

BOARD OF INQUIRY

**Turitea Wind
Farm Proposal**

TRANSCRIPT OF PROCEEDINGS

BOARD OF INQUIRY

Turitea Wind Farm Proposal

Hearing

HEARING at PALMERSTON NORTH on 23 MARCH 2010

BOARD OF INQUIRY:

Environment Court Judge S.E. Kenderdine

Mr D. Bunting

Mr R. Heerdegen

Mr J. Hudson

Mr C. Shenton

APPEARANCES

MR N DAVIDSON and MS K PRICE appeared on behalf of Mighty River Power Limited

MR K LOW appeared on behalf of Tararua-Aokautere Guardians Inc

MR W JOHNSON appeared on behalf of Huatau Marae

PROFESSOR DICKINSON appeared as a Witness

DR STEPHEN CHILES appeared as a witness

MR PAUL BOTHA appeared as a witness

LIST OF WITNESSES

<NEVILLE IAN HEGLEY, on former oath [9.33 am].....	3591
<QUESTIONING BY DR HUFFMAN [9.33 am]	3591
<CHRISTOPHER WILLIAM DAY, on former oath [9.33 am]	3591
<EXAMINATION BY MS PRICE [9.52 am]	3598
<CROSS-EXAMINATION BY MR MAASSEN [9.57 am]	3600
<CROSS-EXAMINATION BY MR JOHNSON [10.13 am]	3605
<RE-EXAMINATION BY MS PRICE [10.23 am]	3609
<QUESTIONING BY MRS HARKER [10.59 am]	3622
<QUESTIONING BY MR KLEIN [11.11 am]	3626
<NIGEL LLOYD, on former oath [9.33 am]	3591
<EXAMINATION BY MS PRICE [11.14 am]	3627
<ROBERT THORNE, on former oath [9.33 am]	3591
<EXAMINATION BY MR JOHNSON [12.24 pm]	3646
<CROSS-EXAMINATION BY MS PRICE [12.26 pm]	3646
<FURTHER CROSS-EXAMINATION BY MS PRICE [3.02 pm] ..	3682
<CROSS-EXAMINATION BY MR JOHNSTON [3.53 pm]	3696
<JEREMY TREVATHAN, on former oath [9.33 am].....	3591
<THE WITNESSES WITHDREW [4.33 pm]	3711
<DR CHILES [2.06 pm].....	3660
<QUESTIONING BY MR MAASSEN [2.35 pm].....	3671
<QUESTIONING BY DR HUFFMAN [2.27 pm].....	3675
<THE WITNESS WITHDREW [3.02 pm].....	3682
<PROFESSOR PHILIP DICKINSON [4.34 pm]	3715
<QUESTIONING BY MS PRICE.....	3719
<QUESTIONING BY MR MAASSEN.....	3728
<PAUL BOTHA [4.40 pm].....	3736
<QUESTIONING BY MS PRICE [6.05 pm]	3743
<QUESTIONING BY MR ADAMS [6.12 pm]	3746
<QUESTIONING BY MR LOW [6.22 pm]	3750

[9.31 am]

5 HER HONOUR: Good morning, ladies and gentlemen. For your information
the noise experts caucused last night until I am not sure when, and they
were again caucusing this morning at 7 o'clock, so they have done their
best to try and sort the noise issues and we gather that Mr Lloyd will be
addressing the latest agreed statement at least between some of the
experts.

10 I think we have to be fairly careful how we proceed, we have got time
constraints with some witnesses who have to get planes, so I think that
probably what we should do is complete Mrs Huffman's questioning of
Mr Hegley which was scheduled last night, then we will get Mr Lloyd
15 to explain the new agreement, and then we will revert to any cross-
examination or questioning that is necessary from the representatives of
the parties and hopefully mainly the lawyers. Hopefully the new
agreement will address some of the concerns of the residents.

20 May I invite the experts to come up to the top table again, please.

<NEVILLE IAN HEGLEY, on former oath [9.33 am]

<CHRISTOPHER WILLIAM DAY, on former oath [9.33 am]

25 <NIGEL LLOYD, on former oath [9.33 am]

<ROBERT THORNE, on former oath [9.33 am]

30 <JEREMY TREVATHAN, on former oath [9.33 am]

HER HONOUR: Mrs Huffman, are you here?

<QUESTIONING BY DR HUFFMAN [9.33 am]

35 DR HUFFMAN: Good morning, your Honour, the Board of Inquiry. Good
morning, Mr Hegley my name is Lee Huffman.

40 My question is in response to paragraph 14 of your opening statement
as I assume it relates to my paragraph or perhaps 23 of my submission
on the redesign. Now in an effort to make sure that you and I are on the
same page I will start by listing my assumptions that underpin my
question: (1) that you actually had no input on which turbines were
removed because the driver was landscape, so your prediction model
45 did not take into account whether decibel predictions in the homes in
our area met L_{eq} noise requirements or not; that your in-house model

depends on the noise reduction of six decibels with distance and wind turbines are a special case that do not follow the three decibel with distance that we were taught in high school physics, which you explained yesterday.

5

[9.35 am]

Your in-house model which is your IP (intellectual property) uses unspecified algorithms perhaps such as fuzzy logic and may or may not use meteorological conditions such as Konkawi (ph 00.14).

10

Your in-house model does not agree within two decibels of the Marshall Day modelling in about 20 percent of the prediction points, they could differ by 10.

15

You did not focus just on our farm when you wrote your letter to Mr Henry on the acoustical assessment of the revised layout on 1 February, taking into account that I had pointed out in our first submission on September 4th that our farm was within 40 decibel contour line which apparently did not comply with the noise regulations in downwind conditions which is southeast in our case.

20

You might have run out of time and not been able to put all the other monitoring points in attachment 3 of your letter to Mr Henry as you had in your earlier evidence. So you only showed the two prediction points closest to our home. If you had put in the prediction points, as you had in your evidence for this call-in hearing in 2009 it would have shown that 78 percent are predicted above 40 decibels as noted in your attachment 2.

25

30

Now if I take five turbines out that you have noted are controlled by Te Rere Hau, that leaves 67 percent over 40 decibels. My assumption is you accidentally forgot to mention in your opening statement in paragraph 12 that 32 percent of our wind rose - - -

35

HER HONOUR: Mrs Huffman, I am sorry, can I interrupt.

DR HUFFMAN: Too far?

HER HONOUR: This is an incredibly long statement, you have packed into it a great many facts. Do you think you could just ask a simple question please.

40

DR HUFFMAN: Okay. Mr Hegley, how do we translate the noise from individual turbines of 20 to 28 decibels which is quite a range of eight decibels per turbine to the apparent lack of meeting the 40 decibel noise

45

requirement for the rest of my neighbours who did not have turbines removed from their homes, and your model predicts over 40 decibels?

5 MR HEGLEY: Sorry, could you repeat the question?

DR HUFFMAN: As you state in paragraph 14, how do you translate the noise from the individual turbine that you reported of 20 to 28 decibels to the apparent lack of meeting the 40 decibel noise requirement to the rest of my neighbours who did not have turbines removed from their homes?

10

MR HEGLEY: The 20 to 28 decibels that I spoke of was the individual contribution from each turbine. Those values were then added to give the total value, so that is what the 20 to 28 decibels is, it is the range of turbines - as I have said the individual turbines in the general area of Dr Huffman's house will contribute to the 28 decibels, the total noise level downwind. I am saying I took that into account in achieving the total level. That is the individual turbines, not the total level.

15

DR HUFFMAN: My question is not about our home but our neighbour's homes, they have turbines than that - 28 from near our home?

20

MR HEGLEY: Exactly the same procedure is taken for every assessment point. I homed it on your place because you had raised the issue. So it applies to the same technique was done at all houses.

25

DR HUFFMAN: Okay, thank you.

HER HONOUR: Thank you, Dr Huffman. Mr Lloyd, can we call on you to explain the latest document to come before us please?

30

MR LLOYD: Yes, thank you.

The acoustic experts caucused last night and this morning, but this morning some agreement was reached. There were three agreements reached. The first one was with four experts present, that is Mr Thorne, myself, Mr Hegley and Mr Day, and that is the handwritten one that is before you.

35

HER HONOUR: We have got typewritten ones I think. So this is the latest?

40

MR LLOYD: Yes.

[9.40 am]

45

HER HONOUR: I see, thank you. It supersedes the - - -

MR LLOYD: No, this is an agreement on the circumstances between the consultants.

HER HONOUR: I see.

5

MR LLOYD: And it sort of sets out our basic differences if you like.

HER HONOUR: Right.

10 MR LLOYD: This was arrived at with Mr Thorne present.

HER HONOUR: Dr Thorne.

15 MR LLOYD: Sorry, my apologies – Dr Thorne present. Then subsequent to that Dr Thorn departed, and I would like to make that clear, leaving three consultants that the second and third agreements were reached.

So this first one is with Dr Thorne present.

20 HER HONOUR: Thank you.

MR LLOYD: What it sets out is that there were four people in agreement with the original acoustic matters document, and that was Lloyd, Hegley, Day and Dr Trevathan.

25

The second point is that we agreed to disagree on noise levels versus the setback distances. Lloyd, Hegley, Day believe the noise limits are appropriate control and Dr Thorne believes setback and noise limits are required.

30

The third point was that Lloyd, Hegley and Day agree on acoustic matters version 22/3/10 with Dr Trevathan absent.

35 Position four, Dr Thorne then set out his position on the acoustic matters version 22 of the third document, and I do not know if I need to read out those points but he set out where he disagreed, was a no, okay was yes, and in some cases he was close on agreement but put in a caveat that because he was unfamiliar with the 2010 version of NZS6808 he needed more time to consider it, or needed to look into it further.

40

45 His position on the acoustic matters document, that is the conditions in the noise management plan, are set out through pages 1 to 3. You will see there are quite a few areas where there was no agreement from Mr Thorne on that document.

HER HONOUR: Thank you. Will you explain where the three of you have got to?

MR LLOYD: Yes.

5

HER HONOUR: - - - result?

MR LLOYD: Yes. The second agreement reached is that document there, it has got second agreement reached on top, it is just a short statement from – and this was reached after Dr Thorne left.

10

HER HONOUR: We have not got that one, yet. Would you like to explain it as we go?

MR LLOYD: It is very simple. It says, “Lloyd, Hegley and Day have reviewed the new set of conditions provided by Dr Thorn on 22 March” – that is last evening – “and find they are not in accordance with New Zealand Standard 6808 2010. The wording was difficult to understand and we cannot agree to them at this point”.

20

HER HONOUR: So this is Dr Thorne’s document?

MR LLOYD: Yes, yes. Is it attached to the -?

HER HONOUR: Yes. Well it is here now, thank you.

25

So that goes with that, your first document?

MR LLOYD: So really, because Dr Thorne was not involved in that we were keen to keep the two documents separate.

30

HER HONOUR: Yes.

[9.45 am]

35

MR LLOYD: The first document I believe the attachments were the 22nd of the third, acoustic matters which has got draft written on it.

HER HONOUR: That is the beginning “Construction noise” through?

40

MR LLOYD: Yes, that is correct.

HER HONOUR: Yes, and that is your document – the three of you?

MR LLOYD: Well the four of us. Dr Trevathan also agreed to that one.

45

- 5 HER HONOUR: I see. Would you like to explain the differences between that and the document we received yesterday? We have had time to note there are some differences.
- 10 MR LLOYD: There is now a third document that you should receive today which is dated 23 March which we subsequently made some relatively cosmetic changes but also picked up on some changes that were of concern, yesterday.
- 15 MR BUNTING: Can I just ask a question. The document attached to your agreed – is that the one we received yesterday?
- 20 MR LLOYD: Yes.
- MR BUNTING: They are the same?
- MR LLOYD: Yes. That is what everyone was working off of, yesterday. But there is a new - we have a new version of that that Mr Day, Mr Hegley and myself agreed to this morning.
- HER HONOUR: That has got page 1 of 10 at the top?
- 25 MR LLOYD: Yes.
- HER HONOUR: Yes, thank you.
- MR LLOYD: So that is the latest, latest, version.
- 30 HER HONOUR: Yes, thank you.
- MR LLOYD: So the difference is – if I could take you through that document and show you what the changes are there is a new paragraph – so on page 2 of 10 there is a new paragraph 3.2 which replaces the old wording in yesterday’s document, and what it provides for – I will let you read it probably.
- 35 HER HONOUR: I think actually you should read it out for the submitters please?
- 40 MR LLOYD: Thank you.
- 45 “Notwithstanding section 5.3.1 of NZS6808 all residential and rural areas in the Palmerston North District Plan are available for assessment as high amenity areas despite the absence of explicit recognition of them as high amenity areas in the district plan. In addition, assessment

of rural and residential land as high amenity areas shall not be prevented by reason of noise levels from the Te Rere Hau wind farm”.

5 So this provides for the provisions of 5.3.1 of New Zealand Standard 6808 to be applied to those dwellings in the Palmerston North District Plan where the background sound levels are low and allows for the 35 dBA night time noise limit to apply.

10 HER HONOUR: Thank you.

15 MR LLOYD: Other changes were changes that I - I had a detailed look at the document this morning, yesterday's document, and came up with a number of my own changes which I recommended to Mr Day and Mr Hegley, and they accepted those changes. What those changes are, in the noise management plan which is page 6 of 10 in section 3.5, there is the addition of a requirement for the consent holder to consult with the environmental services group manager of Palmerston North City Council, or Tararua District Council as appropriate, in determining where the noise monitoring terminals should be located.

20 Originally, that was just undertaken by an acoustic consultant engaged by the consent holder so I saw there is a need for consultation with council to take place and that has been very useful at West Wind.

25 **[9.50 am]**

30 In 4.1 on the same page the additional monitoring is required there and at the end of the paragraph I have recommended that it include - for investigating complaints rather than just determining compliance with the noise consent conditions and that was accepted and those words were included there.

35 On the following page, page 7, again 4.7 we included the requirement to consult with councils with respect to the location of noise monitoring terminals.

40 5.3(b) on page 9. There is words here, “5.3(b) requires that within one working day of being advised which turbines are likely to be causing non-compliance or unreasonable noise the consent holder shall de-rate” and we have included the words, “including if necessary stopping those turbines”. So that provides specifically for the turbines to be stopped if problems are being caused.

45 And those are the changes of the document of the 22nd of March.

HER HONOUR: Thank you very much, Mr Lloyd. People will need a little time to digest this so we will revert to the format we had yesterday when counsel and representatives of the parties were asking questions and we have, of course, we have allowed the submitters to ask questions through the Chair of the various experts still to go. So we are going to start again this morning with Mr Day to complete the Mighty River Power circle. Thank you.

10 MR MAASSEN: Thank you, ma'am. I have one set of questions only for this witness.

MS PRICE: Excuse me, I would like to lead Mr Day on a couple of issues first.

15

<EXAMINATION BY MS PRICE [9.52 am]

MS PRICE: Mr Day, yesterday when cross-examining Mr Hegley, Mr Maassen asked him to describe his area of expertise versus that of Dr Thorn. Can you please give your views on this too?

20

MR DAY: Certainly. In my opinion, our areas of expertise are different. I guess Mr Hegley, Mr Lloyd and I would fit into the category of engineers and scientists who do noise prediction and measurement work with an objective of predicting community response to noise, and assessing potential adverse effects.

25

And Dr Thorn is obviously welcome to correct any misinterpretation here but I understand his area of expertise to be more in the health area and psychoacoustics and he - sorry, finishing off on how we go about our work.

30

To do our assessment of effects, we review the wide body of international research on community response to noise. We use that as our baseline. Dr Thorn is actually a researcher who is doing that research and he is out there at the coalface and his study, once it is peer reviewed and published, will be one of those bodies of knowledge that goes into that huge body of international research on community response to noise.

35

40

So that is my interpretation of the differences in our areas of expertise.

MS PRICE: Thank you. Last Tuesday when questioning Mr Stephen Brown on landscape matters, her Honour made a statement about you and your earlier evidence. She said you had referred to the Turitea area as "industrial" and I refer you to page 3091 of the transcript.

45

[9.55 am]

5 And in fact to quote from page 3092 from your Honour was, “they are then faced with what Mr Day says anyway is an industrial landscape”. What do you say about this, Mr Day?

10 MR DAY: I think that may have been a misunderstanding of certainly what I intended to say but I think it was at the end of my third statement of evidence from the previous hearing, my supplementary statement from the previous hearing where I said, “wind farm noise is very similar to the noise from many other industrial sources and in particular other power generation facilities such as hydro, geothermal and coal fired power stations” and because of that confusion with the word
15 “industrial” in my opening statement yesterday, I used the word “commercial activity”.

20 It is my opinion that the noise is not different from those other types of **(INDISTINCT 1.03)** specifically power generation. If you were looking at a hydro station being installed in the valley up here, it has got generators involved that make potentially pure tones, much bigger generators bolted directly into the ground. They make noise. And we would be assessing it in exactly the same way against the 40 dBA criteria. So that is the analogy I was trying to make.

25 MS PRICE: You heard Mr Maassen cross-examine Mr Hegley yesterday about the correlation between predictions and actual levels experienced at the different wind farms. What can you say from your investigations into Makara?

30 MR DAY: My investigations into Makara involved discussions with the people more directly involved and so that question might be better directed to Mr Botha (**ph 1.57**). My understanding from discussions with Mr Botha is that the noise levels that he has measured are that four
35 of his five measurement positions are well below the predicted level and at one of the five positions, it is very close to the predicted level. The measured level is closer to the predicted level.

40 MS PRICE: Thank you Mr Day. You are now available for cross-examination.

HER HONOUR: Mr Maassen.

<CROSS-EXAMINATION BY MR MAASSEN

[9.57 am]

MR MAASSEN: Have you got the current standards in front of you, Mr Day?

5 MR DAY: Yes, I do.

MR MAASSEN: I want to turn you to paragraph 5.3.2 at page 22 concerning high amenity areas. Are you familiar with that section?

10 MR DAY: Being new, I am not wonderfully familiar but I have read it.

MR MAASSEN: Just take a moment to refresh your memory.

