to the restaurant occasionally – she's at home the rest of the time. And granny has no chance of getting up and running if something happens. So she's at home most of the time and if the landslide occurred suddenly – and this is very very important – there's a landslide occurring without any warning. No warning from monitoring data, no warning from anything, it just comes - 600,000 cubic metres comes – bang, like that.

Question: What's the chance of death to the most vulnerable resident due to a landslide in the Hornsby Quarry? Answer: That number, times that number, times that number, times that – it's a very small number.

The result of the study was primarily dictated, directed towards what could the quarry area be used for. We recommended to the Hornsby Council that part 1 should be quarantined because if we look at the risk to human beings if they were actually walking around here where there's a high probability of landslide occurring, then we're in an unacceptable situation. The report also deals with risk to these areas and potential development there. It was only in recent times that the concern has really come up for residents outside there, and some fairly dramatic statements have been made in the media as to the risk to people outside that. Our conclusion is – not on the basis that I'm standing here as some kind of expert, but on the basis of a detailed study that you guys have paid for using the best information we have and the best technology that we can throw at it – that there is no meaningful risk to the residences around the quarry.

Thank you.

SB: Thanks Dr Pells. As I mentioned we've got the best part of just under an hour for questions and answers now. We've got two roving mikes as I mentioned. As I also asked if we could have one question. If we've got time there can be follow-ups, but at this time I'd really like to give everyone the opportunity to ask a question so I will move you on if you are hogging the microphone. If you have any questions that relate to issues sort of broader than what we've discussed today, ie. broader than the geotechnical report, we will park those and if we can deal with them at the end if we've got time we will. So that's the format.

So does anyone have a question they'd like to kick off with? And if you're comfortable we'd like to use your name and suburb, if you wouldn't mind?

Q. We know that there are earth anchors in the northern slope. Why are they there?

PP: A. I mentioned that during the quarrying operations there was this medium scale failure which was a wedge style failure – this is the northern face by the way we're talking about – and this failure which occurred around about 1994, 1995, I think that's about the right date, was a concern for the quarrying operation because then along the base there, amongst other things, carries the diverted stream in a canal around the base. And also when they started measuring movement up there they weren't sure what the full extent of it was. Charles Gerrard who was part of the advisory team for Hornsby Council at that time worked for the consultants and that is the area which partly failed and then adjacent to it they put rock anchors and also dig drainage holes into the north wall to constrain and prevent any other failures of this sort of magnitude. So that's the main area.

There was a few other areas Derek weren't there where there were rock faults, where there were some local pieces falling out?

DA: Very isolated – (can't hear)

PP: The thing that concerned quarrying – this is the main haul road, and obviously of concern during quarrying operations is even relatively small scale things coming down affecting the safety of people. So if you go around – if you walk down the haul road you'll notice there are patches here where they have bolted some large pieces of rock. So yes there are areas of bolting – that's where they come from.

Q. My name is Arthur Price, I live in Pennant Hills. I'm interested when that slip happened, CSR – see the slope there? How deep is the soil above the sandstone bedrock on those slopes? Is it metres or -- Because

PP: I'll have to listen to the question again. This is soil at the top of the sandstone, further at the top.

Q. As we know, talking about risks, up and down our east coast from Maroubra right up to the Vacluse area on top of cliff faces which is the same stone which is under there, which is under –

SB: Could we just get you to recap the question because we couldn't hear you very well?

Q. What I'm saying is – I'd like to know what the cover of soil is above the bedrock which is sandstone, which this intrusion came through. Is it, it wouldn't be very deep I shouldn't imagine. Also, in Sydney. The Heads is the same stone as that, it's Hawkesbury sandstone, the same as the Blue Mountains - if you look at Govett's Leap or any of that area you see how sheer the cliffs are. And on the eastern suburbs, from Maroubra up to Vacluse, houses are built on top of cliff faces, and those houses are well back from where this is.

So my question is: If it's Hawkesbury sandstone, which it is, that intrusion came through it's very very stable as you said, and also molten rock coming through touching sandstone would metamorphose it, and the face of the sandstone would be very hard, which would also create greater stability to the stone.

PP: Larry, can you perhaps just come up here, because I think it might be a worthwhile time for Larry just to talk a little bit more about the geology and geological evolution of this diatreme. Just to make it clear, Larry wasn't involved in the study at all. Larry worked at that time for the Geological Survey of New South Wales and he and Jane studied the Hornsby Quarry for years. Larry's got a bit of a Powerpoint presentation. It might be worth him going through that because it will set the geological picture I think reasonably clearly.

LB: Just on the part of the question about the basalt hitting the sandstone, the basalt's been mixed with water and you're getting high temperature steam which creates the blast, so the amount of heat transferred to the sandstone isn't as high as if it was solid basalt. If you think of Bondi, there's places where there's sandstone cracked because it was directly exposed to basalt, not to diatreme.

This is a presentation that I did in 2001 and it's on a research project that we had on diatremes in the Blue Mountains in Sydney basin. We visited about 50 diatremes and Hornsby being quarried was the best exposed. You can see all of these things still apply and I would just like to draw your attention to that area dotted in red – that's a nose that's been deliberately left in the quarry because of problems of slope stability, or at least concerns, and it's still there 20 years later.

Okay this is what a diatreme looks like before it gets eroded. There's a lake – these are up in the Atherton – and lakes are about 60 or 70 metres deep, which is deeper than the quarry, and they can last like that for tens of thousands of years. This is what happens when a diatreme forms. You have basalt mixing with water near the bottom of the structure and that expands by a thousand times explosively, and it just bores its way down – so it starts near the surface such as A and then it ends up becoming something like B. So it's boring its way down, it holds that carrot shape, and you can go down to 10 kilometres or more.

Now in the bottom part it's completely chaotic and often there's cavities and stuff like that, but in the top part you've got the lake which you can see right up the top and then there's some bedded facets just immediately below the lake.

Another aspect which is true of diatremes – they have this five kilometre or so thin apron of breccia scattered everywhere because when these things erupt they erupt repeatedly like an ordinary volcano except they go sideways, they don't go up like a volcano such as Hawaii or something like that, they mostly go sideways over the country – so if you dig under your house you might find a bit of this basalt breccia, but it would only be a metre or so thick at the most and mostly that gets eroded away.