15 MR DAY: And the comment 5.3.2 or just - - -

MR MAASSEN: Not at this stage. Unless you feel that you should read it as part of the interpretation.

20 MR DAY: Having read it I would have to say it is one of the paragraphs that I have had difficulty understanding. I was not involved with the draft but I have now read it and I do have a little difficulty understanding it.

25 MR MAASSEN: Yes. I have the same problem that is why I am directing you to it. There a number of submitters who have given evidence to the Board that their experience is that they would qualify as a high amenity area. In other words, their aural experience is one of very low background noise. And the reason we are making explicit recognition in the conditions about that possibility is to recognise that belief and have it scientifically assessed as part of the preparation of a noise management plan. Is that your understanding?

30

MR DAY: Yes.

35 MR MAASSEN: A lot of those individuals who have demonstrated themselves to be intelligent people who are very interested in their aural amenity. Is that your understanding?

40 MR DAY: I cannot comment on their intelligence but I am sure they are interested in their aural amenity.

[10.00 am]

45 MR MAASSEN: Yes, and the question is have we got a robust and understandable methodology contained within this standard for the preservation of their amenity? So that the purpose of my questions. As I understand it, what is contemplated by this clause is that the

background noise testing will endeavour to identify the circumstances when that low background noise exists. Is that correct?

5 MR DAY: Yes.

MR MAASSEN: And then correlate it with the wind conditions experienced at the turbine tower. Is that correct?

10 MR DAY: Yes.

MR MAASSEN: And then endeavour - - -

15 MR DAY: Sorry, maybe I should correct that. Not necessarily at the turbine tower. Generally what happens is there is a meteorological tower which is established, either one or two, depending on how big the wind farm is and there is a meteorological tower that is established in the wind farm and that is generally correlated with that.

20 MR MAASSEN: Right, so have you got any comment to make about the number of meteorological towers that would be required to meaningfully apply 5.3.2 in this situation, having regard to the size of the site?

25 MR DAY: That would need to be agreed with the input from various parties, but it would be either one or two for a wind farm of this size would be my understanding.

30 MR MAASSEN: So if you are unsure yourself, how do you see people agreeing amongst themselves if there is a diversity of opinion?

35 MR DAY: It would again be a group of experts involved with significant measurement of noise and wind over wind farms that would get together and agree on the number of - there is a number of things in the management plan that are set to be agreed by the two experts in terms of the number of monitoring positions and that would include the establishment of meteorological weather stations.

40 MR MAASSEN: So you understand the noise management plan provisions that refer to agreement on the noise monitoring sites to also anticipate agreement on a number of meteorological stations?

MR DAY: Yes, I am not sure whether it is specifically included the wording but that would be appropriate.

45 MR MAASSEN: Would it be appropriate to include that?

MR DAY: I think so.

MR MAASSEN: Now you said that you found 5.3.2 difficult to understand.
Can you just explain to the Board why you found it difficult to
5 understand?

MR DAY: I am just not clear where the six metre a second limit applies.
Whether it is to when the background noise measurements are done,
below that, or the limit only applies. The lower noise limit for the high
10 amenity area only applies in less than six metre per second, so that is
what I am not clear on. But I am sure those involved with the
development of a standard would be able to explain that.

MR MAASSEN: It contemplates as I understand it that above a certain wind
15 threshold experienced at the tower, the high amenity noise limit would
not apply. Is that your understanding?

MR DAY: Well I would say that is one possibility (**INDISTINCT 3.43**)
verification.
20

MR MAASSEN: That is one possibility. And it indicates generally six metres
per second but then says, "an alternative wind farm speed, wind speed
threshold may be applied where justified on meteorological,
topographical and acoustical grounds." Can you see that?
25

MR DAY: Yes.

MR MAASSEN: My question is: who decides it is justified or not and in the
event that there is dispute between the council and the applicant's
30 expert on that matter, how are we to resolve it?

MR DAY: It would need to be resolved in the way that any of these matters
are resolved in terms of interpretation of noise conditions or any
conditions that apply to consented activities. Sometimes have difficulty
35 in their interpretation and it gets resolved naturally through the council
and if it cannot be resolved there, it ends up in the Environment Court.

[10.05 am]

40 MR MAASSEN: So the Court then has to decide what "justified" means in all
the circumstances?

MR DAY: Yes and they would hear evidence from experts and decide what
"justified" means. Hopefully agreement would be reached I am
45 expecting well prior to that.

MR MAASSEN: And you anticipate that the noise management plan that is presented to the council will contain the background noise measurements, identify the sites that qualify as high amenity areas. Correct?

5

MR DAY: I do not anticipate the noise management plan including that. The noise management plan is basically developed in that document we have submitted this morning. There will be a later document submitted I would imagine with the developed design of the wind farm that would include greater detail on the turbines, the details on noise measurement positions and a whole series of additional information at that stage. **(INDISTINCT 1.13)**

10

MR MAASSEN: And at some stage along the process there will be a report to council that contains the background noise data and identifies the sites that are high amenity areas?

15

MR DAY: Yes.

MR MAASSEN: And such a report or some iteration subsequently will explain what the wind thresholds are above which the special amenity or high amenity area standard does not apply?

20

MR DAY: Yes, I would expect it would include that. One of the reasons I also had difficulty understanding it is that if you are correct in your interpretation that the lower noise limits, the high amenity noise limit of 35 dB would not apply above six metres a second, that probably happens anyway because the background noise level is measured relative to wind speed and the background noise level is only exceptionally low in low wind speeds. So in a way, it seems superfluous. There must have been a good reason that the committee put it in there, but it just does not - I cannot really see it arising as an issue.

25

30

MR MAASSEN: Right. Do you think that it would be appropriate that the thresholds, there is some provision for the identification of high amenity areas and the thresholds that apply in respect of them to be publicly available to those people who qualify as high amenity areas?

35

MR DAY: I would imagine all the background noise measuring data would be available through the council to all residents.

40

MR MAASSEN: And the information about when wind speeds will trigger or not trigger the link (**ph 3.28**) standard, the high amenity standard?

45

MR DAY: Yes, certainly.

MR MAASSEN: And in relation to operational reporting, do you anticipate information being provided to the council about how the turbines are being managed in particular wind conditions to achieve that standard?

5

MR DAY: I am not sure that that level of detail of how they manage the turbines could be included in reporting. I imagine having seen the report from Makara that would have a huge amount of detail of the measured noise levels. That Makara report in fact actually does talk about some operational controls they put on, but I would imagine typically a compliance report would only discuss the noise levels and whether there had been - met the **(ph 4.25)** conditions, the noise limits et cetera.

10

15 MR MAASSEN: Right. Thank you, your Honour. Thank you, Mr Day.

HER HONOUR: Mr Jamieson?(**Ph 4.34**)

MR JAMIESON: No, ma'am.

20

[10.10 am]

MR MAASSEN: Sorry, your Honour, there was one matter that my colleague brought to my attention but I did not pick up. May I just ask one other question?

25

HER HONOUR: Yes.

MR MAASSEN: Thank you. Mr Day, I am sorry about that. I refer you please to table 1.

30

MR DAY: Of?

MR MAASSEN: Of your predicted noise levels dated 27 January 2010, so that would have been attached to the amended AEE.

35

MR DAY: 27 January?

MR MAASSEN: Correct. In that list, on the left hand side, is the sites where the comparison was made?

40

MR DAY: Yes.

MR MAASSEN: Do you confirm that you did not make predictions in respect of the following sites – 98, 97, 99, 68, 100, 101, 95, 67, 69, 102 and 96?

45

MR DAY: Yes.

5 MR MAASSEN: And within that sample are some of the highest predictions that Mr Hegley himself made?

MR DAY: I am not aware of that second point.

10 MR MAASSEN: Well, in relation to 98, 97, 99, 68 and 100 the prediction, in attachment 2 to Mr Hegley's statement, is 50.2, 46.9, 46.9, 44.7 and 44.7 respectively. Can you explain why, in your peer review, predictions were not made in respect of those samples?

15 MR DAY: I cannot immediately explain why those ones were not done. As I mentioned in my primary evidence the modelling was carried out by one of my staff and I would have to check with them, which I can do over the recess, on why those ones were not done.

20 My understanding was some assessment positions were deleted because people had signed agreements and issues like that, so I am not sure exactly, because there is nowhere near 100 assessment positions, there are a number of gaps all through, and I thought there were specific reasons why those gaps existed and I would have to check up on those specific numbers if you can give those to me.

25

MR MAASSEN: Thank you I will do that and would you please arrange to do that. Thank you very much, your Honour.

30 HER HONOUR: Thank you, Mr Maassen. Mr Johnson?

<CROSS-EXAMINATION BY MR JOHNSON [10.13 am]

35 MR JOHNSON: Good morning, Mr Day. We have heard that you have been caucusing or the experts have been caucusing overnight and this morning, and I was discussing or talking to Dr Thorne - in fact the early hours of this morning - and it dawned upon me, because I have been a bit confused perhaps when it comes to this whole caucusing arrangements. And you probably realise by now I have been quite precious when it comes to Dr Thorne's involvement with anything to do with other noise experts because he has been harshly criticised, in my opinion, through the rebuttal evidence, especially of yourself and Mr Hegley.

40

45 I have a slight administrative query and you can answer this. When it comes to caucusing how is agreement reached? Is that a voting thing, is it four experts agree, three experts agree, one does not? And I see that

Dr Thorne was not present at one of those documents that Mr Lloyd referred to this morning, so can you tell me how that works?

[10.15 am]

5

MR DAY: Yes, my understanding it works in accordance with the guidelines for caucusing, which Mr Mills read out to all of us in the process of the caucusing, and agreement is either reached by all parties. And if it is not reached by all parties involved, the matters that can be agreed on are listed and the matters that are not agreed on are listed, and the differences and the reasons for their differences can be listed or not, and that is what he have endeavoured to do with the various documents this morning.

10

15 MR JOHNSON: Okay, I understand from discussions with Dr Thorne that you play a major part in the caucusing?

MR DAY: My assessment may be wrong in Mr Lloyd's opinion, but I would say I probably said less than the other four.

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MR JOHNSON: Less than - - -

MR DAY: The other three - - -

25 MR JOHNSON: - - - Mr Hegley's?

MR DAY: The other three.

30

MR JOHNSON: Okay. Can you tell me what your role is and how you were engaged with Mighty River Power?

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MR DAY: My firm was engaged in a peer review of the noise modelling initially, and so we did our own noise modelling and offered peer review comment of the Hegley Acoustics work, and following that I have been also asked by Mighty River Power to give my professional opinion in terms of noise matters in general at this hearing.

40

MR JOHNSON: The problem I have, Mr Day, is that we seem to be up against it. Are you an expert for Mighty River Power when you are caucusing?

45

MR DAY: I am not an expert for Mighty River Power in any situation. In this Court and in the caucusing I abide by the Environment Court code of conduct and I am an independent noise expert that happens to be engaged by Mighty River Power. I give my opinion and that is my opinion only.

MR JOHNSON: So when you submitted your evidence-in-chief, I note here you were engaged by Mighty River Power to be a peer reviewer?

5 MR DAY: Yes.

MR JOHNSON: Who were you supposed to be peer reviewing?

10 MR DAY: My understanding about the peer review was of the work carried out by Hegley Acoustic Consultant.

MR JOHNSON: Okay, and you have continued to do that all the way through?

15 MR DAY: I said that was part of our brief, and later I got asked to express my opinion as an expert on the various issues surrounding wind farm noise.

20 MR JOHNSON: In your experience, Mr Day, is it common that when it comes to your involvement - the likes of applications on resource consents that require noise experts - is it common that one party is allowed to have two noise experts in the caucusing situation? I will just stop.

25 I asked yesterday whether we can have a support person there with Dr Thorne, he was quite fragile, he does not like even sitting with the other noise experts. So when did you stop being a peer reviewer of Mr Hegley?

30 MR DAY: I have not stopped - - -

MR JOHNSON: You have not.

35 MR DAY: - - - beating my wife, **(ph 4.03)** I mean reviewing Mr Hegley, peer reviewing Mr Hegley.

40 MR JOHNSON: So why are you allowed to sit in the caucus, in a lot of cases leading the caucus discussions when you are a peer reviewer, and I was not allowed to put one person forward to support Dr Thorne in this caucusing?

HER HONOUR: Mr Johnson, I am very surprised that you approached your own witness in the adjournment.

45 MR JOHNSON: Yes.

HER HONOUR: You know the rules of the Court.

MR JOHNSON: I know the rules, your Honour, but this was very distressing.

HER HONOUR: Well - - -

5

MR JOHNSON: It is very distressing and I know that I have looked at the codes of conduct and there are some areas here that I know I have sailed pretty close to the wind on. I admit that, and if that is the case then I will take the consequences of that.

10

What I am saying now, your Honour, is that as a peer reviewer, Mr Day – everything I see here, your Honour, all the evidence that has been submitted to this inquiry, there is no suggestion to me whatsoever that Mr Day has been peer reviewing the work of Mr Hegley. In fact this is all his and it dawned on me yesterday, also when Joy was asking questions of the difference of 10 dBA, the variation between Mr Hegley's work and Mr Day's work, that he is not actually reviewing Mr Hegley's work, he is actually putting his own work forward as a noise expert.

20

[10.20 am]

25

Now, I have a problem with that. I will apologise if I have breached any of those things but I think on this occasion here I was very concerned, I have been concerned with Dr Thorne, I have given my personal assurances that he will be looked after. I am concerned and, as you know from our discussions yesterday, your Honour, you should be well aware of that.

30

My concern is, when does a peer reviewer be allowed to sit, cast his opinions? Everything that Mr Day has submitted to this inquiry is not the work of a peer reviewer, it is the work of an expert witness, and - - -

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HER HONOUR: Mister - - -

MR JOHNSON: - - - that is the problem, and I am quite happy to leave it at that and I do not need to ask any more questions.

40

MS PRICE: Ma'am, maybe I can assist here. We are already preparing a response for you on the tables to assist the submitter yesterday. I think it might be useful if, via a memorandum of counsel, we explained that there are two separate computer programs that are used by the two experts.

45

HER HONOUR: Yes, that was made clear in the evidence, as was the fact that Mr Day was a peer reviewer.

MS PRICE: And so we will set that out in the memorandum of counsel so that it is clear for my friend.

5 HER HONOUR: Yes, thank you. Is that all, Mr Johnson?

MR JOHNSON: So my question is, your Honour, and I suppose it is going to have come to back to the Board as well.

10 HER HONOUR: Well, you can make a submission, Mr Johnson.

MR JOHNSON: Okay. I wish to submit to the Board that we have been compromised by having Mighty River Power having two noise experts involved with the caucusing and, in fact, that Mr Day is a peer reviewer and all the evidence that he has submitted to this inquiry has not been as a peer reviewer.

HER HONOUR: Well, you can put that in your final submissions to the Board, thank you.

20 MR JOHNSON: It is just ongoing caucusing that does concern me. Is Mr Day allowed to be a peer reviewer making important decisions and contribution to what I believe should only involve noise experts? And that is a question I would like the Board to consider as well.

25 HER HONOUR: Yes, thank you. Any other parties wish to question Mr Day? Thank you.

<RE-EXAMINATION BY MS PRICE [10.23 am]

30 MS PRICE: Mr Day, in cross-examination by Mr Maassen you were asked why the table, included in your evidence, did not include certain monitoring points. Have you before you your evidence-in-chief, appendix B?

35 MR DAY: Yes.

MS PRICE: Could you look at the key at the bottom of that appendix and read out what it says beside the colour yellow, and then provide your answer to Mr Maassen's cross-examination.

40 MR DAY: Yes, that appendix B, the table has a yellow shaded area and the code for that yellow shaded area says, "Wind turbine or transmission line on site or provided written approval". And those numbers that are highlighted in that section appear to be the ones that Mr Maassen was asking me about – 90, 91, 92, 93 through to 102, so 90 to 102. And

then, my understanding from reading this table, provides the information I was going to request that this is, as I intimated was a possibility, is that the transmission line or the site has been given written approval.

5

MS PRICE: Thank you, Mr Day. I understand that Mr Maassen also asked you about measuring points 67, 68 and 69, so would you confirm that that is also true or not?

10

[10.25 am]

MR DAY: Yes, that is shaded yellow as well.

MS PRICE: Thank you.

15

HER HONOUR: Yes, Mr Heerdegen?

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MR HEERDEGEN: Mr Day, in paragraph 14 of your opening statement, you use the word “fix”, that is all the turbines have been fitted with this fix except for a few on the western side.

MR DAY: Can I get you just to pause a second while I find my statement. Sorry, what paragraph number?

25

MR HEERDEGEN: Paragraph 14.

MR DAY: Thank you.

30

MR HEERDEGEN: The question I have is, is this word “fix”, does that mean “de-rate” or is it something different?

35

MR DAY: Again I think that probably would be best put to Mr Botha, who I understand is appearing, but my understanding and my use of the word there was regarding the software control on the maximum speed, which in my interpretation that does fit in with the term “de-rating” because there is a very small band where they do lose power but it is a small wind speed and a small loss of power.

40

MR HEERDEGEN: Thank you. And somewhere in your evidence you use the word “acoustic” conditions and “noise” conditions, can you explain whether there is a difference between these two terms?

MR DAY: No, I apologise for that inconsistency, they do mean the same.

45

MR HEERDEGEN: Thank you. And, finally, what is the preferable word to use, because we tend to use in these situations “noise” conditions but I

notice that experts tend to sort of label things with “acoustic” conditions?

5 MR DAY: I prefer the word “noise”. “Acoustics” means a large number of other things like the acoustics in this room, the acoustic propagation sound outdoors et cetera and I think what we are trying to do with noise conditions is control the potential adverse effects of noise, we are not trying to control the acoustics, we are trying to control the adverse effects of noise.

10 MR HEERDEGEN: Thank you very much, that is sobering. Thank you, that is all my questions.

15 HER HONOUR: Mr Bunting?

MR BUNTING: Yes, thank you, your Honour. The opening statement again on the second page at the top, you quote a clause from the standard under “C”.

20 MR DAY: Yes.

MR BUNTING: Do you have an understanding of what that actually means? I mean why has that statement been made and where is the boundary of the wind farm?

25 MR DAY: Yes, I personally, as I have been involved on the committee, we have used different words to be on the wind farm boundary because that is arbitrary in a way, and would have said something like 100 metres or 300 metres or 500 metres, whatever it is, because making a statement “beyond the boundary of the wind farm” of course is different in each wind farm.

30
35 But what they are overall saying, and I have read some of the papers they reviewed, is that the impact of ground borne vibration is just not an issue with wind farms used. (ph 4.13) The level of vibration is so small in comparison with other every day activities that create much greater levels of ground borne vibration.

40 MR BUNTING: So that is your understanding as well?

MR DAY: That is from my reading of the papers, and they have read a lot more than I have, that that is my understanding of the conclusion they have come to there.

45 MR BUNTING: Thank you, we can ask the chair as well.

MR DAY: Yes.

MR BUNTING: Again, just looking at paragraph 34, I will let you have a look first.

5

MR DAY: Yes.

MR BUNTING: Do you have any information on staging or is that just a general statement?

10

MR DAY: That is from asking Mighty River Power how they would go about it and it is not completely determined as yet, but the description of numbers that would be in that group, it is very much an objective that they would start in a particular area - it might be five, it might be 15 - so a group of 10 turbines would be constructed first. And my objective was to try and get in there straightaway rather than waiting for the end of the wind farm, the whole wind farm was constructed, and let us measure that straightaway in the first two weeks, get it up and running, measuring.

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[10.30 am]

MR BUNTING: But you do not know specifically where the first stage could be?

25

MR DAY: No, it may be the north end, it might be the south end, I am not sure what it would be. Now, I do not think it is decided yet.

MR BUNTING: Thank you for that. Paragraph 38, which you have taken forward into the conditions, what sort of assessment criteria might there be in determining whether the noise is unreasonable?

30

MR DAY: The measured noise level would certainly come into that, whether the sound had any particular special audible characteristic would come into that, whether the sound contained modulation. At some wind farms there have been reports of a “thwump thwump” type of noise. If it contained that type of noise, all those things would be taken into account and assessed whether it was unreasonable.

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MR BUNTING: So it would be a combination of objective and subjective factors, would it?

40

MR DAY: Yes, that is correct.

MR BUNTING: But really up to those two people to determine?

45

MR DAY: Yes.

MR BUNTING: Okay. Can I just refer to the acoustic matter or the noise conditions that you have tabled this morning in paragraph 3.2.

5

MR DAY: Thank you.

MR BUNTING: Part of the wind farm, of course, is in Tararua District, so should that district be included as well as Palmerston North, do you think? We know, for instance, we have heard from people in Tararua District who have concerns about noise and things.

10

MR DAY: Yes, I think that appears to be a typo, I think we intended that when it ever referred to “district council” it referred to both.

15

MR BUNTING: So we could add that in?

MR DAY: Yes.

MR BUNTING: And just on that whole question of high amenity areas, Mr Maassen asked you questions about 5.3.2, it just seemed to us that the way that that was worded, a high amenity area would not be fixed forever, it could go in and out of being a high amenity area depending on the wind conditions at any particular time, is that your reading of that?

20
25

MR DAY: No, that is not my understanding. My understanding it would be established by doing a really significant background noise survey of noise level versus wind speed, and with the characteristic slope that starts off with low background noise level at low speed and goes higher, that a particular site might have a 20 decibel or less background noise level up to five metres a second, and then it might increase.

30

And so the noise limit would be 35 at those low wind speeds and then it would increase at five dB above the background. And once that original noise survey had been determined that is the limit for that site, it is a high amenity area, it has 35 dB protection up to five metres a second, and then from then upwards it is 37, 39, 40.

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MR BUNTING: It is just the interpretation, you know, it says “would apply when the wind speed is six metres per second and lower”, so it might suggest that if it was higher than six metres per second the high amenity area classification might not apply?

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MR DAY: Yes, and that is what I was saying before. In practice I cannot see generally where that would happen because that 20 decibel background

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noise level very rarely stays above five metres or six metres a second and you will have pumped out – it is still nominated a high amenity area but you only get the 35 dB protection at low wind speeds anyway, so I just feel that it seemed to me that the second is superfluous.

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[10.35 am]

MR BUNTING: Okay. If perchance there were areas identified as high amenity areas and that a lower wind speed apply, what would the consequences be for the operator in terms of the operation of the turbines?

10

MR DAY: Sorry, if the six metres a second - - -

MR BUNTING: Yes, say, it was a high amenity area – that it was defined as a high amenity area, how would the operator achieve then that lower noise level? Would they have to de-rate turbines or?

15

MR DAY: Yes. The only mitigation available is de-rating them in those particular wind conditions. De-rating does not have to be a permanent, it can be software controlled so that it is in certain wind conditions.

20

MR BUNTING: Okay. My final question really was in relation to the caucusing and the handwritten notes of agreement. Have you got a copy of those?

25

MR DAY: I will just get that from our chairman, Mr Lloyd, who ran the caucusing.

MR BUNTING: Just looking through – have you got that?

30

MR DAY: - - - ran the caucusing of course, and Mr Lloyd was our scribe.

MR BUNTING: Okay. Through the notes of the agreement/disagreement when Dr Thorn was present, as recorded in these handwritten notes?

35

MR DAY: Yes.

MR BUNTING: In a number of instances it says close council to do work et cetera. In the revised conditions which the three of you put together, did you take account of some of these concerns of Dr Thorn? Were they able to be accommodated at all? Where it says “close” for instance?

40

MR DAY: Unfortunately, due to time constraints they were not. These handwritten notes were being prepared at I would say approximately

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between quarter to 8 and 8 this morning, and then the revised – what are we calling these documents? – the revised noise conditions, our revised noise conditions were modified at 8.30 so it would need considerable time to try and address Dr Thorn’s concerns.

5

MR BUNTING: So should that be done? Should the conditions be reviewed again in light of the agreements or disagreements with Dr Thorn, where there seems to be some potential to take account of at least part of his concerns?

10

MR DAY: I guess it is an administrative matter. I am certainly happy to be involved or not involved if people felt it would be better if it was just done by Mr Hegley. I guess it is what times the Court has available. But I am sure some of his concerns might be able to be incorporated, but I think most of them – from the document he presented us last night, I do not think a lot of that would be able to be incorporated. Some of them certainly may be with further discussions. I am not sure whether caucusing seems to be the best format for that, being involved with it this morning and last night. Maybe Dr Thorn could work with Mr Lloyd to try and incorporate some of them and then come back to us, but there were difficulties.

15

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MR BUNTING: Okay. But there is some potential there to do that in some sort of forum?

25

MR DAY: Yes.

MR BUNTING: Thank you very much. Thank you, ma'am.

30

HER HONOUR: Mr Shenton?

MR SHENTON: Just in your opening statement at paragraph 19, I just wanted to be clear on what you are meaning in terms of when you say, “In my opinion complaints should be minimised wherever possible, but they are a normal part of an active community”. Are you really meaning in terms of the management of the noise of a wind farm in terms of complaints being minimised? Is that what you were getting at there?

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[10.40 am]

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MR DAY: I am really referring to the paragraph above there in terms of my work with the Ports of Auckland. That type of ongoing activity we have many interactions with residents and the port is complying with the noise limits but they have still got issues so we try to minimise those; things like the reversing beepers and things annoy people so we are trying to change those and things like that.

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MR SHENTON: So it is right through the management of the activity of the ports in that instance, that is what you are really getting at? It is just, yes, by the looks of that statement a little bit in isolation it does not come across like that. But linking it with that one would be better.

MR DAY: I am saying two things. Complaints generally will arise when somebody makes a noise – in my experience most activities that make noise do tend to assert complaints at some stage or other and we should try to minimise those, but they will not ever be eliminated completely.

MR SHENTON: Okay. Thank you. That is all I needed.

MR HUDSON: Mr Day, just going to your handwritten notes, and I will ask you because you are on the stand but it applies to the other people as well. Can you just give me the, if you are able to on the first page there is a 3.1A and B where it says, “Thorn position on above document is: (a) no, but only because of 40 dBA level, and (b) is no, only because of 35 level”. Could you tell me what Dr Thorn’s position is, or do I need to wait to get to him before I can find that out?

MR DAY: I think you should confirm it, but my understanding is his position on the first one is he has 35 instead of 40, and 35 he would like 30.

MR HUDSON: Does he want a distance as well? Again, I can wait?

MR DAY: No, he made it very clear he wants a setback distance specified and a noise limit specified.

MR HUDSON: And the setback distance being?

MR DAY: I think two kilometres – yes, that is right. In the document he submitted last night he had a two kilometre setback distance and then a three and a half kilometre mitigation boundary. I should let him explain what that means because there are some things that happen in that distance as well.

MR HUDSON: Yes. I am not meaning to preclude him but if I do not ask you then when I get to him I have missed you.

MR DAY: That is right.

MR HUDSON: Then there is whole series – and as Commissioner Bunting was just asking it would be helpful if there is a means while he is here of getting your, or his input into closing that gap where he says “close” on a number of occasions. “Close – council to do work”, it is scattered

throughout that handwritten document. So if that is able to be done it would be helpful for us and I am not sure. I will leave that for you and Mr Mills to possibly work out during the day.

5 MR DAY: Yes. I think maybe in chambers or in discussion with the various parties that could be discussed, it is an administrative matter I think of **(INDISTINCT 3.41)**

10 MR HUDSON: It is, but we want to make use of the noise experts while they are here.

15 Now you said in your opening words today that you described yourself as a receiver of research on community's response to noise, and without putting words in Dr Thorn's mouth you would describe him as a person who does the research on community response. Those were your words this morning?

20 MR DAY: That is a shortened version of my words but that is basically the words, yes.

25 MR HUDSON: That is included in there. I note in your opening statement which was given yesterday that in places you are critical of Dr Thorn. For example, in paragraph 5 you would say, "The contrary evidence provided by Dr Thorn on these matters is in my opinion 'scientifically soft'".

[10.45 am]

30 Further on in paragraph 7, and I am not sure of the exact context of this, "I reiterate the standards committee which included representatives from the Ministry of Health, MfE, concluded that infrasound, low frequency sound and vibration are not issues of concern for wind farms".

35 The position that I detect that we have got here is a vast number of potentially affected residences, many of which have made their views known throughout this process, who are concerned to varying degrees. Some are frightened of the unknown effects of noise and what is being sought by them, short of experiencing the effects if it is built is some degree of surety and reassurance as to the noise environment they may
40 be going to live in. Is that reasonable?

MR DAY: Yes.

45 MR HUDSON: When there are words like "scientifically soft" to describe somebody who you described as someone who does research on

community response, I wonder how someone in your position advances there science if they do not take note of community response and all that we are hearing and receiving in this issue regarding noise at this hearing is community response?

5

MR DAY: What I said in the description of my area of expertise is that I review as much as I can physically of the international research on community response. So there will be 20 airports in there – the huge studies on 20 different and the community response to noise, each one of those might have an equivalent of a Dr Thorn going out and doing measurements in the homes and asking for community response, and there has been a whole stack of significant work on wind farms and various other noise sources. Hundreds of research studies, individual research studies go into that wider body of knowledge. What I am saying is Dr Thorn is one of those and once it is peer reviewed, his work, and goes into the international body it will be one of a hundred community studies out there, or more, that we take into account when assessing the effects on the community.

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MR HUDSON: That is what gradually leads to the evolution of standards and to change, is it not?

MR DAY: Yes, and that work has to be done in a scientifically hard way.

25

MR HUDSON: But it is still part of the process which I think if I follow what you just said you accept is the normal way that standards evolve and community expectations and acceptance levels are incorporated into standards.

30

MR DAY: The standards do the same process that I and Mr Hegley and Mr Lloyd get involved with, which is reviewing the wide body of international research, and certainly in the case of the wind farm revision of 6808, reviews all the literature they can get hold of, all the community studies which have been done and try and come up with reasonable levels of noise to protect the community to a reasonable degree of protection.

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MR HUDSON: That is again reflected in paragraph 37 of your opening statement which says, “As noted above, noise effects involve a subjective personal assessment. Providing for the situation where a wind farm is complying with 6808 2010 but is still creating unreasonable noise effects is therefore particularly challenging”.

45

So is your position, if I am understanding it correctly, that simply complying with 6808, the new standard, is the position that the applicant should adopt?

MR DAY: Yes. My starting point would be that complying with 6808 is actually sufficient. I have added this in following hearing and reading the transcripts with all the various concerns of the residents and I understand how they feel, and in a way those fears are made worse by somebody telling them that vibrations will come through the ground, and the fear of the unknown become high.

[10.50 am]

I made an attempt here to give an additional control in addition to 6808, which in my opinion would be adequate on its own, to try and give the residents some additional protection based on a subjective analysis. I think it is potentially dangerous, but I think I am recommending it to the Board in this case to try and give greater confidence in the ability to control these effects.

MR HUDSON: So by doing that are you in effect making a recommendation which goes a small way in comparison to the recommendations that Dr Thorn is making? You are departing from the standard which you say is sufficient, you are interpreting community response and you are applying a subjective mitigation of your own?

MR DAY: I am not departing from the standard, I am adding.

MR HUDSON: Adding to the standard.

MR DAY: Adding an additional control to the standard to try and give an additional level of control.

MR HUDSON: I just go back to what I said, is that in a small way doing the same thing but not to such an extent that Dr Thorn is proposing?

MR DAY: I guess Dr Thorn has taken it a step further in saying, yes, I want setback limits and additional controls et cetera, yes.

MR HUDSON: Yours is a smaller step towards that?

MR DAY: I am not sure whether it is a smaller step or not. Dr Thorn did not recommend this type of control, he recommended a setback. This one is possibly a little more radical than his and because of the subjective nature of it potentially dangerous, but I think it is in addition to his. In that area it goes further than his. His goes further in areas of setback type controls.

MR HUDSON: Thank you. No further questions.

5 HER HONOUR: Mr Day, the opposition to your work in this matter has just surfaced from Huatau Marae and Mr Johnson and the people he represents.

As I understood your position you were recruited by Mighty River Power to give a peer review of Mr Hegley's work, is that correct?

10 MR DAY: That was the initial engagement two years ago, or whenever it first commenced, yes.

HER HONOUR: Why did it expand out to criticism of the other noise experts?

15 MR DAY: Well it expanded out to commenting on the standard, to commenting on generally the noise matters in here. They did not ask me to criticise other consultants work, they asked me to also review the other – in this case Dr Thorn's – evidence and his work and comment on them. I think at the first hearing I actually said I was initially
20 engaged to review, but in that I said I had also been asked to review the evidence and I commented on a number of the submitters and a number of the evidence in my first statement of evidence.

25 HER HONOUR: So you saw your role as a peer reviewer of the other consultants?

MR DAY: No, as a normal expert witness that is before the Board to offer my opinion to assist you in making a decision.

30 HER HONOUR: Indeed, but a peer reviewer is really very confined to the work before him which is I understand Mr Hegley's work, and yours seems to have expanded to become a peer reviewer of other peoples' work, including Dr Pringle and so on?

35 MR DAY: I guess as a peer reviewer of the assessment of effects Mr Hegley's work was noise contours and an assessment of effects, so in reviewing that we did our own modelling, as I mentioned was done by my colleagues, and then we reviewed the assessment of effects also, and the
40 brief expanded to include a review of other experts offering opinions on the adverse effects also.

[10.55 am]

45 HER HONOUR: And the concern of Mr Johnson has only just emerged as far as you know at this hearing.

MR DAY: Yes.

5 HER HONOUR: Well last night he certainly mentioned to me that he was concerned for Dr Thorne.

10 MR DAY: Yes, last night was the first I had heard of it and as I said I expressed these opinions six months ago at the previous sessions of the hearing and this is the first I have heard of it was last night.

HER HONOUR: Moving on from that matter - - -

15 MS PRICE: Ma'am I should perhaps clarify one thing. Following the judicial conference call at the end of January, it was Mr Day that was engaged as the primary witness to review the conditions and provide mechanisms that he thought might address some of the noise issues here, rather than Mr Hegley. So indeed from January onwards this year it has been Mr Day that has been the primary witness.

20 HER HONOUR: Yes, I think some of this was lost in translation to the Board and because there was no objection and matters that come before the Board on an inquiry like this as you know come under the Commissions of Inquiry Act where any evidence that is put before the Board can be taken into account. So there is a sort of grey area in there between legal
25 issues and what we have got before us at the moment. So, yes, thank you.

30 Can I ask Mr Day why Dr Thorne was kept out of the loop of what I understand was sort of loose caucusing although our impression from the Board when we kept inquiring were we going to get a further statement from you before we sat for this hearing, was well, there was just absolutely no information on where things were at and we came to the Board very confused and puzzled why we had not had a further caucus statement.

35 Was it because all of you were so busy in doing what you were doing, I mean you flew down on the Friday I understand to review this latest report from Meridian which we are very grateful to have I might add. Was that the reason that Dr Thorne was kept out of the loop?

40 MR DAY: My understanding is Dr Thorne was not deliberately kept out of the loop. I was overseas until two weeks ago. On my return within two days, three days, these revised conditions and noise management plan in a first version was prepared and my understanding, we will check the
45 dates on the emails, but an email with that attachment of that document was sent to Mr Lloyd and Dr Thorne on the Friday, Thursday or Friday,

immediately following my return from overseas. So that is a week and a half ago Dr Thorne had that document.

5 And Mr Hegley made several phone calls and tried to contact Dr Thorne and got no response, and then we were officially told through the lawyers, I am not sure how many days ago, that he had been told not to caucus.

10 HER HONOUR: Yes, we heard that too.

MR DAY: Yes. So that - we tried to get him involved in the loop 10 days ago to get this sorted out over the week leading up to this re-sitting and to very much get him involved and getting an opinion and redrafting those conditions and noise management plan.