Now this is a place called High Pippiny which is in the Atherton up in Queensland, and this is a diatreme except it's just a raw hole. It's 82 metres deep down to the lake near where Philip's standing, and it's just a great hole – it's about I think a hundred metres across – and if you went for a swim there there'd be another 80 or 90 metres of water below you. In other words, that's how diatremes start, you get an enormous blast, it clears everything out and then it fills up. This is what diatreme material looks like in hand specimen – that's a rock hammer there – and if you look at that closely with a hand lens there's no cavities in it and there's all sorts of different sizes of fragments and they all work together so there's almost no vacancies in there and the thing is all cemented together by a small amount of mud. And in fact it's almost as strong as concrete – by almost I mean it's about 10 times weaker than concrete but you can drive a car on it and you can make a house out of it, you know like building blocks and so on.

Now this is a very important slide here. What we have is one of those trees that used to be on the top fell down into the diatreme when it was forming and that piece of wood got converted to charcoal, and if you've ever looked at charcoal hot or cold you'll see that it's smaller than the original piece of wood, and that's why there's cracks in it. Now the real interesting thing here is that the diatreme material didn't fill right up to the charcoal – the charcoal shrank back and there was a cavity left. In order for the charcoal to be converted like that the diatreme material has to be about 350 degrees centigrade, which is far hotter than you need to cook a chicken or anything like that in your

kitchen. And yet this was solid, it didn't collapse onto the charcoal, and the reason it didn't collapse onto the charcoal is this is called base surge – and it's solid, even when it's hot, hotter than boiling water, hotter than boiling mud, it's solid, and it's solid from when it first deposited, and it was deposited as a base surge – that's where you mix mud and water and this basalt and you get this really high speed explosion and it travels outwards in all directions and I like to think of it as a toilet roll. If you take a toilet roll and roll it on the floor you can get a thin deposit left behind, that's the toilet paper unwrapping, but the toilet roll can be doing 60 kilometres an hour and yet the material being deposited is being deposited at zero, just like a bicycle going over a road. The bicycle is going at say 60 kilometres an hour but the contact between the tyre and the road is zero. There is no speed there and that is how this stuff gets laid down. As soon as it stops moving it sets instantly and there is a term for that it is called fixotropic. You can do it with cornflower and water, and because it solidifies that that way you can deposit on a horizontal surface or a steeply dipping surface or even on a vertical surface.

And that's what we think happened at Hornsby. Now you've seen variations of this photograph that's looking east from the west side of the Quarry. Those wonderful beds.

Now for many years in University that was given as a classical example of collapse of bedding into the diatrema. Classic example. But the trouble is it is like one of those black swans, it is not true. It is certainly bent and it is certainly shallow, but I draw your attention - see where the letter B is up there, this is a close up of it - and if you look closely even though it is poorly in focus you are looking at the bottom side of the bed. It is not dipping into the Quarry, it's dipping the other way and there are other places where you can see the underneath side of the bed here, so that model was wrong. It didn't slump into the Quarry, that's its bedding that's dipping outwards, so whatever it did it didn't slump into the Quarry.

Now this is the south wall over here. You are still looking west and this is one of these strange, they're called dip slopes, that's where the bedding in the original material is still there. They didn't mine it away, and you can see it starts right at the top of the Quarry and it goes all the way down. That would be under water down at the bottom there. Now that's steep and on the eastern wall it's shallow dipping away, so it's not the same centre - there's two centres here – there's one that has steep bedding and one that's dipping away and has shallow bedding, so there's multiple centres at Hornsby.

This dip slope it looks like concrete and there is no structure inside that - that's all one bed laid in a fraction of a second by that concept of the rolling pieces of toilet paper.

This is the nose I pointed out at the beginning where D is - and that's on the south wall, you are looking south at the south wall - all that D area from the

top of the Quarry to the bottom is a dip slope. That's all one bed and when they quarried it that they were nervous about that because vertical bedding is difficult to handle in a quarrying operation, so they cut across it.

You see where it says X and down there, that's all that nose that was deliberately left because they were concerned about it collapsing into the quarry. Now that's been there for twenty years, and it hasn't closed

This is on the western side where the bedding is exceedingly deep and everybody I talked to said this is collapse into the diatrema, but it's not, that is the bedding as it was originally put and you'd be foolish to stand there now because that's clearly not safe, but it is not safe on a small scale.

This is over on the west side and the north side - I think it looks like there might be some shallow bedding on the north side, is that correct Phillip?

PP: Well we won't worry about that.

LB: OK, all right, anyway so you don't need to worry too much about this except there is no tiering there is no slump inwards. That bedding is in its original disposition, that's how it formed and it formed about two hundred million years ago.

PP: Can I pick you up on something there Larry - we are running out of time, but I think it is very important because on one of the television programs a big issue was made of there being slumping into this Quarry. You might even see in the pictures there, everything was slumping down to the Quarry.

Why I wanted Larry to be here was - Larry and Jane studied this from the point of view of basic geology. We have relied on them, it's science. I don't know how many times you went into the quarry over the period but a lot of times.

LB: About five times.

PP: And we don't have time to go into all of this and we probably haven't answered your question about the depth of the sandstone and the soil cover over the top of it. All I can say in terms of in general around the quarry there are an awful lot of bore holes being drilled from which we have interpreted what the sandstone profile and the soil profile is but I think we will probably have to deal with your questions on a one to one basis afterwards because we probably haven't answered your question properly. But I have needed an excuse to get Larry to come and give infinite detailed geology if you don't mind - thanks Larry for that.

Q. Speaker Joe Nagy, I live in Wahroonga.

Well what we have heard this afternoon is still opinion, it is based on fact, it's I would suggest unfair for us to challenge you because we haven't got the knowledge but it is still an opinion perhaps an expert opinion.

What I would also like to say is that you have defined risk in terms of life loss, but there are more than lives at stake here, although I agree with you.

I am talking about the word risk and how you have used it to strengthen your argument - there is nothing wrong with that or illegal or anything else or immoral or unethical. What I am trying to say though is your opinions are just that opinions based on your expertise your knowledge and your training. Risk is a function of what is known and what is unknown. Unfortunately, we don't know what is unknown, now we a few of us we 12 of us a few weeks perhaps a month ago were fortunate to hear the opposite side of the story from Dr Ineson and he admitted he didn't know some things either and I have not heard you touch on these and that's the base of my question and that the years of quarrying by CSR and explosions according to him had destabilised the quarry and just what will happen there is anyone's guess.