15 HER HONOUR: Yes, well thank you for that information. I have no further questions, thank you. We will move to Mr Lloyd and he is the next person in line to be discussed. Yes.

20 MRS HARKER: Excuse me, ma'am, might I ask a question.

HER HONOUR: Yes, of course.

<QUESTIONING BY MRS HARKER [10.59 am]

25 MRS HARKER: Morning ma'am, Board. Mr Day I am not an expert on noise which will be painfully apparent. You say that your anemometer or whatever the thing is, is up on the hill taking measurements of the wind speed. Yes?

30 **[11.00 am]**

MR DAY: It is not mine but - - -

35 MRS HARKER: Well, whoever.

MR DAY: - - - Mighty River Power have one up there I understand, yes.

40 MRS HARKER: That is what, for the standard and when you are in one of these special quiet areas what we are expected to hear down here is correlated to the wind speed up there.

HER HONOUR: Yes, but the noise measurements made beside your house.

45 MRS HARKER: Yes, Mr Hegley has been have you not, Mr Hegley? And you have measured it and it is very very quiet at our place. Yes, you

remember that. Probably at the bottom of what your machine can register. Yes.

5 MR DAY: I think you might have to address the questions to me.

10 MRS HARKER: Sorry. He knows what I mean. So that you put the turbines at the top of the hill to get the best of the wind. Yes. The wind might be blowing merry hell up there but down in the valleys where we are in special little - all sorts of various areas because you can see what the topography is like - it can be quiet down there, my 26 decibels. And are you telling me it is raging up there I have to expect to get 40 dB down there, on top of my 26? Can you explain?

15 MR DAY: Yes. If the measurements show that your area is very quiet in those conditions - - -

MRS HARKER: Yes, it is.

20 MR DAY: - - - then you will get a protection to 35 decibels because you are a high amenity area.

MRS HARKER: So I will never be expected to cope with more than 35?

25 MR DAY: Other than when conditions produce more than 30 normally, without the turbine there, in conditions that produced 35 decibels at your property which happens when the wind gets up in a different direction, then the wind farm is allowed to make 40 decibels. But in the conditions where it is very quiet, the wind farm is only allowed to 35 decibels.

30 MRS HARKER: So how am I supposed to know? I have not got a link to the thing up in the hill, have I?

35 MR DAY: No, but you will be hearing the noise in the trees around you that produce the 35 when the turbines were not there.

40 MRS HARKER: Well, put it another way. I was up at Dr Huffman's house the other day. There was a breeze and the gum trees were going shwshwshwsh, like that. And I could still hear Te Rere Hau on the other side of the hill. How do you explain that?

45 MR DAY: Well, you will hear the wind farm. You will continue to hear the wind in the gum trees and you will hear the birds and you hear the trucks and you will hear the wind farm - - -

MRS HARKER: Trucks?

MR DAY: - - - it is one of the - in the valley between Te Rere Hau and there is a road that goes up that has got cars and trucks that go up there. All those noises will be present and you will be able to hear all of those and down amongst the background you will be able to hear the wind farm.

5

MRS HARKER: So you are quite positive that my noise effects will not be too bad, that I will not be bothered enough to complain.

MR DAY: Whether you complain will depend on you individually, but I am certainly very clear that you will be able to hear it. And that is part of the problem I think with these other wind farms is people have expected not to be able to hear the wind farms. But you can hear them but at a level that is what is regarded as reasonable for any other activity that might go on in a rural area. In fact more stringent control than most other activities.

10
15

MRS HARKER: Well, there is a range of turbines still just 2. Diddly squat away from us on the hill behind and that noise is going to come, with inversion layers and what not, it is going to come down and hit us. Unless I have a noise meter going full time how am I going to say to you guy, I am sorry, I cannot cope with this. What are you going to do about it?

20

MR DAY: Firstly, just to alleviate the concerns about inversions. Wind farms are luckily one of the noise sources that are not terribly affected by inversion layers because inversion layers only occur when there is no wind and they do not operate when there is no wind so they have that benefit that they do not get the normal defraction patterns that happen due to inversion layers.

25
30

[11.05 am]

But what you can do if you are hearing a noise that you think is unreasonable is that hopefully there will be measurements either will have been carried out or may be being monitored near your place and you will be able to check up with the council what those noise levels were and if something really unusual is happening then we have this provision now for the subjective evaluation to be done as well by two independents.

35
40

MRS HARKER: So how soon will it be fixed?

MR DAY: Well, it cannot be instantaneous for the reasons that I mentioned in my - but I would hope that somebody would be able to assess it within a matter of days and in terms of de-rating and modifying the turbines might be within a week or two of that.

45

MRS HARKER: Thank you. That, ma'am, is one of our biggest concerns. Thank you.

5 HER HONOUR: Thank you. Mrs Harker. If I could just return to you for a moment back to this question of industrial noise and I am aware of what you said in your evidence about the noise from turbines being very like those of a damn, but as you also point out that this spreads over a very wide area and most of the residents who are before us actually live on
10 rural residential plots and the question I guess I am asking you is, is it fair to subject a community as cohesive and as concerned as this to what is in your words, industrial-type noise?

MR DAY: In my opinion it is that level of industrial-type noise
15 **(INDISTINCT 11.07.08)** but let us stick with that for a moment, of that industrial-type noise is at a reasonable level in my opinion it is fair. The district plan envisages and would allow every rural residential site in this district to be exposed to 40 dBA. If we think that is inappropriate then that is heading in **(INDISTINCT 11.07.34)** either
20 inaudibility or 30 dBA because this whole area deserves much greater protection than that is fine.

But my understanding is that every house, every rural residential house, in this district could be exposed to 40 dBA from either a chicken farm
25 with big fans that go on the end of the sheds or a hydro electric power station rather than dam which is what I was referring to and have water noise over a spillway.

I do work for Mighty River Power on their hydro stations. And every
30 rural residential house could be exposed to that level of noise. It needs to be assessed carefully a wind farm because it is going to affect a large number of people but that is also the case for motorways, new motorways that go through areas, they affect a large number of people. And the limits for those are much higher again than those sort of dBAs.

35 Airports affect a large area of the community. So there some other commercial industrial activities that make noise that affect large groups of the community and 40 dBA is regarded as a very good level of protection. In the past it has been neither 45 nor 40. That has shifted
40 down in the last 10 years and now it is generally 40 and sometimes 35. 40 is the normal good level of protection.

HER HONOUR: Yes, thank you.

45 MR KLEIN: May I make a comment?

HER HONOUR: Yes.

MR KLEIN: Good morning, Mr Day and Board. Mr Day, I have to confess I
 5 have a real problem with the way you bring in motorways, airports,
 chicken farms and (**INDISTINCT 11.09.39**). We are not talking, with
 respect, to this. We are not talking about airports or motorways in this
 context. And in this context as ma'am has rightly noted, we are
 residents who have subscribed to living in a particular area because of
 the quiet rural amenity values they offer.

10

[11.10 am]

I wonder when you and your predecessor, Mr Hegley, labour the point
 of the 40 dBA as the World Health Organisation level of acceptable
 15 noise, I would suggest, and correct me if I am wrong, that when those
 kind of levels are set by an organisation like the World Health
 Organisation the recommendations to try and get a buy-in from a global
 community - these are people who live in highly industrialised areas, as
 well as elsewhere, to try and find a medium a lowest common
 20 denominator if you like, or a minimum standard or a minimum
 recommendation to get a minimum buy-in to ensure the health of the
 greatest number of possible people. And we have heard and it has been
 accepted that - -

25 HER HONOUR: Could you ask a question please?

MR KLEIN: - - - a high amenity area - - -

HER HONOUR: Excuse me.

30

MR KLEIN: And my question to you is, sorry to take so long but I felt I had
 to make my point.

HER HONOUR: Yes.

35

<QUESTIONING BY MR KLEIN

[11.11 am]

MR KLEIN: My question to you is, how can you justify a 40 dBA as
 40 reasonable in this kind of environment? And I do not think you can.
 Please answer that.

MR DAY: I think the five minute discussion I have just had with you
 answering your Honour's questions explained why I think 40 is
 reasonable. But to follow a little further along the lines of your
 45 introductory comments, the 30 dBA WHO recommendation for internal
 criteria is actually not a compromise in terms of the various parties

buying on, it is very specifically stated in it that it is an ideal objective that in practice cannot be reached in most situations in industrialised countries overseas and whatever. And 30 as internal is put forward as the ideal objective. And it is specifically stated in the document.

5

And so the 40 dBA outside with open windows will give you - even with open windows before you shut them - will give you a level of 25 inside. So 40 dBA is giving you a 5 dB safety on what the WHO regard as an ideal objective.

10

MR KLEIN: So why do we have continuing complaints from people who identify a particular incessant repetitive noise that is quite unlike the sway and come and go, and I remember you noted the port of Auckland's problem with the beep beep beep of the reversing trucks that drive people nuts. I put it to you that the tonal characteristics people are identifying from wind turbines are not dissimilar and just as irritating. Someone at some point in earlier hearings made the analogy of a mosquito. That is not a loud noise but it is a very incessant and very irritating one.

20

HER HONOUR: I wonder if we could hear from Mr Botha which might actually answer some of your questions.

MR KLEIN: Thank you.

25

HER HONOUR: Right thank you. I want to close this down now. We are running out of time for various people who have come for this hearing. So I wonder please, Mr Lloyd, can he be introduced, Mr Maassen, thank you.

30

MR MAASSEN: Mr Lloyd, you have come to this hearing for the purpose of this caucusing and you have indicated this morning how the caucusing has advanced. Would you please answer any questions that people have in relation to those matters in your evidence-in-chief. Thank you.

35

MR LLOYD: Yes, I will.

HER HONOUR: Ms Price.

40

<EXAMINATION BY MS PRICE

[11.14 am]

MS PRICE: Mr Lloyd, you have Mr Maassen questioning Mr Hegley and Mr Day extensively regarding the robustness of various provisions of the new standard. As Mr Hegley outlined in his opening, you have now agreed a revised set of appropriate acoustic conditions with Messrs Hegley and Day and Dr Trevathan. Is that correct?

45

[11.15 am]

- 5 MR LLOYD: That is correct.
- MS PRICE: Those conditions are based around and adopt the provisions of the new standard, do they not?
- 10 MR LLOYD: Yes, they do.
- MS PRICE: So do you accept that the new standard includes noise limits that, as the standard states, “are sufficient to provide protection against sleep disturbance and maintain reasonable amenity at noise sensitive locations”?
- 15 MR LLOYD: I believe that the standard used in conjunction with the proposed noise management plan will assess whether that will be appropriate level of control, yes.
- 20 MS PRICE: Thank you. Do you also consider the normative status of appendix B to the new standard is consistent with the best practicable option approach to noise provided for in the RMA? That is, it would allow for the use of improved assessment methodologies should those become available in the relevant timeframes?
- 25 MR LLOYD: I missed the last bit, I am sorry.
- MS PRICE: Do you consider that the new standard allows for the use of improved assessment methodologies should those become available in the relevant timeframes?
- 30 MR LLOYD: I actually think appendix B is a normative standard and I disagree with Mr Hegley’s assessment of normity. If you look at the description of normity within the standard, it actually means it is an integral part of the standard. It is not – if you want it to be advisory then that is like in appendix A which is informative. So I have a little difference of opinion with Mr Hegley as to how appendix B should be operated. I think that is an integral part of the standard and so that applies the sort of current level of knowledge and I am not sure that that is able to be changed in the future in the way it is written. It would need a new standard to do that.
- 35 MR LLOYD: I actually think appendix B is a normative standard and I disagree with Mr Hegley’s assessment of normity. If you look at the description of normity within the standard, it actually means it is an integral part of the standard. It is not – if you want it to be advisory then that is like in appendix A which is informative. So I have a little difference of opinion with Mr Hegley as to how appendix B should be operated. I think that is an integral part of the standard and so that applies the sort of current level of knowledge and I am not sure that that is able to be changed in the future in the way it is written. It would need a new standard to do that.
- 40 MR LLOYD: I actually think appendix B is a normative standard and I disagree with Mr Hegley’s assessment of normity. If you look at the description of normity within the standard, it actually means it is an integral part of the standard. It is not – if you want it to be advisory then that is like in appendix A which is informative. So I have a little difference of opinion with Mr Hegley as to how appendix B should be operated. I think that is an integral part of the standard and so that applies the sort of current level of knowledge and I am not sure that that is able to be changed in the future in the way it is written. It would need a new standard to do that.
- 45 MS PRICE: In your caucusing you have also agreed to the proposed provisions for a noise management plan, haven’t you?

MR LLOYD: Yes.

5 MS PRICE: Those provisions provide for an independent assessment to be made for unreasonable noise by both an appropriately qualified acoustic expert and council's environment health officer, don't they?

MR LLOYD: Yes.

10 MS PRICE: Do you consider that these experts will be qualified and experienced in making assessments of unreasonable noise?

MR LLOYD: Yes.

15 MS PRICE: Mr Lloyd, do you consider that if imposed and combined with the revised proposed acoustic conditions you have agreed with the other acoustic experts, that that will provide an appropriate level of protection for residents?

20 MR LLOYD: Yes, I do.

MS PRICE: Do you consider it would have assisted if similar conditions and noise management plans had been imposed for the Makara wind farm?

25 MR LLOYD: No, I do not think the way that panned out it would have helped much.

MS PRICE: Why is that?

30 MR LLOYD: Because many of the provisions that were provided for Makara were similar to these and the issue became one of the fact that the turbines that were supplied, even though early emissions reports indicated that they would be appropriate. In fact, the turbines that were supplied did generate noise with special audible characteristics, which has proved an issue for residents and cause complaint. So the issue was
35 that there was some element of not wide element of non compliance, but there were issues with the turbines, which I understand have been corrected now or have been reported to be corrected now. But they did cause complaint for the period that they operated up until February this
40 year, even though the standards similar to these ones were in place.

MS PRICE: So Mr Lloyd, I put it to you that that was actually the task that was set out for you acoustic specialists, was to agree a noise management plan draft provisions here which would stop the
45 management issues that had occurred at Makara.

MR LLOYD: Sorry, yes. I believe that the noise management plan would – is a lot stricter. That element of it is a lot stricter than was provided at Makara and would have assisted, yes, sorry.

5 MS PRICE: Okay, so just to clarify for the transcript, do you consider it would have assisted if similar conditions and noise management plans, as you have now caucused and provided, had been imposed for the Makara wind farm?

10 [11.20 am]

MR LLOYD: Yes, I do.

15 MS PRICE: Thank you. Mr Lloyd, in your opening statement yesterday, if I have recorded you accurately, and I do not have the transcript available yet, you told us of the situation where because of wind farms, such as Makara, started with one or several tonal effects, reducing the tone to levels not annoying to residents was difficult because they were already sensitised and tuned in to the tone, correct?

20

MR LLOYD: Yes.

25 MS PRICE: Given you are presently, and I quote “jaded by wind farms”, and indeed you mention some fairly emotional responses from complainants in meetings that you had. Are you tempted to go tougher on wind farm developers as you are “left sure of the ability of the standard to control noise and to make sure people are not annoyed”?

30 MR LLOYD: I think I said I was less sure than Mr Day of the ability. Mr Day seemed to be very confident of the ability of the standard and I think I explain with my experiences that I was less sure. I have considered that obviously in the ability to reduce noise. But I do come back to the actual levels that we are talking about and when you start talking about 35 dBA limits during quiet background sound levels, it is very difficult to recommend that stricter levels than 35 dBA be applied in my professional opinion.

35

40 MS PRICE: Thank you. Do you think it is the purpose of the wind farm standard to ensure people are not annoyed?

40

45 MR LLOYD: I think the purpose of the wind farm standard is to protect amenity to the degree where the great majority of people are not annoyed. I think there will be – the standard will allow for a small percentage of people who are more sensitive to noise. Some annoyance will remain, but the aim is on the Bell Curve to pick up in 80 or 90 percent of the population and ensure that they are not severely annoyed.

5 MS PRICE: Thank you Mr Lloyd. I now want to explore with you whether you think this annoyance is an emotionally derived value judgement or a health issue. You and I have to try and make sense of some of the hieroglyphics in this case. Mr Lloyd, are you aware of the meaning of the term “nocebo effect”? We are all familiar with placebo effect, but are you familiar with nocebo effect?

10 MR LLOYD: I think I have heard of it before. What does it mean?

MS PRICE: Nocebo effect mirrors the placebo effect. It is the polar opposite. It is when people experience symptoms of illness due to their expectations that a particular effect or event or treatment should cause such symptoms. With all your current wind farm work, have you read the analysis of the nocebo effect in the December 2009 expert panel review of the American and Canadian Wind Energy Association?

MR LLOYD: No, I have not.

20 MS PRICE: I would like to table a new exhibit here, which is that report. I think – is it number 113? Your Honour, I forgot to introduce this by Mr Day this morning, but they are still in the hot tub. So if I could introduce this via Mr Day now?

25 HER HONOUR: This has been cited in one of your expert’s briefs. I am not sure whether it is Mr Hegley, is it, or Mr Day?

MS PRICE: It has been, and it will be the subject of further cross examination this afternoon.

30 HER HONOUR: Yes, thank you.

EXHIBIT #38 - EXPERT PANEL REVIEW OF THE AMERICAN AND CANADIAN WIND ENERGY ASSOCIATION, DECEMBER 2009

35 MS PRICE: As you have not read that, I would like to invite you to have a read while the hot tub continues and if you do have any response to the discussion of nocebo effect in that document, I think it would be useful if the hot tub could have that discussion later. Now, for the benefit of the Board - - -

40

[11.25 am]

45 MR LLOYD: Can I just comment that it is talking here about adverse outcomes of mental and physical health and I am not an expert on mental and physical health.

5 MS PRICE: No, unfortunately, I think we have had made clear to us that we have two types of experts in this hot tub. So we have what I would call the acoustic experts – of which you and Mr Day and Mr Hegley and Mr Trevathan – but we have attempted caucusing and agreeing conditions with the other type of expert, and Dr Thorne advised us yesterday that he is psychoacoustic expert. Now, this report is specifically addressing psychoacoustic issues.

10 MR LLOYD: Of which I am not an expert.

MS PRICE: Okay, thank you. So - - -

15 MR LLOYD: I can, I mean I have sat through – and I am sure this effect may have influenced some people in some instances, there is a lot of people involved in complaining at West Wind and at Te Rere Hau. I can use one example, if you like, that has convinced me of peoples approach to the wind farm noise and I sat through the Te Rere Hau hearing and listened to the evidence of Ms Huffman. And Ms Huffman stated during that hearing that she thought Te Rere Hau was a really good idea at the outset and she had no concerns about it and, in fact, she supported it at the outset of the hearing, and it was only she heard the noise that she became an opponent of that wind farm.

25 So I think, particularly as far as Ms Huffman is concerned, that I would say the nocebo effect certainly would not apply to Ms Huffman, in that her concerns are new concerns that resulted from listening to the wind farm itself, she was not against the wind farm in the first place. There are other people who were against the wind farm and against wind farms initially, and I am not sure what their mental situation is I am not an expert on it, but that is my position certainly as far as that example is concerned that Ms Huffman was not against the wind farm in the first place.

30
35 MS PRICE: No, but she is against this wind farm and on the evidence that was served on 1 February it is clear that it is the Te Rere Hau wind farm and its extension that control the noise contour not this wind farm?

40 MR LLOYD: I accept that.

MS PRICE: And Dr Huffman has what is more not appealed the Te Rere Hau extension, and we have quite a difference in noise conditions between those two wind farms, would you agree with that?

45 MR LLOYD: Oh, the extension has very little relevance as far as Ms Huffman's dwelling is concerned. It is further away than the

existing wind farm, so the actual increase of noise from the extension will not make a great difference. So I think it is wise, and it is probably appropriate, that Ms Huffman did not appeal the extension.

5 MS PRICE: Do you agree that the conditions for the current Te Rere Hau wind farm, which controls the noise contour, are very different from the conditions that you have now agreed for this wind farm?

MR LLOYD: Yes.

10

MS PRICE: Do you agree that the Te Rere Hau wind farm controls the noise contour in the area where Dr Huffman's house is located?

15 MR LLOYD: Sorry, I thought we were talking about nocebo effect in the first instance.

MS PRICE: At no point have I raised nocebo effect and mental health issues in relation to Dr Huffman. You have raised Dr Huffman so I have now gone back to question you about the physical noise effects as an acoustic expert vis-à-vis Dr Huffman, Te Rere Hau and the Turitea wind farm.

20

MR LLOYD: I apologise for not answering your question.

25 MS PRICE: Okay. So my question is, do you agree that it is the Te Rere Hau wind farm that controls the noise contour in Dr Huffman's general region of her property?

[12.30 pm]

30

MR LLOYD: I would need to check on that.

MS PRICE: Well, could I ask that you do check on that, I think it is quite a key part of this case is that there is an existing wind farm which is causing issues, which again we need to explore as to what is an appropriate level of annoyance, no one wants to design a wind farm to annoy residents. And I am looking at those issues of annoyance as opposed to adverse health effects from some of the other topics that I will be getting into with Dr Thorne, but just sticking with the annoyance issues for a group of residents around the wind farm, vis-à-vis the existing wind farm there seems to be a level of annoyance.

35

40

MR LLOYD: Yes.

45 MS PRICE: The conditions for the noise at that wind farm are quite different to the ones you have just agreed?

MR LLOYD: Yes.

5 MS PRICE: Would you agree that the ones for the Turitea wind farm are much more stringent than the ones for the Te Rere Hau wind farm?

MR LLOYD: They are more stringent, yes.

10 MS PRICE: Thank you, Dr Lloyd. I think I can leave that subject with you but I do invite you to go back to Mr Hegley and Mr Day's analysis where they have confirmed that it is a noise contour controlled by the Te Rere Hau wind farm in that area.

15 HER HONOUR: Ms Price, I think we will take an adjournment.

MS PRICE: Thank you.

HER HONOUR: Thank you.

20 **ADJOURNED** **[11.31 am]**

RESUMED **[11.51 am]**

INITIAL RECORDING CUT OFF

25

MS PRICE: - - - on high amenity issues and no doubt that is going to be the subject of questioning for the planners in the coming days and also legal submissions, as to what the meaning of high amenity areas vis-à-vis the Turitea wind farm. Have you reviewed the district plan and are you aware of the noise controls in the rural zone?

30

MR LLOYD: Yes.

35 MS PRICE: What do you say about those noise controls, do you recall what activities are permitted in the rural zone?

MR LLOYD: I would have to look at the plan specifically to see. I know there are exemptions for activities also in section 6 of the district plan.

40 MS PRICE: Well, I will try to guide you through so you do not have look at the district plan.

MR LLOYD: That would be nice, thank you.

45 MS PRICE: Rule 9.6.1 lists permitted activities for the rural zone and they include farming - and they exclude factory farming just to be clear -

horticulture, some river protection works – which are not really relevant here – and roads and traffic. They also include as permitted activities production forestry, and essentially to proceed with that you just have to file a harvesting plan, that is not something that council reserves approval processes to as a permitted activity. My analysis of the plan is that there are no noise limits applying to all of those permitted activities, is that your analysis too?

MR LLOYD: I believe that they would be exempt in the section 6 part of the plan, yes.

MS PRICE: So the 40 dBA base level protection at night applies to other activities in the rural zone, not those permitted activities?

MR LLOYD: Yes.

MS PRICE: It is 50 dBA at daytime and 40 at night just to be fulsome?

MR LLOYD: Yes, and it applies at the site boundary not the notional boundary so that is the only difference there.

MS PRICE: So would you agree that in theory there are, therefore, no controls over quite a large range of rural activities in that rural zone, it might be bird scaring for horticultural purposes or felling trees for the production forestry, which could even occur through the night if they had lights?

MR LLOYD: Well, the noise limits in the district plan do not apply but, of course, section 16 would still apply to them, and the noise would not be unreasonable and you would have to draw up the best practical option.

MS PRICE: I agree with you. what I am trying to explore here is not the RMA but the high amenity issues for these areas around the Turitea wind farm.

Now, when I look at the district plan, in respect of rural lifestyle subdivision, I could not find anything about reverse sensitivity impacts on such subdivision, they appear not to be provided for, do you agree with that?

MR LLOYD: Yes.

MS PRICE: So, to me, that means that the rural-residential lifestyle subdivision residents that come to those subdivisions cannot, via the plan, have an expectation of high amenity, do you agree with that?

[11.55 am]

MR LLOYD: They would - - -

5 MS PRICE: They may be achieving it now, I am not debating that with you.

MR LLOYD: No, and that is where I was going to go - - -

10 MS PRICE: - - - I am asking you, do you think the district plan provides for it?

15 MR LLOYD: That is where I was going to start but your question was, with relation to the district plan. Now, as far as high amenity is concerned, if you looked at the district plan there are elements of activities that you would expect to occur in a rural area that are exempt from the noise limits in the plan, and those people could experience, from time to time, higher noise levels from those activities. But there are noise limits, the 50 and 40 decibels noise limits, that would control other types of activities that would provide a raised level of expectation for those people for activities you would not expect to find in the rural-residential area.

20 MS PRICE: But vis-à-vis the permitted activities in the rural zone at the moment there is a range of permitted activities, which we all agree some of which could be quite noisy, which are not provided for with noise limits and, therefore, we have got the 40 and the 50 dBA applying?

25 MR LLOYD: But generally they are things like farming and forestry that would occur on a seasonal basis, so that you would not expect to get high levels of noise from those on a constant sort of basis, so there will be times when it will be noisy but there would be an expectation that between those times it could be relatively quiet.

30 MS PRICE: Well, I would say that roads and roading is something that could continue on quite a long term basis and I would say that bird scaring activities, in relation to horticulture, could go for quite a long period in terms of the annoyance effects, would you agree?

35 MR LLOYD: Well - - -

MS PRICE: There has certainly been a lot of cases on it.

40 MR LLOYD: Well, I have said it was seasonal and I think bird scaring is – roading is not seasonal – but bird scaring devices is highly seasonal and it only occurs when the fruit is ripe to be picked or on the - - -

- 5 MS PRICE: Thank you. Mr Lloyd, I would now like to change our line of questioning and I would like to take you back to an earlier case that you were involved with. I am talking about the case of Wellington Airport v Wellington City Council, and specifically the Corrigan development, you can recall that?
- MR LLOYD: Yes, I can.
- 10 MS PRICE: You appeared for the developer, correct?
- MR LLOYD: I did.
- 15 MS PRICE: The developer wished to construct residential units inside the noise contours for Wellington Airport, specifically the L_{dn} 67 day time contour, correct?
- MR LLOYD: That is correct.
- 20 MS PRICE: I understand that the L_{dn} 67 is roughly equivalent to an L_{eq} 67 in day time and an L_{eq} 57 at night, have I got that right?
- MR LLOYD: That is correct.
- 25 MS PRICE: So I am a bit perplexed, if you can recommend residential development in an L_{eq} 57 at night, why are you against an L_{eq} of 40 at night for wind farms?
- 30 MR LLOYD: Well, the circumstances are entirely different of course, in one situation you have got a residential development that is occurring inside a suburban centre area of Wellington. I can go through that case if you like. There are specific noise limits provided for in the residential area, if it had been over the road in the residential area then the standards would have applied, the insulation standards would have applied to the dwelling, and it would have basically gone through as a – it would not have had to go to a hearing at all. So it was the fact that the – I mean the development was occurring in the suburban centre kicked it into a resource consent hearing in the first place.
- 35
- 40 MS PRICE: I find that quite interesting, because what you are saying is basically a suburban centre with noise controls in place you would distinguish from a high amenity area around the rural zones where you are saying you would like an L_{eq} of 35?
- 45 MR LLOYD: Sorry, I do not understand that question.

[12.00 pm]

5 MS PRICE: I probably have not explained myself well. You are saying that because it is in a suburban area in Wellington somehow that distinguishes it from these rural areas where, even though they do not have a right via the district plan to be treated as a high amenity area, you would give that to them?

10 MR LLOYD: But, as I was going to go on to say, because it was in a suburban centre there was no outdoor area at all for the apartments, they were three-storey apartments on the edge of Maupuia looking over Evans Bay with a wonderful view and a wonderful visual amenity that was described by others. There was hardly any outdoor amenity available to the dwellings, so the intention was to provide a high or a
15 reasonable level of amenity inside the dwell - by providing noise insulation to that dwelling, and that is what was done.

MS PRICE: Have you ever proposed 35 for anything other than wind farms?

20 MR LLOYD: I have been doing it for 30 years so, and to say - - -

MS PRICE: And - - -

25 MR LLOYD: - - - that is a difficult question. I do not normally go as quiet as 35 dBA.

MS PRICE: Thank you. And within that Corrigan development, was it relevant to your analysis that there was a no complaints covenant being put on the property?

30 MR LLOYD: No. In my opinion a no complaints covenant provides a warning to residents or prospective buyers of a property that they are moving into a situation where the high noise levels will exist but, in my opinion, it does not help to mitigate the adverse effects at all, so I am
35 not a great supporter of no covenant situations other than that.

MS PRICE: Thank you, Mr Lloyd, I have not further questions.

40 MR LLOYD: Thank you.

HER HONOUR: Thank you. Mr Maassen?

MR MAASSEN: No, thank you, ma'am.

45 HER HONOUR: Mr Johnson? No, anyone else? Thank you. Mr Heerdegen?

MR HEERDEGEN: No, thank you.

HER HONOUR: Mr Bunting?

5 MR BUNTING: Thank you, Mr Lloyd, perhaps the question may more appropriately directed at Mr Botha, but at Makara the report says the problem has been fixed, has that been reflected in the complaints record since the fixes were done, do you know?

10 MR LLOYD: We have still received complaints since the council – I do not how many complaints to be honest with you, I could check that with Mr Borich if that was required, but I know that complaints are still being received by council from various parties. Although one email I read, from a party that has complained on regular occasions, indicated
15 that the tonality had been corrected but there was still concerns about amplitude modulation from that particular complainant, so that is a positive in that respect.

MR BUNTING: So you are not aware if complaint numbers have dropped?

20 MR LLOYD: I still know of one complainant in particular who is convinced that the situation is still unacceptable to them, but I am not sure overall what the circumstances are, and the weather conditions have not been such that – although just lately I see the northerly has been gusting a little bit, so it could well be that those circumstances have arisen, so it
25 will be interesting to see.

MR BUNTING: The second thing on the Makara report, I think you made comment you had completed your peer review only a couple of nights ago - - -
30

MR LLOYD: Sunday night.

MR BUNTING: - - - the council, so are you able to make any comment at all about that or is it - - -
35

MR LLOYD: It is basically with Phillips Fox at the moment being looked at as far as the legal aspects are concerned and it is due to be released tomorrow so I am reluctant really to – I am happy to talk about the Meridian report which has been released - but what my actual findings are, probably if the Board would allow me to not go into great depth on that I would appreciate that.
40

MR BUNTING: Shall we leave that, ma'am?
45

[12.05 pm]

HER HONOUR: Yes.

5 MR BUNTING: In the hearing I think we have heard people from Ashhurst
talk about noise problems in Te Apiti, do you know if there have been
any special audible characteristic issues from there which have caused
those complaints?

10 MR LLOYD: Actually it is Mr Botha's wind farm again and so - - -

MR BUNTING: What, sorry?

15 MR LLOYD: It is a Meridian wind farm, Mr Botha's is coming to see you
soon so perhaps that is a question you could ask him. I am aware that
extensive noise readings have been undertaken there and, in fact,
comparisons of the prediction methods have been undertaken there as
well - so that may be of interest to the Board - but I understand that they
have isolated what the issues are and put fixes in place to try and
correct those but Mr Botha will be able to confirm all that.

20 MR BUNTING: Thank you very much. And it is just a question I asked
Mr Day, I would be interested to know your view, you know if there is
a problem. We have got these two officers or two experts that look at a
problem and it is this question of what the assessment criteria might be,
25 another easement on this, have you got anything to add there?

MR LLOYD: Certainly at West Wind – I mean it is difficult to know what the
problem is going to be, if there is one, I mean hopefully there will not
be any and that will be a wonderful situation.

30
ut if there were problems to arise the first issue is in identifying that
problem and what weather conditions it occurs and where it occurs, and
it may be that visits will be made outside dwellings, inside dwellings, to
assess specific problems that are occurring inside dwellings. So there is
35 a raft of things that can be done, and certainly with more experience
that we are getting with West Wind there is a greater body of
knowledge about how to approach these things. And the trick will be in
if there are issues or complaints arising when compliance occurs, and I
anticipate that is where you are coming from.

40
And, you know, there could well be that you have got a special audible
characteristic inside a dwelling, say where compliance is being
achieved, or it is impossible not to prove compliance because of high
wind conditions outside, for example. And it is that stage where you
45 would say, "All right, even though inside the house the noise level is 25
decibels and should be acceptable, we have got this tonality and we are

5 measuring it, we can all hear it – maybe even not measuring it we can all hear this tonality – and that is unacceptable”, and that noise becomes unreasonable at that stage. And that is where I see that part of the noise management plan kicking in and providing for a fix for those problems for de-rating or for some remedial action.

MR BUNTING: So you are relying fairly heavily on the judgement of the council officer and the acoustic - - -

10 MR LLOYD: Yes, it is.

MR BUNTING: Thank you very much. Thank you, your Honour.

15 HER HONOUR: Mr Shenton?

MR SHENTON: No, I do not have any questions.

HER HONOUR: Mr Hudson?

20 MR HUDSON: Mr Lloyd, are you advising council on compliance or otherwise of Te Rere Hau?

MR LLOYD: Yes.

25 MR HUDSON: I am aware that we have not got evidence, say from Mr Hunt, on that so I do not want to go there but Ms Price did ask you some questions about the noise conditions applying to Te Rere Hau and you said that they are quite different to this.

30 MR LLOYD: Yes.

MR HUDSON: Can you just give us an opinion as to the effectiveness of the conditions which you have signed up to this morning, in terms of the residents - like the Huffmans and Stewarts and others in that area - who are obviously very concerned about the effects that they might be experiencing knowing what they are currently experiencing from Te Rere Hau?

[12.10 pm]

40 MR LLOYD: Yes, the Te Rere Hau certainly predated Taranua 3 and West Wind, so at that time there the concept of this low background sound level was starting to become more and more apparent and being developed. Te Rere Hau does not have that, it just has a basic 40 dBA noise control and it is very prescriptive as to – in fact it only applies in
45 one location and it very prescriptive as to what wind conditions that

5 should be applied and how it should be measured and was a product basically of that first hearing at Te Rere Hau. So since that time there have been a number of different hearings and I see a lot in the new standard that has resulted from West Wind in particular and the control measures that arose during that hearing with the help of overseas experts that were there; Dr van den Berg and Malcolm Hayes were at that, and Mr Hegley and myself and Mr Thorn. So it was a sort of a great opportunity really to advance the levels of where we were.

10 I see the 2010 version of 6808 coming from that with further improvements as well. So I think that the noise management plan in particular I am impressed with in the way that it does attempt to provide for short term assessment of problems and for fixes should problems occur, and the way that there is a sort of proactive way of monitoring the turbines as they come on line.

15 I think is as up to date as you can get. There is no – the state of knowledge cannot be more up to date than the level of conditions and the noise management plan that we have provided for and that is why I support. It is a long way away from – it is much better I think than the Te Rere Hau conditions which I have yet – I have been given a brief from Palmerston North City Council to review that compliance certificate and that is due by the end of the month. West Wind, I have not been able to do it yet.

25 MR HUDSON: So even though Te Rere Hau may be complying with its conditions, its conditions are so different that the effects on people could be quite different?

30 MR LLOYD: One of the issues with Te Rere Hau is with the character of the turbines, and they are specifically quite different from anything that would be put at Turitea for example in the first instance. So there are issues with assessing that particular character of noise and determining how acceptable that is to the residents and, you know, there is not a lot in the conditions that assist with that determination, although the control measures do provide for the assessment of special audible characteristics but there is a struggle to determine whether they exist or not at the dwellings.