SB: OK, do you have a question?.

Q. That is the question do you want me to ask it again? OK, why haven't you put that into your calculations, what is the calculation of that, the CSR and the unknowns? Thankyou

PP: Thankyou, first of all I agree that risk is about the unknown and that is why I was talking about black swans to say how important to try and think of the extremes, the question if what's an opinion and what isn't an expert is an interesting one. I try or we try as a group to steer very far away from what is in lay people are called opinions. What I like to express it is we have measured tested drilled interpreted, yes, calculated it and from that reached a conclusion. If there is something wrong with our measurement, our drawing together that measurement our calculations than a far better way of dealing with it is best deal with those because the conclusions just follow from those.

There is not a lot of value saying I don't know what, I don't agree with your conclusion but I am not prepared to address any of your data or your calculations or your measurement actually not a very useful way of going forward. You are welcome to say that but I can't deal with that. I can deal with somebody saying you didn't know that this was there or you didn't measure that or you didn't do that calculation properly. I will fall on my sword on that basis, I don't have a problem with that. But I can't deal with just, yeah, I like your measurements, I like your calculations, I just don't like your answer. That's very hard for me to deal with.

Now the specific question about blasting. The answer is probably in two things. First of all when they blast for quarry excavations, the whole direction

of blasting design is to break the rock that you want to dig out and don't waste energy in breaking the rock you want to leave behind, because that costs you money.

So they actually design blasts so that they direct their damage to the rock that is to be excavated and if you done the details of it you find that when the blast goes off in the quarry doesn't go bang in one hit. They will drill a whole lot of holes and they will go of like a zipper, one, two, three, four, five so there is always a space for the next hole to blast into, that's how blasting is designed. It might look like one hell of a big explosion but it is not.

I can give an example of where we were doing work out in the Pilbara two years ago where they had to slice off a piece of rock and the edge of a cliff underneath a completed bridge and they sliced off about four metres long by ten metres wide by delayed millisecond blast. They cut it like a knife and the bridge footing was in a metre at the back and it was unaffected.

The second thing as a physical example it will take you to is all the freeway cuttings on the F3 freeway up towards Newcastle have been excavated by blasting. Up until recent times they all drilled and blasted. As part of their work, the RTA has been fiddling round there for years cleaning up and washing down and tidying up because pieces had been falling off.

A very careful study has been done as to how the rock has been fractured by that blasting. It averages one and a half metres. So I am afraid to say that the dramatic pictures that was on the ABC of the diatrema and everything outside there all cracked with all due respect is not true. It is simply not true. It is not true from the physics of blasting, and it is not true from the observation of blasting. If you would like Mike Eggars who spends his time working for BHP and Rio Tinto and iron ore mines of Western Australia, he could probably talk at length on the effect of blasting damage to the rock.

Mark I don't know if you want to say anything, thanks.

Q. My name is Rae Rostyn from Berowra. I would just like to know what the effect of the water – the rising water level is on the possibility, affect on the rock?

PP: A study we did indicated that as the water level came up it decreased the stability of the quarry faces, particularly for the smaller medium scale but even the very large scale failures, so a level was set above which the water should not be allowed to rise. Derek would know exactly what that level is but pumps have been installed in there to control the water to that level.

Now you might rightly say that is all very well but what happens if there is really a big flood can we keep up with it. Well the actual flood waters in the quarry are diverted around the quarry. The water that accumulates in the

quarry is groundwater flowing out of the rock and that rain that flows directly in or lands directly on it. But major stormwater runoff is diverted around the quarry completely. So yes rising water level does impact negatively on the stability of the quarry.

Q. My name is Leonie Healey from Pennant Hills. I wonder if we could go to a diagram of the quarry and if you could show us what part of that site could be developed and would it be safe, please.

PP: As I mentioned before the quarry has been divided into these areas part to the eastern area which some years ago was already partly developed for playing fields - that's the TAFE there - when you are in this eastern area you can't actually even see the quarry those of you who have been there, you can get there quiet easily by walking down this road. That's, if I go one step forward, the edge of the diatreme that's the volcanic intrusion cuts through this eastern area so part is above material that in one way could have been quarried but probably wasn't of sufficient quality.

The analyses that we have done indicate that if you draw a notional line up here the level of safety of this area against instability is comparable to what I have been talking about affecting the houses. There is also the old crusher area which, with some work on it could be reused and down in the valley, down below here, well away from the quarry is an area where, apart from the fact they have dumped some fill there, is well away from the quarry influence.

So it has been proposed that these areas could be developed in whatever form, whether it's a beautiful botanic gardens or whether it's a golf course or a school it's not for us to say.

What I would want to say that whilst it's been pointed out that certain remedial measures definitely would have to be done here like all these steep fill slopes would have to be remediated. None of these areas would be developed until a lot more studies had been done. Nobody, whether it's a Lend Lease or a Multiplex or a Joe Bloggs, would contemplate putting huge amounts of money into developing any of these areas without a considerable amount of detailed investigations.

In that sense you could think about our study as a feasibility level study. It's not the all singing complete investigation for any particular development. Why didn't we do the all singing one? Because depending on what development, you would actually tailor your investigation towards it. If somebody just wants to put a golf course here or a garden equivalent to the ones in Vancouver or Ireland you don't have to do a detailed geo-technical investigation. If somebody is proposing to put a school here with playing fields, you'd investigate the school area in detail the playing fields far less. So it's not really feasible for us to have done, well it would have been highly uneconomical to do

an investigation covering all possible options. So I think its best to think of the study in that context.

Q. Peter Waite Pennant Hills. This is part of the copy of your report Dr Pells, I had to go to the Administrative Decisions Tribunal to get that, and that wasted six months.

In your quote, PSM's quote, it said there would be provision for a community meeting. This meeting should have been held in February or March 2006 so that people could know what you have explained

SB: I think the report's only been out since February 2007.

Q. It came out in February 2006 the point that I am making is--

SB: No it is 2007 sir.

Q. I am sorry, 2007, apologies.

SB: I have got it right here, it's 2007 so we couldn't have had a meeting a year before.

Q. I'm a year out.

SB: And it is available on the web site.