40 MR HUDSON: Well we do not know. It is outside the expertise that we have got here to go into that so I will not.

Okay, thank you, Mr Lloyd.

45 HER HONOUR: Mr Lloyd, do you think that if we had instituted as one of the people who signed off on the Makara decision if we had instituted

Dr Thorne's 30 dBA that it would have avoided the problems at Makara?

5 MR LLOYD: It would have been so different it is difficult to determine whether it is the actual level that is the issue. I think there are people who are experiencing noise levels of 30 dBA who are still complaining about the noise. But obviously the quieter it gets basically then there will be less objection to the noise, but I do not think it would have made the issue go away completely, except in a way that there may have been 10 much less development, there may have been fewer wind turbines because of the noise issues. Obviously there would have been actually. There would have been fewer wind turbines and in that respect the issue would have been less.

15 [12.15 pm]

HER HONOUR: When you do your measurements do you do the same sort of measurements as Dr Thorne, or do you have completely different instruments? I will ask him this. I mean what is the difference between 20 you?

Different disciplines – yes.

25 MR LLOYD: Yes.

HER HONOUR: What about the measurements, because Dr Thorne says you can measure these special audible characteristics, and he has been doing that, he says both here and at Makara. So what are the sort of mechanical differences between you? 30

MR LLOYD: Well I have been measuring special audible characteristics using narrow band analysis separately to Meridian's monitoring, they have got noise measurement terminals. They have got four locations and one roving location. So they have been collecting all the background data for long periods of time and what I have been doing is going separately and using separate equipment to set up outside and inside people's houses and measuring. You know, we have measured special – I have measured special audible characteristics and tones at West Wind. So in that respect for special audible characteristics and also amplitude modulation, we have been measuring that separately, 35 too, in a similar way to Dr Thorne.

45 I am not sure exactly. I have not seen a report from Dr Thorne on how he has gone about doing that so I am not exactly sure what the differences are. But I suppose the main difference is that we have been relying on the long term terminal noise readings that come from the in

situ noise monitoring to a degree and then doing further analysis around any special audible characteristics that we have been perceiving.

5 I think that is the difference is that – or the difficulty is that getting there when those issues are occurring has been something of a problem but we have managed to do that.

10 HER HONOUR: Do you think that criteria should be developed as to what is reasonable for special audible characteristics in the way that we seem to have developed them for noise levels?

15 MR LLOYD: Well the methods that are used and are set down in the standard do come up with penalties that apply, and anything from one decibel up to six decibels might apply. So I suppose there almost needs to be a – well there is a need for subjectivity, for being able to go and listen to that sound and decide whether that sound is audible, is intrusive and is annoying. Certainly the first time I walked into a dwelling in South Makara Road and was able to hear the tone it was like “Ah, I understand what the residents are saying. I agree that is unacceptable”.
20 Then I was able to measure it as well, which I think was a bonus.

25 But really both Matthew Borich from Wellington City Council and I, we walked out into the car and we said, “Yes, okay, we know what the residents are complaining about now”.

So you measure it to death but there is nothing quite like going and listening to the sound and finding it and hearing it and saying subjectively that is a problem and we need to do something about it.

30 I think that is provided for in the standard now.

HER HONOUR: Yes.

35 MR LLOYD: There is an element that you can go in and listen and there may be – you know, I do not think there should be too much of an overemphasis on the monitoring. It is great for compliance but when you start talking about unreasonable, you know, it is unreasonable to who, to a degree. But if you go in and listen and hear it and it is a problem then – it was pretty obvious at that stage.

40 HER HONOUR: But Dr Thorne had been making those measurements before. He agrees with you that you have to measure the sound.

45 MR LLOYD: Yes.

[12.20 pm]

HER HONOUR: What has puzzled me is why is this vacuum between what he is suggesting and what you are suggesting, your group if I can call you that, at this point.

5 We have had a submitter who talked about deaf children and how they can, in spite of being deaf, because of special audio ear characteristics they can hear sounds other people cannot hear and we were very interested in that and we will be picking that up in our report probably.

10 There just seems to be some people who pick up these characteristics, really like litmus paper, whereas others do not actually notice them. We have had anecdotal evidence just generally around that at Makara some people hear vibration through, or experience vibration through the floor and mattress and these are top professional people, and in the
15 the same house another resident will hear tonal noise which is bothering. So you know, this is what we are concerned about of course.

But you do not think you can go down the track of establishing criteria for reasonableness of special audible characteristics?

20

MR LLOYD: Using your example, I would not know how to do it for vibration in a mattress. You know, if the crockery rattles – I have not seen it at a wind farm but I have seen issues where some sort of vibration occurs and the crockery rattles in the sideboard, and I do not
25 know how to – that is unreasonable but I do not know how to write conditions for that.

That is why I am saying if you walk in and subjectively – there is an infinite number of variables that could occur.

30

HER HONOUR: Yes.

MR LLOYD: We know how to measure tones, we know how to do amplitude modulation, but there is a limit on what you can do as far as define –
35 and how accurate those are, you know, whether five dB is an appropriate penalty that should apply, or six dB is an appropriate level to apply that is not an exact science, the Board should understand that. But it is like the dBA level that you use, it is a way of simplifying a very complex situation and you are not going to get – you are not going
40 to be able to deal with every single acoustic noise issue with one number, or with one set of tones.

So you almost need to be able to have this situation where someone goes along and says, “Okay, you know, you are complying. Everything
45 stacks up but, hey, that is unreasonable. There is something happening here which is not right”.

HER HONOUR: Well thank you very much, Mr Lloyd, for your help and assistance. It has been considerable, thank you.

5 MR LLOYD: Thank you very much.

HER HONOUR: Now we come to Dr Thorne. Mr Johnson?

MR JOHNSON: Judge, yes, Dr Thorne, your Honour.

10

<EXAMINATION BY MR JOHNSON [12.24 pm]

MR JOHNSON: Dr Thorne has been engaged by Huatau Marae as a noise expert. He has submitted evidence for the redesign, including in November, and he has been participating in the caucus with other noise experts. Do you agree, Dr Thorne?

15

DR THORNE: Yes.

20 MR JOHNSON: Could you please make yourself available for cross-examination?

HER HONOUR: Sorry, I have omitted asking Kevin and Lyn Low and also Jan Dixon whether they want to ask questions of Mr Lloyd. I think we would prefer to move on to Dr Thorn, he has got a plane to catch, if that is appropriate? Thank you. Right.

25

[12.25 pm]

30 Dr Thorne, do you think you might change places please so that some of the Board members can see you, and move into the centre.

DR THORNE: I do not have to fly out until tomorrow.

35 HER HONOUR: Right. Thank you. That is helpful, thank you. Ms Price?

<CROSS-EXAMINATION BY MS PRICE [12.26 pm]

MS PRICE: Dr Thorne, at paragraph 3.3 of your statement of evidence regarding the redesign you state, "Mr Hegley's predicted sound level at Huatau Marae was previously 41 dBA L_{eq} , correct?"

40

DR THORNE: Yes.

45 MS PRICE: What did you base your figures on?

DR THORNE: My calculations.

MS PRICE: Could you make those available to us please?

5 DR THORNE: My calculations are in the report.

MS PRICE: In the same paragraph in that report you go on to say that Mr Hegley's predicted noise level at Huatau Marae as a result of the redesign proposal is 40 dBA L_{eq} , correct?

10

DR THORNE: Yes.

MS PRICE: Dr Thorne, is it not correct that Mr Hegley's original predicted noise level for Huatau Marae was in fact 36.8 dBA L_{eq} ?

15

DR THORNE: I have it at 41 so I will stay with my figures.

MS PRICE: Could I take you then to table 2 of the December 2008 report, at monitoring point 9?

20

DR THORNE: Sorry, what page is that?

MS PRICE: Page 36.

25 DR THORNE: Item number?

MS PRICE: It is table 2 and it is monitoring point 9.

DR THORNE: My page 36 does not have that. I see, you are meaning the Hegley report?

30

MS PRICE: Yes. So you stated that – I am trying to get you to confirm that Mr Hegley's original predicted noise level for Huatau Marae, which is monitoring point 9 in his analysis was in fact 36.8 dBA L_{eq} ?

35

DR THORNE: If MP9 is then yes.

MS PRICE: So that table says 36.8?

40 DR THORNE: No, MP9 is 37.1. MP9 is 37.1.

MS PRICE: I am just getting a second copy here. So you are looking at this page, page 36?

45 DR THORNE: Page 36.

[12.30 pm]

MS PRICE: Excuse me, ma'am, we are just sorting out the different tables.

5 HER HONOUR: Yes.

MS PRICE: Sorry, a few discrepancies here so I will repeat the question, correctly. It is correct that that table that you have in front of you the level for Huatau marae was in fact 37.1 dBA L_{eq} .

10

DR THORNE: Okay.

MS PRICE: And now with the four turbines that have been removed as part of the redesign, that is turbines 122, 123, 124 and 125, Mr Hegley's predicted noise level for Huatau marae is now 28 dBA L_{eq} is it not?

15

DR THORNE: Well it depends. I have quite different figures. So I apologise to this hearing if there are different figures. But when I did my work and I assumed these locations I had 41 dBA at Huatau.

20

MS PRICE: Based on your calculations or looking at Mr Hegley's?

DR THORNE: No, looking at Mr Hegley's.

MS PRICE: Okay, can we just now turn to the turbines that have come out - so the redesign proposal, and can you see Mr Hegley's redesign evidence, that is attachment 2 of appendix 7 of the AEE.

25

DR THORNE: I do not have that document.

30

MS PRICE: I am sorry to belabour it, it is just that it is quite an important point for your client.

DR THORNE: Thank you.

35

MS PRICE: So attachment 2 of appendix 7 to the redesign AEE at monitoring point 9 which is the Huatau marae site. Mr Hegley's predicted noise level is 28 dBA L_{eq} .

40

DR THORNE: I see. Yes, reduction of 8.8.

MS PRICE: Okay. And Mr Day's predicted noise level for Huatau marae following the redesign and the removal of those four turbines, is 25 dBA L_{eq} . Correct? And you will find that table 1 of appendix 8 to that redesign AEE, again at monitoring point 9.

45

DR THORNE: I would take it as read.

5 MS PRICE: Dr Thorne, when you first appeared before the Board last year, you were questioned about the provisions of the draft standard which has now become the 2010 standard. They were still under review at that time. Do you remember that questioning?

DR THORNE: No.

10 MS PRICE: During your previous cross-examination you were asked if the draft standard proposed that any wind farm sound levels should not exceed the background sound level by more than 5 dBA or a level of 40 dBA L90, whichever is the greater. Do you recall that?

15 DR THORNE: No.

MS PRICE: I could take you to the transcript. We are talking about page 1610 but what I am going to do instead is switch to a different line of cross-examination, see if I can get the questions and answers out efficiently, because I am concerned about time. So. Are you aware that the 2010 standard as it has now been introduced, states that and I quote, "to provide a satisfactory level of protection against sleep disturbance this standard recommends a limit of wind turbine sound levels outdoors at noise sensitive locations of 40 dBA L90".

25

[12.35 pm]

DR THORNE: If that is your quote then I am happy to accept that.

30 MS PRICE: The 2010 standard also states that this limit is based on an internationally accepted indoor sound level of 30 dBA to protect against sleep disturbance. This assumes a reduction from outdoors to indoors of typically 15 decibels with windows partially open for ventilation does it not?

35

DR THORNE: That is not quite my understanding but I will accept it to this point.

40 MS PRICE: Dr Thorne, assuming a 15 dB reduction from outdoors to indoors, an external noise level of 20 dBA L_{eq} , that is the Huatau marae monitoring point 9 under Mr Hegley's analysis, 28 sorry, would result in an internal noise level of 13 decibel L_{eq} would it not?

45 DR THORNE: Yes.

5 MS PRICE: So based on both Mr Hegley and Mr Day's predictions any wind turbine noise levels received inside Huatau marae will be below the internationally recommended limits required to protect against sleep disturbance will they not?

DR THORNE: I would debate that.

10 MS PRICE: Dr Thorne, are you aware that both Mr Hegley and Mr Day's noise level predictions for the redesign also include potential cumulative noise effects from the Te Rere Hau wind farm, including the recently consented extensions to that?

15 DR THORNE: Yes.

MS PRICE: And based on the modelling he has undertaken, or both of them have undertaken, Mr Hegley and Mr Day have concluded that the Turitea wind farm will be able to be operated in compliance with the old standard at all times. Even taking into account any cumulative effects with the Te Rere Hau wind farm have they not?

20

DR THORNE: That is their statements.

MS PRICE: Mr Hegley has also proposed an additional consent condition requiring continuous monitoring to ensure that any potential cumulative effects are adequately considered and responded to, has he not?

25

DR THORNE: If that is in their document.

30 MS PRICE: Dr Thorne, are you aware that like its 1998 predecessor, the 2010 standard also includes clauses relating to special audible characteristics?

DR THORNE: Yes, I have read that.

35 MS PRICE: These clauses essentially require a maximum six decibel penalty to be added to the measured level at a noise sensitive location if the wind turbine sound levels exhibit special audible characteristics, do they not?

40 DR THORNE: Yes, they do.

MS PRICE: Dr Thorne, at page 6.4 of your evidence you state that, quote, "based on my investigations and in my opinion there are clear and definable markers for adverse health effects due to unreasonable or disturbing noise after a wind farm starts operation". End quote.

45

DR THORNE: Yes.

MS PRICE: Do the effects you are referring to include effects from ultrasound?

5

DR THORNE: No.

MS PRICE: Do they include effects from infrasound?

10

DR THORNE: They may do.

MS PRICE: And effects from low frequency sound?

15

DR THORNE: They may do.

MS PRICE: And effects from vibration including ground-borne vibration?

DR THORNE: Yes, they may do.

20

MS PRICE: Dr Thorne, are you aware that all these possible effects have been considered in detail by the committee of experts that prepared the 2010 standard?

25

DR THORNE: I am aware that there has been a committee that has developed a standard. I am also aware that there were some, what, 290 pages of evidence lodged against or in discussing that standard. So the - it is an interesting process and you now have your standard.

30

MS PRICE: Are you aware that the committee determined that it was not necessary to include additional thresholds or limits regarding all those effects: infrasound, low frequency sound, vibration et cetera, either because they will either be well beyond the threshold of human perception, beyond the wind farm itself, or due to the paucity of evidence that they in fact exist at all.

35

[12.40 pm]

40

DR THORNE: I cannot make any comment on the deliberations of the committee because I do not know what they did.

MS PRICE: If I understand your evidence correctly, you are suggesting that the night time level should be 35 dBA normally. Correct?

45

DR THORNE: Yes.

MS PRICE: And 30 dBA for special audible characteristics. Correct?

DR THORNE: Yes.

5 MS PRICE: You think all noise sources should comply with these 35 / 35
dBA requirements. Correct?

DR THORNE: Please define “all noise sources”.

10 MS PRICE: Do you think all noise sources should have to comply with 35 /
30 dBA?

15 DR THORNE: If you are now referring to industrial noise sources, residential
noise sources, traffic noise sources and other noise sources other than
wind farm noise sources there are different standards that apply to some
of these. And by location. Now 35 dBA outside is a good design
principle.

MS PRICE: Dr Thorne, are you aware of the WHO guidelines?

20 DR THORNE: Yes, I am.

MS PRICE: What do they say about inside noise?

25 DR THORNE: They look at 30 dBA. L_{eq} , 8 hours.

MS PRICE: Are you also aware that the generally accepted attenuation into a
house with windows slightly open is 15 dBA. Do you agree with this?

30 DR THORNE: In a New Zealand situation I probably would.

35 MS PRICE: Are you aware - in fact that is fine if you have agreed that it is 15
dBA, I can cross out quite a lot of my questions. Am I correct that your
evidence focuses on your concerns about three things: infrasound, low
frequency noise and vibration?

DR THORNE: No.

40 MS PRICE: Dr Thorne, have you considered proposing limits at Turitea for
each of these: infrasound, low frequency noise and vibration, or did
you not consider that was necessary because there is none?

45 DR THORNE: I have not - sorry, my answer to that is in the noise
management conditions that we prepared and would have been able to
discuss with Mighty River Power and its consultants if such discussion
had taken place.

MS PRICE: So in those noise management conditions that you prepared, did you propose limits for infrasound, low frequency noise or vibration from the Turitea wind farm if it is - - -

5 DR THORNE: We have guideline measurements, yes.

MS PRICE: Why did you not seek to include them in the proposed conditions that were caucused last night and this morning?

10 DR THORNE: For two reasons. And if I may, your Honour, I will explain those reasons. After the major hearing last year we were given, as I understand, the requirement of this inquiry to address the concerns that had been raised by the inquiry concerning reasonable noise, infrasound and other noise issues, including low frequency and audible sound.

15 We - and I am meaning it is a team of people not just myself. There is probably six of us involved - put together - reviewed the noise management conditions that I had placed before this inquiry in August, found what we understood to be the issues. We then started to
20 undertake intensive research at Makara and other locations, other wind farms, to find what the noise issues were so I could get an understanding of what we were talking about.

25 The end of the year we had finalised I thought fairly good working noise management conditions that addressed the concerns of this inquiry, addressed the concerns for analysis of audible noise, objective analysis I should say of audible noise, infrasound and the issue if vibration did occur.

30 [12.45 pm]

35 At that point just before or just after Christmas we submitted our report to the community group, the Huatau and the local community groups. They then took that document and discussed it with different people, as I understand, because we got comments back.

40 One of the briefs as we understood it from this inquiry was (a) how can I identify a complaint, (b) how can we identify reasonable or unreasonable noise, and (c) how can we mitigate or remove such noise.

45 Now turning that full circle it came back to how can we assist the applicant, because we have no view either way, in providing a complying or a wind farm that would achieve both the applicant's aim, which is to generate electricity, and the residents' aim which is to live without interference from unreasonable noise.

5 This document was available. Its precursor had been in my evidence and was fully available to the applicant and I think I made the point seeing it is in transcript that we were quite happy to work with the applicant on these things. The noise management plan then went through the different processes and was refined as we went through. It was available before the 21st, I believe, when the evidence had to be available to this inquiry.

10 It was made available as I understand in May in a documentary form that gave all the background reasons for the management plan. My understanding up until that point and in fact at the start of this hearing, is that the 1998 standard is the standard that applies and my reading of this standard simply says that it cannot apply to this hearing.

15 So to suddenly have a document come out of the blue on me was a little bit of a shock, especially when it was not something we had considered and something that we had worked towards - used another document to work towards to address the questions raised by this inquiry.

20 So when we met last night in the caucusing I made the point, and I believe that is in the document, not that I have a copy of this document, but I believe that I made the point that the issues were complex. I would not expect my colleagues in that caucus to try to understand or make a decision on anything that we had written because clearly they had not bothered reading it, or not looked at even the old information that we presented to them. And it was unreasonable for me to expect any comment from them.

25 Hence today you have my comment which I had to do for this hearing on your 6808 2010, but there has been no concurrent commitment from Mighty River Power or the other people to give proper consideration and due regard to our noise management plan.

30 Now our noise management plan is in three different sections. The first is that it deals with setback distances, the second it deals with noise conditions that can be measured under strictly defined conditions and, thirdly, it has unreasonable noise and switch off noisy turbine provisions. All of these have been prepared in a check and balance situation and they have been reviewed by the proper people for it.

35 40 So most of the text has been prepared or reviewed and rewritten by people in the legal fraternity. That does take away some of the meaning from the document, but nothing that cannot be fine-tuned to bring it into some plain language. The conditions for un (ph 4.48)-infrasound I understood were not to be, and I may have totally misunderstood this, 45 but that was not an issue for this redesign inquiry.

[12.50 pm]

5 However, in other venues where I am appearing for wind farms and
community groups, infrasound is a major issue. Audible sound, ground
vibration, house resonance and sleep disturbance are the major issues.

10 I am sorry to take such a long way to answer your question but it was
not a simple answer.

15 MS PRICE: So are you saying that you did not propose levels for infrasound,
low frequency sound and vibration because you had been advised that
that was not a part of this?

20 DR THORNE: No, I am not saying that at all. I am saying that in the noise
management conditions that I have prepared and the noise management
plan that I have prepared all those aspects are taken into account
properly by stating the standard that must be applied, by stating the
parameters that should be applied and by setting out a discussion
25 process whereby the local government, the noise consultant, whomever
that person may be, and the community can properly discuss their
issues and develop the noise management plans and the conditions over
a 12 month to two year process in the time that it takes the
establishment of the wind farm.

30 However, I must say that turning that around it means that all these
aspects have to be considered in the predictions and the prediction
modelling. We have spent six to eight months now working on those
processes so we could understand what are the conditions that – sorry,
so I could come to this Board to explain what are the conditions that
relate to infrasound vibration, low frequency sound, audible sound,
unreasonable noise, reasonable noise, unreasonable person, reasonable
person, and that that information is in a state of process, and it is in my
evidence and part is in my addenda because I realised that I had not put
35 a set of conclusions to my report. That was a bit late unfortunately.

40 But I have considered it, and remembering that I have colleagues who
are specialists in infrasound, who are specialists in ground borne
vibration, and that they as well as ourselves have different points of
view and different standards and criteria to apply.

45 However, to come to the conclusions that I have put in our management
conditions we have done the fieldwork over six months in lots of
different locations in order to have something in our plan that we could
say this is where we believe the median point is.

5 MS PRICE: So the problem we have, Dr Thorne, is that some things are so important that this inquiry needs to lay them down as conditions of consent if it grants the wind farm. My client needs to know whether or not it can meet those conditions before it starts competitive tenders for turbines. So we actually need to have the parameters of the issues that you think are going to affect the public surrounding the wind farm.

DR THORNE: Certainly.

10 MS PRICE: Which is why having levels and criteria that can be enshrined in conditions for infrasound, low frequency sound and vibrations is critically important.

15 Now if I look at some of the conditions that you recommended as part of your evidence it is a very broad blanket approach that you have applied. I will give you an example, condition 1, "No wind turbine shall be installed within 2000 metres of any dwelling or noise sensitive place existing as at the date of issue of this permit. Have you modelled what a 2000 metre setback would do in terms of taking out turbines and what would be left?"

20 DR THORNE: Yes, I believe I have. I am getting rusty on my memory on my own evidence but I believe it is one of the graphics in my report.

25 MS PRICE: So for this inquiry to impose that recommended condition it would have to have accepted that the risks were such that it required that kind of setback, because essentially you would not have a windfarm left, it would be tantamount to declining consent and I think we all are aware of that.

30

[12.55 pm]

35 But this inquiry needs to establish the reasons why that condition would be reasonable and that is why this inquiry needs to hear from you as to what are the levels behind infrasound, low frequency sound and vibration to support proffering that condition with a 2000 metre setback?

40 DR THORNE: With due respect, if I may answer that in three parts.

45 Your client was invited to work with me as I understand the situation. They chose not to. We had to do the investigations at our own cost and those were considerable. We had to come to our own conclusions and hire colleagues who needed to be paid, that was at our cost – and I am speaking for my business.

5 The issues relating to infrasound and vibration are exceedingly complex, as I am sure you are going to try to allude to later on, if I pick up on one of your earlier comments. I can say that we have done this analysis. I have made a comment and a critique on some of this work. I do not see that it is my responsibility to spend hundreds of thousands of my dollars assisting your client when your client was invited to assist and work with me.

10 I come to this hearing with as much information as I can prepare at my cost and I find absolutely nothing, except last night, with a bunch of very trite conditions.

15 Now these conditions therefore, if I have to address infrasound vibration and audible effects and low frequency sound, these should have been addressed in detail in your conditions, if I may say. They were not. In fact they are so badly constructed as sets of conditions that I could not use them.

20 Now that is a criticism. So if you wish to criticise me, by all means, but I have tried to do the best I could with my resources. You people have millions of dollars to work with.

25 MS PRICE: Okay, Dr Thorne. I accept the difficulty for parties coming to this inquiry with the lack of resources, the money for the analysis. I can understand that and I understand how you feel. So to take this a step further, let us forget about the Turitea wind farm and all the modelling and analysis and conditions that would need to be made specific for this wind farm.

30 Can you tell me very generally then what is a reasonable level for infrasound and then what is a reasonable level for vibration, and then what is a reasonable level for low frequency sound? Forgetting about Turitea, just generally?

35 DR THORNE: I could. With due respect, your Honour, if I may say – I am not trying to avoid this particular question but at the moment we are in a compensation claim process with a wind farm in Australia which addresses these very conditions. I am not at all willing to explain or to identify levels and criteria that we are looking at, except to say that we are looking at infrasound, low frequency sound, audible sound, special audible characteristics and we are looking at distances of between 1200 and 3000 metres, so we are not looking at just one farm, we are looking at psychological effects, and I am not willing to say anything – and I apologise. I am not willing to say anything at this inquiry that would prejudice my client and my barrister in the other case that we are currently progressing.

45

MS PRICE: Dr Thorne, perhaps I did not - - -

[1.00 pm]

5

DR THORNE: No, I would be happy to answer that there are general criteria that we can put in place.

10

MS PRICE: That is what I was wanting to get at. I do not want you breaching any confidential negotiations on any other wind farm. In fact I do not want you to answer for any wind farm situation. My question is much more general than that. I am wanting to know what your opinion is of a reasonable level of infrasound and vibration and low frequency sound?

15

DR THORNE: If I may go to vibration because that is the first and easiest one to look at. My conditions set out the requirements under British Standard 6172 from memory. However we have set that out because we are following the same guidelines as New South Wales and Victoria, and that is a 0.5 hertz to 80 hertz vibration, and it is set out in detail. It requires extremely sensitive vibration analysers. We have tried doing this work so we know what it needs, what sort of responses we get. The - - -

20

MS PRICE: Continue.

25

DR THORNE: With infrasound, with due respect you are diving into an area that has become extremely fraught between acousticians, cycle acousticians, health experts of any colour and stripe, and there is no agreement on criteria. However, what there is agreement – no, I will not say what there is agreement. However what our research and studies would indicate is that there is a modulation effect - and this is published, we have published this, or I have published this – that is being brought forward into our conditions, which is using dB and three dB modulation. But we only go to eight hertz, not down to one hertz which is a bit of an area of debate within the different parties.

30

35

MS PRICE: Okay, just to clarify. I am not asking you a question about whether there are agreed levels between the various types of professionals. I am asking your opinion, just Dr Thorne's opinion, on what are appropriate or reasonable levels for these three different aspects.

40

Just to clarify, the modulation effect you just referred to?

45

DR THORNE: Yes.

MS PRICE: Is that a special audible characteristic?

DR THORNE: Yes.

5

MS PRICE: Or is it infrasound?

DR THORNE: No.

10 MS PRICE: Or low frequency sound?

DR THORNE: We would use it (modulation) only in the audible range.

15 MS PRICE: Thank you. Okay. So my question is about infrasound, vibration and low frequency sound. Now it is correct that you have referred to a vibration standard and I want to ask you about another vibration standard, it is the ISO 2631, part 2, 1989 standard, are you familiar with that?

20 DR THORNE: We do not use it.

MS PRICE: That measures acceleration and velocity. Is vibration a problem for the Turitea wind farm, Dr Thorne?

25 DR THORNE: We do not know and no evidence has been led by the applicant to give us geotech results on basalt.

30 MS PRICE: Okay. That ISO standard I referred you to has a spectrum in it and it goes from serious building damage to cracking in houses to just perceptible to scarcely perceptible.

35 If you had proposed vibration conditions based on that ISO standard we would have been happy to agree those. Have you been able to propose some vibration standards that we could agree, or our acoustic experts could agree?

DR THORNE: If your people had talked to me, no doubt we could have.

40 MS PRICE: So are you inviting us to resume the caucusing on vibration?

DR THORNE: No, you have left it far too late. If I am directed by this inquiry to do so, but quite honestly you have had all this time and you have done nothing with it.

45 MS PRICE: So for the benefit of the Board who has to impose conditions on this wind farm can you state what in your opinion is an acceptable level

of vibration for the Turitea wind farm so that the Board can formulate the most appropriate conditions.

5 HER HONOUR: Dr Thorne, you may wish to think about that over the luncheon adjournment.

DR THORNE: Well, your Honour, if I may.

10 HER HONOUR: Yes. Thank you.

DR THORNE: It is not a simple answer.

HER HONOUR: No, no, thank you. We will resume at 2 o'clock.

15 **ADJOURNED** [1.05 pm]

RESUMED [2.06 pm]

RECORDING RESUMES AT 2.09 PM

20 <DR CHILES, sworn [2.06 pm]

25 DR CHILES: - - - 98 standard in that context. Look for the technical areas where we knew where the improvements could be incorporated and a lot of that had fed through from the experience on the likes of West Wind.

30 At the beginning of 2009 we prepared a public consultation draft. The consultation draft – usually these types of standards are fairly sort of technical standards that raise little interest, but there was quite heavy interest and we had over 600 submissions I heard Dr Thorne referring to just now as a result of public consultation.

35 [2.10 pm]

40 Again Standards New Zealand process we had to address each one of those submissions individually which we did so. We did not accept all of them, but we had to record our reasons why they accepted or not and as a result of that interest I think we actually got to a better standard.

45 That took us halfway through 2009. There is then a formal voting procedure on New Zealand standards. We had the first postal ballot somewhere in the middle of 2009 and surprisingly at that stage we still had a number of negative votes from within the committee. We then had a fairly intensive period of ironing out the remaining areas of disagreement.

5 As you will be aware, having sat through the hearing here, there is a lot of different views about wind farm noise and they were represented on this day. I did not say we had to bring all those together. We managed to iron them all out and we got to the second postal ballot and there we just had one negative vote and you are going to hear **(ph 1.16)** this. That was from Professor Dickinson and you are going to hear from him later today.

10 Professor Dickinson through the process had participated in the process the same as everyone else and through the process he had put down technical reasons why he felt we should adopt certain procedures. And if required after I have finished here we can go through each of these in detail.

15 He put each of those on the table. The rest of the committee looked at them, weighed them up against the evidence, tested them against the other evidence we had and found that the rest of the committee disagreed with his viewpoints and they could not reconcile the evidence he was putting on the table with the international literature and the other literature that was being considered.

20 Standards New Zealand due to the potential seriousness of having a view strongly expressed against the standard, we then had all through the last part of 2009, beginning of 2010, working through with Standards New Zealand to the extent that they are satisfied that Professor Dickinson's views could not be accommodated within the standard. And then we have just published in March 2009, 1st of March.

30 HER HONOUR: Is that all you want to say?

35 DR CHILES: I guess I should just introduce myself. I am an acoustic consultant working for URS. I have worked on wind farms for both developers, currently working for Meridian and Energy 3, and I have also worked for residents. I am working for someone on the Te Rere Hau extension at the moment, on the appeal. And I have worked for councils for Gebbies Pass I was involved in the commissioning so I have sort of had reasonable experience sitting on all three sides of the table on other projects.

HER HONOUR: Would you like to outline why you did not accept Dr Dickinson's submissions in his evidence?

45 DR CHILES: Certainly. So Professor Dickinson has set out 10 or so, maybe it is only six, technical reasons why he disagrees with the approach in

the standard and I will have to get someone to put his paper in front of me if we want to do them line by line. And on each of those points I personally disagree with Professor Dickinson's standpoint and the committee collectively disagree with Professor Dickinson's standpoint.

5

I would just like to say on the voting for the standard, I did not actually have a vote as chair. I was not voting. And I think the other thing - I mentioned the representation on the standard. So all those different organisations represented, not all of them are technical acoustics organisations but all of them appointed technical acoustics experts to the standard so there was an enormous sort of wealth of knowledge within that committee.

10

And the other thing that we were particularly lucky with is I mentioned the executive of community boards, they could not find a technical representative, but they put a resident from Makara forward for the standard and were very lucky we had someone with particular technical aptitude who added to the process.

15

So I think that the point I was trying to make is that the committee had no particular bias one way or the other in terms of that representation.

20

[2.15 pm]

25 HER HONOUR: And did your subsequent paragraph on special audible characteristics which we have read, did that pick up some of Professor Dickinson's concerns?

30 DR CHILES: I do not believe special audible characteristics was one of the key things Professor Dickinson raised. I will correct myself if I am wrong but do we want to go through them line by line now?

HER HONOUR: No, we do not? He is here to speak for himself.

35 DR CHILES: I am obviously going to run away but I mean all of those points if there is a question raised then there is another line of technical argument against so if that is needed at a later stage then I happy to provide that.

40 HER HONOUR: Well, we will leave that to the lawyers. Thank you. Ms Price have you got any questions?

45 MS PRICE: Thank you. Dr Chiles, can you explain for us why the committee made the statements in paragraph 5.5 which is entitled, "other factors"? This is the part relating to ultrasound and infrasound frequencies.

DR CHILES: Which particular clause?

5 MS PRICE: 5.5, paragraph 5.5. There are a couple of clauses there under the subject heading “other factors”. This inquiry is quite concerned with issues of infrasound, low frequency noise.

10 DR CHILES: Certainly. I think probably one of the driving factors from certain quarters to hold the revision - and as I say it had been considered in 2004 and we were aware of a lot of technical issues, but there was no imperative to revise. One of the driving factors has been the anxiety over possible health effects so this was one of the main parts of our brief.

15 To look into these health effects we turned to the scientific literature so in particular at the time people were talking a lot about vibroacoustic disease and there was a Wellington resident who was proponent of that disease and he put forward to the committee a big bundle of research papers on vibroacoustic disease which we took and reviewed, and
20 likewise we have looked at wind turbine syndrome and various other reported health effects.

For all of those research papers the consensus view of the committee was that those research papers were either flawed or did not show the
25 effects they were claiming to. And I will take vibroacoustic disease as an example because I think it is quite a good example.

Vibroacoustic disease is worried about sound causing a physiological effect and they talk about thickening of the arteries through sound
30 instant on the body. This was an effect that was first observed many years ago on technicians working on the back of jet aircraft. So these are technicians exposed to exceedingly high levels of noise and there was a physiological effect reported in terms of thickening of the arteries on those aircraft technicians.

35 There has been a line of research papers which have taken that older finding and they have somehow linked that to the sound levels from wind turbines. The committee having reviewed all that paper found that there was no causal link shown between the very high levels of jet
40 aircraft noise and the relatively low levels of wind turbine sound.

And if there was such a link then we would all be exposed to those same effects from traffic noise or natural pressure in the environment, from wind and so forth, so although the researchers came from various
45 universities and on the face of it looked credible if you actually worked through the scientific methodology then our finding that it was flawed.

And the same occurred for any of these effects that have been raised. There is no scientific link.

5 The committee has not ruled out the possibility that there is a health effect that we do not about. There is a lot of wind farms in other parts of the world and there have not been a large number of cases anywhere that have arisen. We are not actually aware of any confirmed from a small number of cases so. So we have not ruled out that at some point there is a health factor but all this evidence that we have seen, there is nothing there at the moment.

10 And as I say on the basis of low frequency sound, the low frequency sound from a wind turbine at a distances of houses is no different from low frequency sound from a whole host of other sources in the environment.

15 MS PRICE: Thank you, Dr Chiles. At that time that your committee was meeting, if I understand your chronology right, there was a North American expert panel also set up to consider these similar issues and this morning I tabled as an exhibit this report by the American and Canadian experts, in fact they went wider than that, there were UK experts, that reported to the Wind Energy Associations over there. Are you familiar with this report?

25 [2.20 pm]

DR CHILES: I have read that report but I could not quote details.