Q. This is not the point, it wasn't available, I had to take action to get it released, legal action.

SB: Is there a question you have got there?

Q. I am coming to the question. I have 11 questions.

SB: Sorry you have got one so pick one.

Q. Eleven questions for Dr. Pells and I understand the answers are in the mail. The issues I am raising is one that Dr. Pells is aware is on page 9. It states: there is no meaningful risk of deep seated sliding on the northern face of the quarry affecting buildings, and I agree with Dr. Pells, and it also says: affecting infrastructure .

Now on the north west corner of the rear of private properties on their land is the sewer line. Now I have raised the question: Did PSM obtain the sewer diagrams on the north west corner of the quarry lands and if not would PSM consider amending its report? If not why not?

Now I don't want to paint PSM into a corner but these sort of questions, and there is a hole in the fence at that corner, which means that children from those properties up there can go into the north west corner and go down into the quarry lands. For this reason I am saying unequivocally that the lands are not safe because they are accessible by children and that there is the sewer main there that I have seen.

SB: OK, thank you for your question.

PP: I can actually make life a bit easier because Peter did put his questions in writing and there are a lot of them but, and I won't answer all of them because he didn't ask all of them.

The one question he asked was about the sewer main, which was a perfectly fair and proper question, is a sewer that runs across the top then cuts across goes out of the site and back inside the site boundaries comes down here. We knew about the sewer main round the top, we knew it went out of the boundary.

Until we got Peter's question we didn't know it came back into the site here. So that's fact OK. Peter, having raised it, we have gone back and looked at what is the risk of instability of this site impacting on that sewer main and if you want to go into details Derek can discuss with you afterwards. But it is not an issue of any substance in regard to the sewer mains. But to be fair to you we didn't know about the sewer main in that point until you raised it.

Peter did raise a couple of other questions, one or two which I will address because they are important. He asked whether we were aware of certain documents that were germane to the quarry operations while CSR were operating it. At the time we wrote the report we did not have all that documentation because CSR and Hornsby were still discussing life.

We have since had the opportunity to see the CSR documentation in relation to all the geotechnical work done during the quarrying operations. Mark Eggars and Phil Clarke spent time last week going through all that - there is nothing in there that has changed anything that we have in our report. We knew a lot about it but we have never actually been able to put our hands on the data until fairly recently. So again a fair question to Peter Waite: Yes we have seen it now. If you had asked us that question a couple of months ago we would have to have said No. And Peter I have the answers to the other questions here but it might be best if we just deal with them afterwards.

Q. My name is Lucy Bal and I actually live up on the north face, our property abuts the quarry site so I have personal concern with it. I am curious what your actual brief was to look at the site with your studies because surely there would have been some sort of outline as to what end uses are going to be the result of the study.

The reason why I am so interested in this is that I have documents at home which show that CSR was not only willing they were very keen to rehabilitate and make the entire site a park for the community at little or no cost to the Council.

The plan was that the quarry site, once it was all made safe and made into a nice parkland, a 50 year plan. It was to be joined to parks to the playing fields area which has been long planned for as playing fields sporting fields or whatever which we desperately need. This was all supposed to be done at little or no cost to the community. We've had funds going into that site from the State Government local sporting groups, individuals, we still don't have our park.

Now my understanding is that that arrangement fell through because CSR were only willing to go through with this if Council promised they would not attempt any development at all on the site. It has been zoned open space for a long time. It was supposed to be our central park for future generations. Now why has all this money been thrown at a geotechnical study? Surely Council is thinking of development instead of the park we were supposed to have at little or no cost.

What is the end result of your brief? Is it for development, including even on that the little nose that was mentioned how dangerous it is, that was part of the Valuer General's assessment that unit blocks would go on there. I mean the whole thing is ludicrous. We were supposed to have this site for little or nothing for our park and CSR was supposed to do the work.

We are being let down and we are paying for all this over and over again - consultants, Lawyers what have you. Now you are not doing all this work just to make the park I am sure of it.

SB: Thankyou. There were probably two parts to that question: One is what was the brief issued to Dr. Pells' firm and the other part is about the use of the actual site. This is probably better handled by someone from Council. I don't know whether you want to take that on notice Robert or Nick but you probably need to address that as it is two parts. So if you would like to deal with the brief issue.

PP: I can't quote the brief verbatim, and I don't know but maybe Derek can but the intent of the brief as we interpreted and as we worked to it was to study the geology, geotechnical and groundwater regime around the quarry and to assess what constraints there were on possible use the quarry land arising only from those three facets.

We had and I still have absolutely no knowledge of what CSR may or may not have proposed in the past I have literally no knowledge of it. I have no

knowledge of the dollars associated with that and I have no knowledge of what CSR may or may not have promised. I was never given it I never asked for it and still not very interested in it quite honestly. That was not what we were asked to do.

Whilst we were given the property boundaries and therefore we did focus within that area of land shown by those dark lines, we were in no way constrained to look only within that patch of land and the reason why I showed up that Ethics of Institute of Engineers, if somebody had told me to constrain myself I would have told them to get stuffed, quite honestly, because that's not the way it is. If we see something outside the patch of land we have been asked to look at we will say so. But that was the constraint of our brief and that is all I can answer.

SB: So the second part of your question relates to future uses so Robert would you like to - yep I got that at no cost to the community - I got it - so Robert would you like to respond to that - or the Mayor?

NB: I was in the bathroom before so I missed part of that last question. But in terms of putting a park there I think the Councillors are pretty much unanimous that's what we want to see put there.

Just out of interest there are actually representatives of at least one firm, maybe a few, who have come to Council today to put forward their ideas how the quarry hole could be filled which would allow the various scenarios to take place at little or no cost to the community and maybe residents may wish to put their feedback to those representatives.

I agree that Council shouldn't have had to pay so much for this site. Its still a point again which all of Council is unanimously displeased about and we are certainly pursuing all legal avenues to get some sort of justice on that issue.

Again I certainly haven't had any disagreement from my colleagues on Council. We all want to see recreational facilities there, we are certainly working towards that and that is why we spent the morning hearing from various representatives of various filling companies as to how that actually can be achieved.

SB: OK Thankyou.

Q. Mick Gallagher from Mt Colah. Just a quick one in response to the Mayor here. I think everyone here has good intentions about the site. It's unfortunate we got lumbered with it but also because we got lumbered with it its got to be paid for somehow we have got to chase that hidden money.

And what I am saying is that we paid GST on a debt we should never ever have paid GST on a debt only if we made a profit out of something so I think

we should be asking for that GST money back, that would be a start - and put into the community.

SB: Thankyou we will take that on notice.

Q. Jean Bolton from Galston. From a geologist's point of view Dr. Pells: is there any risk to the quality of the water in that quarry which I understand is potable water from unexploded detonators when the mine was being actually mined?

PP: Yes first the water quality of that water is actually very good. I don't have the latest chemical data but basically good quality water. In terms of risk to it from explosives or detonators or so on that may have been left behind I would have thought that would be in the insignificant range

First of all as part of any mining operation after any explosion, everything has to be checked out - that all of the explosives had gone off. Not that they are particularly concerned about future groundwater but particularly concerned about themselves when they dig in with their next excavation bucket.

From that point of view, no. From the point of view of natural environment as it - no sorry - the environment as it is at the moment there is unlikely to be any significant change to the groundwater quality. If the quarry is to be filled, depending upon what is filled, put into the quarry, then it becomes an issue. Obviously if the quarry is filled with completely natural material, what they call naturally excavated material, then there should be no impact on the groundwater. If it is filled with something else then it is a different story altogether.

Q. Andrew Beatty from Ferntree Close. I just want to know - it's a question to Council actually - why is part 2 always referred to as being part of the quarry when as far as I know it is not?

PP: I can only answer from our point of view: part 2 is part of the land.

MW: Council is very much aware that the part 2 that was referred to is known as Old Man Valley. However in the interest of rigour in carrying out the geotechnical analysis it was decided that we would look at that land as well and consider the constraints of that land overall with the adjacent quarry land if Council was to do a future development or other use of quarry.

Q. But we have just been told that that wasn't the case.

MW: No you weren't told that. That was considered by Dr Pells in his study - the land was there we had access to the material. No Council hasn't made a decision on what use that land is going to be put at this stage.

PP: Can I say one thing technically, is that part 2 was very much part and parcel of quarrying operations, because when I said they stripped that northern face there to stabilise - all that material went in there - and when, so all that material there was moved by the quarry trucks from there up into this area - so why or wherefor legally I don't know but that's where it came from. (Background comment) – I can't hear. sorry.

SB: That is probably outside the issue, we can deal with that maybe at the end if we have got time.

Q. Allan Williams from Normanhurst. I picked up two other matters arising from this Stateline Program. One was what was the effect if we had an earthquake in the region here – and that's a question. And secondly the other thing, I think it was Dr Gerrard raised was that if they lowered the water - which I now understand is 38 metres deep, at the moment the water pressure is out into the side walls - if you lower the water you than get pressures coming in and I understand Council is proposing to fill the hole in some way and I think that is a terribly important thing to do but when they do pump it out are we going to get instability then?

And before you answer those two points, can I just observe that microblasting, which you speak of, was only practised about the last 10 years of the quarry life, prior to that they went for the big bangs.

PP: I'll take all three questions in turn. First of all – earthquakes – yes first of all earthquakes make slopes less stable and the impact of the earthquake is like having a horizontal acceleration, the ground that is taken into account and the stability analyses we do when we calculate the factory of safety. In terms of how you build that into probability – earthquakes of different magnitude have a different probability of occurrence – the bigger the earthquake the less the probability. That's how it's built into the answer.

So, Yes the earthquakes make life worse. Have we taken it into account: Yes. Second question, Charles Gerrard's point, that if you lower the water level very rapidly you'll diminish the stability of the quarry: Dead wrong. Because you pull the water out, the water pressure is still in the rock around and it destabilises the quarry faces. So – answer: you don't pull the plug very quickly. You draw the water level down slowly enough so it can drain the rock around about. How do you know it's doing that: By having ground water monitoring balls all around the quarry. So perfectly valid point, can be taken into account.

Third one I have forgotten—

SB: Microblasting.

PP: Oh – yes you're right. Millisecond delay, use electronic detonators, is a relatively new thing. Delayed blasting has been going since I started civil engineering and I graduated in 1968. The excavations by blasting on the F3 quarry were done using the same technology at the same time as this quarry here.

Q. I have it from the previous general manager of the council that because of noise complaints from local residents they went to the microblasting, but that was only the last 10 years of the life of the quarry. Prior to that it was heavy blasting.

PP: Microblasting is just little big blasts. The point is not how big the blast is, the point is that when – let me take an example. If you go to—

Q. It's sequence blasting.

PP: Yes all right – sequence blasting is the better term. When they let off in one of these big open pit mines maybe several tonnes, maybe a hundred tonnes of explosives in one blast they don't go off at once – they go off bore hole by bore hole by bore hole in a sequence, and the best way I can explain it is like a zip. The people in the audience here who do blasting who have got nothing to do with the study and nothing to do with I don't know what, but they know what I'm talking about. And all that's happened – microblasting is where you go to successively smaller and smaller blasts, and that's usually for noise consideration not for damage to rock consideration.

I mean, I worry about things that really are worth worrying about. I worry about black swans. In the scheme of things I don't worry about blast damage to the quarry walls. There are things that worry me far more about the quarry walls – geological structures, the big ticket items, they worry me.

SB: We're heading towards 3.30 so we'll have to wrap up fairly soon.

Q. I'd like to have some clarification on a point that you made earlier. You said that you'd recommended that part 1 quarry area be quarantined, I think that was the word that you used. I'm asking this question because I want to know is there some future potential use for that area? What did you mean by quarantined?

PP: What we mean by quarantine is that the public should not go into that area, that's what we mean by quarantine. So there is that public access to this part of the quarry, and in fact there should be no public access to anywhere around there unless somebody comes out of private property, over the back fence and into it. And that's what we mean by quarantine.

In terms of potential use of this area – to use the whole area no doubt the best way is to fill it and stabilise the slope by filling. Now I'm not going through the

history of who proposed what and how we got to where we are, that's the best way to use the whole area. We have suggested in the report, and this is a philosophically difficult one, there are parts of that quarry where you could have spectacular walkways, akin to some of the walks in the Blue Mountains where people could walk there and get fantastic views and great geology and so on. The difficulty in our day and age is that it's all right for you to walk along a natural path in the Blue Mountains which is as dodgy as all hell, if you walk along a natural path in something that the council owns and then that becomes a liability issue, and that's the dilemma of our life. So in a reasonable world is there areas in that quarry we could use now: Yes. But we don't live in a reasonable world unfortunately.

Q. Dr Pells, Bill Aitken, Normanhurst – just to go back to an earlier point on the RL, the water level in the quarry, I believe that when Dr Gerrard made the report back in 2006 which was of course in the middle of a long drought, the level of the water was 20 metres. I just heard mention that it's now 38 metres and I believe in your report it was said that the level should not go higher than 30 metres. What is the danger if it increases, if we get prolonged rain or prolonged groundwater draining into it – although you tell me all the groundwater's diverted – how high has the quarry actually been in its lifespan, the water, and when does it become a real danger?

PP: It has never been higher than it probably is today, I think that's probably fair Derek? As they were leaving the quarry and taking the last of the rock out they stopped pumping and the water started accumulating and that's continued there. They had pumps which they then, the quarry operators, took out.

It's better for Max to reply to this. I know that there is – I don't know if they're in yet or about to go in, but the pumps to control the groundwater to the level that we have recommended are either about to go in or have just gone in or something like that, I don't know the answer to that question.

In terms of sensitivity to level – we set a level which we thought was a reasonably conservative level. I wouldn't lose any sleep if it was five or six or eight metres above that. I'd lose a lot of sleep if it was 20 metres above that. I'd start losing sleep. But I wouldn't be losing sleep for the people outside, I'd be losing sleep for the council people who've got to go in there to put the pumps in. That's what worries me. And they've then got to go in and maintain the pumps – that's when I start losing sleep.

Q. Just one question: To remediate the quarry would it be better if the quarry was in CSR's hands or in the council's hands? What's your opinion?

PP: This could be the last job I ever get for Hornsby Council. I guess my idea of life is history is history, how we got to where we got to today is – we might have done it differently but today we are in a situation where the quarry is

where it is and we need to get the best way to solve the problem as we've got it today.

Q. Could CSR remediate the quarry better than council can?

PP: I don't think council will ever – I can't see Max and his boys getting out there with spade and shovel – so whoever remediates the quarry is going to be an organisation comparable of CSR. In fact, to be perfectly frank, CSR no longer has any involvement in quarrying. CSR sold to Boral, Boral sold to Rinka and before you just jump on the bandwagon and say CSR would have fixed it just make sure you actually think as to how continuous some of the involvement of these organisations are.

I'm not taking sides in this argument, but one thing that's important about the Hornsby Quarry, it's more than just an economic fill it up and fix it and make some money out of it, and with all due respect to the CSRs and BHPs and Rio Tintos of the world, their primary concern in life is not the future wellbeing of a particular site. They may end up with a site that provides a good outcome, and I'm not being negative about it, but that may not be the driving force. And given where we are today, and given the fact that we do have a quarry, maybe the best outcome is under the control of the Hornsby ratepayers to get somebody who does the job effectively but with a reasonable bit of control on the environment. That's my view, that's a personal view, it has no valid basis on the Hornsby Council but that's my answer.

Q. Dr Pells, thank you for your report and your explanations today. As Peter Waite has already said it's a great pity we didn't have this discussion and your report much earlier in the piece. But my question was: In your report you had said that in part 3, the crusher area, the likely area that will be available for development is between about 1.8 hectares and two hectares. I see from the expressions of interest that some of the development companies feel that they would like to push that envelope out further – that was one question.

And secondly, parts 2 and 4, we've got pretty fluid situations with the fill if I could put it that way and I'd just like you to confirm that you think as your report says that considerable remedial work would have to be done in both of those areas before any development could take place.

PP: The southern crusher area, which is this area here – Larry Baron mentioned the southern face here, the fact they left a nose of rock behind because – and you might have seen some of these pictures of these long continuous quite highly polished surfaces in them. That southern face is a source of concern in terms of quite large scale instability, because of the presence of those types of features. For that reason we've pushed the quarantined area back beyond – those who know the quarry know there's a road along there, and that was the perimeter road along the quarry, we've

actually quarantined behind that. Now it might seem that that's a very conservative view we've taken and it was deliberately a conservative view.

It's also quite steep around this crusher area. It may be possible with a lot of site specific investigations and quite expensive engineering work in terms of retaining walls and anchors, to push out the increased area of potential development here. But I would be wary, I would be wary about making that area any bigger than, much bigger than what we suggested. I would examine any such proposal with a considerable degree of scepticism.

The other question was the fills that are in the area down here and across here. Now the fill that went into this bottom part of the eastern area which went back in the late 1980s/early 1990s, went in under quite well-controlled conditions because that was supposed to be a playing field already. This filled area, the quarry – CSR moved it from there, put it in there, they say under well-controlled conditions because at that stage they did think that they were going to be developing this whole thing in the end and that was going to also be a playing field area.

The problems are not the fill so much itself, the edges of the fill in the batters are very very steep and quite high and also unfortunately when they filled this area there was a creek running here, and nobody gave much cognisance to controlling and channelising that creek, so it's under the fill. So if one goes right back to the Coffey's reports they did for Hornsby Quarry back in 1988/1989, it was basically that if this area was – a fair bit of work had to be done to the drainage of that area.

Now again depending what the final proposal is for this area will depend on how much work needs to be done. It must also be said that everything back past my pointer here, that's all natural ground up there, and everything past my pointer here is actually rock on the surface. So it's wrong to put the whole eastern zone in one box. Some of it could be built on today, some of it, depending upon how far you go out to the edge will depend on how much modification is needed to the site – again, if that's the edge of a golf course it's a non issue, if it's the edge of a residential area it is an issue.

Q. Everything I've listened to today tells me that the only thing that needs to be done is to actually pump the water out continuously in the mine to maintain a level. I have listened for two hours to everybody telling me how stable everything is, so why do we need to stabilise the quarry, other than pumping out the water?

PP: I missed the—

Q. Sorry, the question is: Is pumping out the water seems to be the only thing required to maintain stability from everything I've been listening to

today, 'cause you've gone to great lengths to tell us how everything around it is stable.

PP: I'm still not with her.

SB: The question was: The last two hours they've heard that the quarry is stable. What impact does pumping the water out have on stability?

Q. Is that the only thing required to maintain stability, is to pump out the water? It's a simple question.

PP: I'm not sure I understand the question, but I think the question was: The only thing to maintain stability, the only thing it needed was to pump out the water – is that what you said?

If I haven't communicated this properly I apologise, but when that quarry, when they finished the quarrying operation there was no water in the quarry and the analysis we've done, we've analysed it as if there's no water in the quarry and then we repeated the analyses allowing the quarry to fill incrementally, metre by metre by metre by metre, to see how that impacted on the stability calculations. And what we found is that the initial bit of filling has no effect at all, and then once it starts getting above a certain level the water starts diminishing the stability of the quarry.

But, the zones of risk that I've shown, and the zones, the factors of safety and the probability of impacting the houses and so on are as if the quarry's empty. So taking the water out of the quarry doesn't solve anything. But I'm probably not understanding the question at all.

Q. The question is, okay, you've said that 30, what was it, 30 metres is an appropriate level for it to maintain stability, so if we just pump the water out to maintain that 30 metres, that is the only thing that is actually required, is that, that's the question. Because everything else you've said has told me that all the sides of the walls and everything else is stable, that's what I've been told today. So if that's incorrect you haven't actually relayed what is unstable about the walls.

PP: What you've been told today are a very short version of a very long report, and what I've tried to show out of it was, if I go right towards the back, that there are two levels of failure to consider: the small to medium scale and then if we look at the small to medium scale I try to show that at that scale – these are the levels of risk around various parts of the quarry. And then we looked at the larger scale. What we said was that if the water level rises above an amount that we nominated, these levels start getting worse.

Q. I know that.

PP: Okay so, therefore it is wise and appropriate to maintain - to stop the water level just going on filling it up.

Q. Yes, but that's what I—

PP: But that's not the only thing that's been done to this quarry at the moment.

Q. Yeah well you haven't—

PP: It's the only thing that's physically been done. But in addition to that there's a whole network of monitoring been set up around this quarry, to monitor whether anything is happening, any black swans are occurring, any movements are occurring, that we were not aware of. So there's a whole – and I can – I actually have here—

Q. But you've spent two hours telling me that everything is stable.

(Background comment)

Q. Yes you have, you've just gone to great lengths to say that all the houses are on stable ground.

PP: That's right.

Q. There's nothing on the other parts of the quarry so we don't have to maintain it.

PP: I have said quite clearly, and I think I've said it quite clearly, I've said that--

Q. Yes that the houses are safe and that there's no problems of slip anywhere.

PP: That's right, that's what I've said.

Q. Isn't that the main priority, is to maintain that the homes are safe?

PP: Well that's right, that's what I've said.

Q. We don't have to worry about a mine that's going to crash in on itself, and you've just told me that will only happen if the water rises. So my question is: If we keep the water at the level it is, will nothing happen to the mine? And so that all that really needs to be paid for is to pump the water out to 30 metres?

Q. I'm sorry, I'm trying to establish what cost is going to happen to the community.

PP: In terms of safety to your house and in terms of safety to people living in the residential area, yes that is all that is required.

I mean – no – I think I understand at last your question. The answer to your question is Yes, in terms of safety to you and safety to the people, that is all that's required.

Q. My name is Dave Lomas, I'm from Berowra Heights, thank you for your presentation. I have Charles Gerrard's report in my hand here and it is a great pity that he isn't here himself to talk with you about this because you've really got the stage to yourself as it were, you're the only one who has the expertise to talk the way you're talking.

However, just a couple of points. If – I think you're like me, I think your grandmother has long gone off the scene – but if she were around, and if she'd gone to a shop to buy eggs which might have salmonella in, surely you'd just tell her Don't go. That's what I would tell my grandmother for sure: Don't buy them, go somewhere else.

SB: Is there a question?

Q. Also, Charles Gerrard says that the north facing – the northern part of the quarry was not drilled effectively and effectively analysed by you. He says – you say that the northern face of the quarry: There's no risk of deep-seated sliding of the northern face of the quarry, that's the place where the houses are of course, affecting existing buildings and infrastructure to the north of the quarry. Now Peter's told you that there's actually a drain up there which you didn't know about. The unconditional nature of this statement is questionable – this is Charles Gerrard – in the context of the geotechnical uncertainties. Such uncertainties are significantly high at this site for the reasons expressed in the engineering geology sections of your report.

Also, the majority of the most recent instances of slope instability at the quarry have occurred in the northern face. Now, that's just what this lady was talking about, the part where people are actually living. I just find it a real shame that Charles Gerrard and Richard Ineson aren't here to talk about this with you, and it's a great pity this was held all in a rush when Richard Ineson is not available.

What I'd like to ask you is: Have you addressed these criticisms of Charles Gerrard?

PP: Can I just have that, the thing you're reading?

SB: Can we just have the document that you're reading off so that Dr Pells can refer to it in responding to you?

Q. He's got his own up there.

PP: I don't have a copy of his letter with me.

(Background comment)

SB: No the letter that you're referring to.

(Background comment)

PP: So what part were you reading from?

SB: Is it the criticisms?

(Background comment)

SB: This bit, the northern face – okay. It's the last part.

PP: Okay, I'll just read this again so we all hear it. First of all, this is the context, Charles Gerrard, Dr Charles Gerrard, is a very well respected – well certainly by me – geotechnical specialist, was part of the original Hornsby Council group that evaluated consultants and then he was retained as being a peer reviewer for our report. He was given a draft of the report to peer review. He then wrote this letter in response to the draft report and then we took into account his comments in producing the final report.

Charles hasn't read the final report. I don't know why, but he hasn't. And to be fair on him it's a bit hard reading that thing if it's on the net – not the sort of thing you do for evening entertainment.

In his review of our draft report he raised things that he called minor, moderate and major criticisms. And this particular section that you've alluded to is on the section of major criticisms and it relates to the northern face, and it says: In PSM report section 3.3 page 8, which was the draft report and not the final report, it says there is no risk of deep seated sliding of the northern face of the quarry affecting existing buildings and infrastructure north of the quarry.

And he goes on to say: The unconditional nature of the statement is questionable in the context of geotechnical uncertainties. I think what he said there is, as a matter of English, perfectly true. We perhaps shouldn't have used in the draft report the words "there is no risk". I've tried to back off that here and we've given you a risk now of three in a billion. If you're more comfortable with three in a billion than no risk, well that is technically more accurate.

I think both are meaningless – or sorry, I think the three million has no physical meaning of much sense. Anyway, it says: Such uncertainties are

significantly high at the site for the reasons expressed in the (inaudible) section of our report – which is true. Also: The majority of the most recent instances of slope instability of the quarry have occurred in the northern face – which is true – which I have tried to show you today in the slides. Despite the high level of geotechnical uncertainty and the record of recent failures, PSM did not take the opportunity to gain engineering geological data from behind the northern face through the drilling of a bore hole similar to the one they drilled behind the southern face.

As part of the CSR investigations of the quarry, after Charles Gerrard had left Golder(?) Associates, they drilled a deep bore hole – a 90 metre deep bore hole on the northern face of the quarry. It didn't change anything, it doesn't change anything, there is a bore hole there, it goes to that depth, it's part and parcel of what we've done. So it's just unfortunate that - the way things happen, the peer reviewer, reviews the draft report, we take it into account, we take it seriously, it doesn't mean that we accept every single thing he says but when Charles Gerrard says something I take it seriously. We've had some fairly robust discussions during the course of the study, and some of the most robust discussions actually turned out – because we were talking about apples and bananas, and it gets back to probability.

When Charles Gerrard talks about probability, he's talking about the probability of grandma dying from salmonella poisoning because she's gone to the restaurant and eaten the eggs. When we talk about probability in the report, we talked about the probability of the eggs being at the restaurant, and it took Charles Gerrard and us about three years to work out we were actually talking about different things. When we finally worked out Friday two weeks ago, after I'd been interviewed for Stateline and he'd been interviewed for Stateline and Stateline were lining the two of us up against the other and we had a discussion on the telephone, we finally discovered we were talking about apples and bananas. And he said my one in a million chance of failure was actually a one in a million chance of death to a person - I agree entirely. It took us three years to work out what we were actually talking about. But that's a bit of trivia for you.

Q. ?? Morley from Westleigh. My question is directed to the council: Have the pumps been installed in the quarry to keep the water down? If not, when will they be installed?

SB: Is that one for you Max? So the question was: Have the pumps been installed in the quarry and if not when will they be installed?

MW: No the pumps have not been installed. We're working with PSM and they're advising us on the appropriate level of water in the quarry pit at the moment and our advice is that at the current level things are quite okay. So being a decision by council on the future use of the pit, we're planning to install those pumps when PSM tells us we'd better do that. The pumps are in the

depot, they've been serviced and they're currently devising a system to make sure we can get the water out with safety.

SB: Thank you very much Max. That kind of brings us to the conclusion today. Nick I was going to bring you up if you wouldn't mind – or if you'd like to stay there, whatever you like – just to make a couple of closing remarks and there's a couple of little housekeeping things I wanted to take care of too.

On your seats everyone is a card called "BangtheTable" – interesting name. It is – on the back of it is a website where you can continue to raise questions, lodge comments, you can have complete anonymity. You do have to register on but we don't see where the comments came from, or council doesn't see that, and that site is up and live now. So if you go there you will see a section about Hornsby Quarry. It will be up for about the next couple of weeks. Again, it's a very transparent online forum for you again to raise questions or comments from council on this issue, so I would encourage you to continue the debate on that process.

As I said, today's presentation from Dr Pells with Powerpoint will be available on council's website from close of business this coming Thursday, as will all the questions and answers that were raised today. They will be typed up and put there again for your viewing.

And also just one final housekeeping – on your seats is that little evaluation form. If you wouldn't mind doing a quick tick and flick on that we'd appreciate your views.

And now Nick I'll just turn to you to make a couple of closing comments if you would. Thank you.

NB: Well thank you. I thought I'd come down the front, I didn't want everyone twisting their necks, even if I know a good chiropractor.

I learnt about this meeting, it only seemed like a few days ago, I've just been on my honeymoon, so I was certainly pleased to see the meeting was being arranged, so if I could just start by thanking the Deputy Mayor, who was in charge at the time, and my colleagues arranging the meeting, and I did feel that if matters of concern are being raised we certainly don't want to muck around with certainly getting the answers out to you.

I certainly won't be ever able to think about black swans the same way again, but to Dr Pells, I've certainly tried reading the report for as some light evening reading and I've got to admit I struggled, but certainly I felt that he certainly made it easy for a mere mortal like myself to understand what is a very detailed and thorough report.

As I alluded to earlier, council is continuing considerations of the future of the quarry and likewise is certainly keeping our options open in terms of future legal action. We are actively working on both fronts. A resident asked earlier whether it was better that, in terms of rehabilitation of the site, if it was in CSR's hands or in council's hands. From your point of view as residents I certainly think you're better off if it's in council's hands, you've at least got us to come back to. Whether you like it or not, we're here, all of us are here, if it's in the control of someone outside of council, it may be easier for them to solve it but certainly like a private company, but you certainly won't have the access that all of you have to come and see us to complain, to even give a bit of praise here and there.

So we're here, we're taking seriously all your feedback, and like I said this morning we're actually speaking to companies about the specific issue of filling. We went to expressions of interest, we had 15 responses. We've got a representative of the local cricket association, we've had a school approach us, we've had developers approach us. So there's 15 different expressions of interest, and then council will certainly formally consider a report which will be certainly made available to residents again to comment on, and then from there we'll be able to make a decision as to how we move forward.

So to Sarah Brisbane, thank you for your efforts as the facilitator this afternoon. To Dr Philip Pells, certainly thank you for being available to answer the questions and certainly for being able to make what is a very complex, detailed report a bit more understandable to those of us like myself who certainly don't have your level of expertise.

So thank you everyone for coming along and we certainly look forward to discussing this matter with you further.

SB: There is as we mentioned earlier down the front here some rocks, show and tell, so I think the guys from PSM are going to stick around for a couple more minutes. If you wanted to ask anymore questions you're welcome to do that.

I just had one question I wanted to clarify if that's okay. I was asked in the hall out there if this report was available at council, 'cause it would be pretty heavy going reading it online. Is it available at the local library?

MW: (Inaudible)

SB: Okay, so the answer to that question is if you'd like to actually physically look at this report it's at council offices. So that's the answer to that.

Thanks everyone, enjoy the rest of your weekend.