30 MS PRICE: Am I correct that many of these issues were the issues that you were canvassing?

35 DR CHILES: Yes, I mean the think the interesting thing - I do not know whether it is that report or the covering letter to it - where a lot of the issues arise from anxiety and there is this research out here claiming health effects. Residents who have a wind farm being proposed next to them go and look at this research and that generates an anxiety, and then that anxiety in itself appears to cause effects. And that is moving outside of my area of expertise. I think the American study found that type of effect following on.

40 MS PRICE: Yes, in fact one of their main findings was that the sound from wind turbines could not plausibly have direct adverse health consequences. Now that is something that New Zealand Standards deals with quite a lot quite apart from this wind farm standard, is it not? They are dealing with potential health effects.

45

DR CHILES: I do not know directly, but I understand there are
(**INDISTINCT 2.21.19**).

5 MS PRICE: So you have only been involved in this one standard?

DR CHILES: No, I have been involved in acoustic standards so on the general
environmental noise where we are working to the same basis of
providing reasonable protection for health and amenity.

10 MS PRICE: Right.

DR CHILES: So for the acoustic sound is yes, that is the - - -

15 MS PRICE: So considering potential health effects is not unusual in the
Standards committee's approach in the ones that you have been
involved in?

DR CHILES: No, for acoustic standards that is perfectly normal.

20 MS PRICE: Okay. Now the objective of that North American panel, and I
just want to see if you think that your committee also had a similar
objective, was to provide an authoritative reference document for
legislators, regulators, and anyone who wants to make sense of the
conflicting information about wind turbines sound. Is that a fair
25 reflection or not of what you were trying to achieve?

DR CHILES: Some of the goals would be the same. I think that was
commissioned by the Wind Energy Association so - - -

30 MS PRICE: Correct.

DR CHILES: - - - whereas the New Zealand Standard we were not. We are
not trying to promote wind farms we are trying to provide a method by
which they can be assessed to ensure those effects do not arise so some
35 of the wording seemed similar, but perhaps there is a slightly different
based on who is - - -

MS PRICE: But it would be a guide for regulators and legislators.

40 DR CHILES: The wind farm standard and indeed all of the other - there is a
series of - it seemed to be eight New Zealand acoustic standards and
they have all been written with the Resource Management Act in mind.
Politically - I think it is because we do not have national environmental
standards which we dearly need, they have sort of filled the gap and so
45 when they have been written they have had that application at the
forefront.

MS PRICE: Okay, so let us explore that interaction with the Resource Management Act then. Can you explain the intention behind the high amenity area and the standard and for example when does the committee intend that high amenity area to apply?

DR CHILES: Within the context of the standard, as I say the main thing from my point of view was a lot of technical refinements and I would quite like to talk about them, but I won't. If I get a chance I will, but will not go into it, it is not necessary. So there is a lot of very important technical refinements the whole way through the standard, some of which you have heard about, and that was the main thing.

The most contentious thing was this high amenity noise limit and to my mind it is something of a sideshow. The committee struggled with that more than any other issue and if I turn to the other paragraph - ideally we would have referred to planning documents. If district councils conducted their public consultative processes and they determined what amenity they wanted in their districts then as an acoustic standard we do not want to get in those political decisions. We could have deferred to the appropriate process.

So if a district council says, this is an especially quiet area we could say, okay, we can do the technical things to make that an especially quiet area. The problem we have got, and we had one draft which essentially did that where we said, look, if your district plan says it is especially quiet then we will go along with that. The problem we have got is that the district plans are not that sophisticated. They simply - so, if we took a very idealistic view and said, okay, the district plan has got to identify it in those words then the limit would not apply anywhere. And again this is the type of areas where our community representative kept us honest.

[2.25 pm]

Unfortunately if you move away from that ideology then you are left with something of a vacuum and that is why, I think you have heard expressed this morning, there is a little bit of uncertainty over how this limit applies. And that is simply because we have to leave it a little bit grey because the planning documents are not doing the job that we would like them to be doing.

So what we have said is either the planning document does say this is an especially quiet area or if there is some other indication in the planning document that it is an especially quiet area. And by way of indication we have picked on the 40 dB night time noise limit so most

district plans around the country either have 40 or 45 as the night time noise limit. There is a handful that have lower noise limits.

5 We said, okay, if you have gone below 40 then you are not saying it explicitly but implicitly you are saying this area needs to be protected more so than other areas. So that is why we have got a sort of a two-pronged approach on that.

10 MS PRICE: Thank you, Dr Chiles. So did you hear me cross-examining Mr Lloyd earlier on the district planning provisions which is always a little unfair because it is something that will come at the planners later on, but I was looking at the rural area that surrounds the Turitea wind farm specifically which in fact does not have noise conditions requiring a level below 40 dBA so you would put that in the kind of normal category?
15

DR CHILES: Unless there is some other text in the district plan that particularly singles out the area, yes.

20 MS PRICE: Okay, well in fact I have probably found the text which shows that it is not singled out because there are all these permitted activities that are not provided with a noise issue.

25 I want to put to you something that has come out of the caucusing which we have all just got this morning because I have not yet been able to talk to my noise advisers, because they are still in the hot tub but I thought it would be useful to get your view on it.

30 They have agreed a clause, clause 3.2, that says “notwithstanding section 5.3.1 of the new standard” that is the one we have been discussing “all residential and rural areas in the Palmerston North district plan are available for assessment as high amenity areas despite the absence of explicit recognition of them as high amenity areas in the district plan”.

35 That to me seems to be counter to what your committee’s intention was just as you have expressed it now.

40 DR CHILES: It is. I mean you have to take the standard as it is written rather than as I am telling you it was intended to be written, but that is. It is a very difficult situation where all of New Zealand is very special and anywhere I do a project around the country in a rural area I am always told that this is a very special rural area. And it is. We live in a wonderful country.

45

5 In terms of providing consistent noise rules across the country there has to be something that differentiates what we are looking for as somewhere which has got special protection. And so we are not saying the rest of the areas are not very nice. They are but there has to be some sort of flag that says this is worthy of additional protection.

10 MS PRICE: Otherwise you would have the situation where all rural areas in New Zealand just about became high amenity areas.

DR CHILES: Everyone rightly considers that they live in a special area.

15 MS PRICE: Thank you. I have got one other thing I would like you to explain which is how this six metres per second wind speed requirement in clause 5.3.2 is intended to work with respect to the high amenity noise limit.

20 DR CHILES: Certainly. This maybe something when you speak to Mr Botha later that you will get further insight on as well. The high amenity noise limit is for amenity and not health is the first thing to bear in mind. So under the 40 dB noise limit or background plus five we are always complying with the World Health Organisation guidelines unless the wind is making more noise anyway so the high amenity noise limit the health side of it does not come into it. So it is providing additional protection of amenity only.

25 The idea behind the high amenity area is you are looking to capture the times when it is particularly quiet at the residence but you have still got noise coming from the wind farm. Typically when the noise at the residence is down at 20 or 25 and so if you had the wind farm at 40 then it would be more intrusive.

30 If you are going to put that limit in, if you put that in all of the time, then you will end up restricting the wind farm for a lot of the time when it is not actually that quiet. So if you want a robust control you have just got to say, right, the wind farm is going to be 35 all of the time and therefore we will always have that protection. But there will be a lot of the time when the background noise is higher than 20 / 25 at the residence. Somehow you have got to determine what the cut-off is between when it is quiet and when it is noisy down at the residence.

35 **[2.30 pm]**

45 At West Wind they went about this in a slightly theoretical way, in a very complex way, and they looked at the conditions at the house. And justifiable in the fact that we are trying to protect the resident down

there so those are the conditions that matter and they said, okay, when the noise level falls below 25 decibels at the house and at the same time the wind speed is less than one and a half metres per second at the house that is when our high amenity noise limit will apply.

5

You still miss some occasions when it is quiet at the house and you have got wind turbine noise. So if the wind speed is higher than one and a half metres per second it might be decibels background so you are still missing some of the occasions when it is quiet.

10

In order to catch all of those occasions when it is quiet, you would have to go back to the situation of applying the 35 all the time and then you would be taking turbines out unnecessarily that would not actually be creating that nuisance.

15

So the West Wind condition was trying to achieve an aim but the practical application of that means that it does not achieve it all of the time. The West Wind conditions are also very inefficient, quite alarmingly so. I think - I was not involved in the process but it looks to me like people were looking to expedite the process and they agreed to conditions which were not - did not have any particular technical finesse in my view.

20

So there is an awful lot of monitoring required at people's houses and then you have still got to do quite a lot of correlation to work out what the 25 and a one metre per second at someone's house means for the wind speed up at the top of the hill. So there is a lot of correlation required and there is quite a time delay on that and you see now you are only just getting the monitoring report from West Wind because they have got to go through quite a big process to set these limits.

25

30

The approach in the new standard was to adopt a more practical control which is the six metre per second that you have mentioned which applies at the wind farm. What this means is that it is a control that conceptually is an awful lot easier and from the control system's point of view a wind turbine operator can enter that directly into his control system. And it also provides benefit for a lot more of the time.

35

The previous conditions where you are looking at the conditions down the house, you may end up tailoring your wind turbines if de-rating is what is required, tailoring which turbines are de-rated for one specific house. Whereas now with this six metres per second rule when you hit that thing you have got to pull down all of the turbines so you are 35 at all of your receivers. So there is a bigger benefit there.

40

45

Looking at the analysis for how wind speeds correlate at the top and the bottom of the hill, the six metres per second applies for more of the time for the West Wind conditions. For the cases we have looked at. It still misses some of the time when it is quite down the bottom of the wind turbines are blowing. So any control you put in will always miss some of those occasions. And we are on a statistical bell curve and we are just working our way up the tail and it is how far you go and you have got to law of diminishing returns. If you took it up to 10 metres per second you would still probably miss a very small percentage, but you would still miss some and it is trying to find the appropriate balance.

One of my own roles on the committee was to go and look at the map data to try and look at these correlations between wind speeds at the top and the bottom of hills. I was provided with wind data, I think it was for the Mill Creek wind farm. I worked through all those correlations and there is not a perfect correlation of a set of parameters that will sort of kick in and say, okay, you have got a situation here that is really quite quick. Let us pull the turbines down.

There is not a perfect answer. What I found is this six metres per second does protect for most of the time and on that basis I think it is an appropriate response. Because this has not been through a - the data used to get to this point is not extensive you do not find this type of perusal internationally, again our community representative we ended up with a clause in here that you can revisit that on a site by site basis if necessary.

Personally I think that is slightly unfortunate we have ended up with that provision in the standard. The intention was to get away from these very inefficient sort of long analysis exercises that have been required and go to something that provides better protection for the community in a much more efficient way and I think that is where the six metres per second was always intended to serve.

[2.35 pm]

I am just to trying to think what other aspects I can clarify on that. Just keep going.

MS PRICE: No, I do not have any further questions, thank you, Dr Chiles.

HER HONOUR: Mr Maassen?

<QUESTIONING BY MR MAASSEN**[2.35 pm]**

5 MR MAASSEN: Good afternoon, Dr Chiles. I want to take you to appendix B, amplitude modulation, page 39. As I understand it this standard, in part, was intended to be informed by New Zealand experience of wind farm development?

10 DR CHILES: Correct.

15 MR MAASSEN: In relation to the wind farms that were constructed by 2009, what datasets did the committee have in its possession relating to the demonstration that amplitude modulation, of the type described in the Interim Test Method, was the appropriate threshold for annoyance from amplitude modulation?

20 DR CHILES: To my knowledge, and I may have missed one, but to my knowledge West Wind was the first wind farm to use that condition. I will stand corrected if I have got that wrong. West Wind, as you are aware, you have only just got the commissioning report, so the condition has not been tested through cases, and that is why we have phrased it as an Interim Test Method, we are not trying to make it out to be anything more. It was arrived at through the West Wind process from the international experts – Malcolm Hayes and van den Berg –
25 who came up with that test method.

30 Internationally, we have looked around for tests for various things that could be included, internationally there are not any other tests that the committee was made aware of or could find. So we do not have a robust dataset to show that that is the ultimate method, which is why we have put a reminder in there about section 16, and it is why we have also put the commentary in there saying that at some point we envisage that this needs to be enhanced.

35 And I think the comment, in questioning earlier, someone else made the comment, “Well, just because we have made the comment that doesn’t actually alter the standard” - that is perfectly true - but while on this occasion the decision was made to do a full review of the standard and everything was up for grabs. Part of that, I think it is a five yearly
40 review or it should be a five yearly review Standards New Zealand do, they could get to their five yearly review and they say, “Okay, look we have flagged this issue here that it may need a new test” and if a new test had come up by then they could do a partial review of the standard at that stage to update that test.

45

MR MAASSEN: Moving from amplitude modulation to tonality, my understanding is that using, I think what is termed the “Joint Nordic Method” you both ascertain the existence of tones that have special audible characteristics as well as deriving the dBA penalty to be applied, is that your understanding?

DR CHILES: Correct, the only comment I would make is that we have referred to, what we have called in B2.3, the “Reference Test Method” we refer to ISO 1996 part 2 2007, and that is essentially the same method as what you refer to as the Joint Nordic Method.

MR MAASSEN: So they are not simply methods of the assessment of the existence of the tone but also give you figures for the dBA penalty?

DR CHILES: That is correct and I think it is worth – previously, in a lot of the New Zealand acoustic standards that the panel may be familiar with, there is often a five decibel penalty for special audible characteristics. The ISO standard has a sliding scale from 1 to 6 and so in adopting that standard we have had to allow the penalty to go up to 6 rather than 5, and so that is why there is a slight sort of oddity in the standard that the penalty can be 6 for that particular special audible characteristic. Does that answer your question?

[2.40 pm]

MR MAASSEN: Yes, that is absolutely fine, thank you. So if the characteristic at issue is one of tone alone and it is qualifying as special audible characteristic there is a range of potential dBA penalty from 1 to 6, is that correct?

DR CHILES: Correct, yes.

MR MAASSEN: Are you aware that in Makara there were at least three different ones that arose which were of concern?

DR CHILES: Yes.

MR MAASSEN: Do you know whether they attracted the same penalty or different penalties?

DR CHILES: In terms of the consent conditions for Makara?

MR MAASSEN: No, in terms of the analysis that was done by the consent holder, presumably they did either the Joint Nordic Method or the Reference Test Method, identified the tone and then applied the derived penalty, is that a reasonable expectation?

DR CHILES: I am not aware of what process they have been - I have flicked through the commissioning report this morning but I am not aware of what the process was.

5

I think the point you are arriving at is that you do not penalize something twice. So we are dealing with a – we have got noise limits, 40 dB, and then we are saying, “If a noise has got some characteristic that draws your attention to it, that makes it particularly annoying, then we penalize it to account for that annoyance”. We do not then keep on penalizing it. If it has become more annoying it cannot then become more annoying again.

10

It is not an exact science, we based off the international research that shows how people respond to tones, it has gone into the ISO method. We have not then said, “We are going to double penalize things” although I do believe the 1996 does allow for multiple tones in the method, so I am not sure how that applied to Makara, but when it is applying to multiple tones it is still ranking it on that scale of 1 to 6.

15

20

MR MAASSEN: I take it from your answers to your questions that you have really only seen the compliance report in the last 24 hours or so, and that the committee did not have a dataset from Meridian that would have informed or at least assisted in informing the appropriateness of the thresholds contained in the Reference Test Method?

25

DR CHILES: Most of the committee’s work was done before the turbines were operational at West Wind. So, as I mentioned when I ran through the timeline before, the final voting was in August or September 2009, which was just as West Wind was finally getting up to its – as I understand, I think it was getting all the turbines operational. The committee was fortunate in our representative from the New Zealand Wind Energy Association was Mr Botha, who are going to hear from, and so Mr Botha was obviously intimately involved in West Wind so we did have that knowledge available on the committee.

30

35

MR MAASSEN: Thank you, Dr Chiles. Thank you, your Honour.

MS PRICE: Ma’am, if I could beg your indulgence while I have been sitting listening, I have got one thing that I would like to put to Dr Chiles which I think might short circuit a lot of the planning cross-examination later.

40

HER HONOUR: Yes.

45

5 MS PRICE: And it is a little unfair, Dr Chiles, I am very concerned at how the caucusing report has come out with a high amenity noise condition and it does not seem to fit with what the committee was intending, or in fact what the standard says, and it is the subject of Board inquiry. I read to you before what the experts had agreed and I just want to read to you something I have put together, on the hoof if you like, including what is in the high amenity area.

10 MR MAASSEN: Your Honour, if I could be heard on this, as I understood this witness he was called by the Board for the purpose of explaining the standard. Now, he is being asked to comment on a caucusing outcome, which he was not involved in and which he could not have anticipated, and I have not gone into that subject because I think it is simply unfair to Dr Chiles. And if he is to be treated - has a different purpose - in other words to contribute to this caucusing, then I would wish to cross-examination on that matter, and I do not wish to do that, I think it is completely unfair.

20 HER HONOUR: Thank you.

[2.45 pm]

25 MS PRICE: Ma'am, my learned friend, indeed, did ask Dr Chiles questions about the Makara wind farm and his response in evidence before you was that those conditions were inefficient and in fact have not been able to deal with the complaints from the residents quick enough. That is exactly the point in play here with the caucusing that was required of our acoustic experts, was to come up with a noise management plan that could address the issues that have arisen at Makara. So from my submission, putting to this expert what his evidence about Makara has led us to understand, I would like to hear his views on a noise condition that could work with the standard rather than creating yet another set of conditions that vary from the standard.

30
35 HER HONOUR: I think he is rather on the spot in respect of the latest caucusing agreement, Ms Price, and I think John Maassen's interjection on that is correct. I think that that is something we as a Board particularly have to make up our minds on of what you put before us.

40 Dr Chile's evidence is a background to the document that his Board have produced, or his standards committee has produced and I think that is where we have to leave it.

45 I would like to go after him on certain legal questions but I think that is probably inappropriate, too.

I think could we pass on?

5 MS PRICE: Sure.

HER HONOUR: Thank you.

10 MS PRICE: It may be that Mr Botha is actually the better witness in terms of
looking at - - -

HER HONOUR: I think so, yes. Thank you very much.

Mr Johnson?

15 MR JOHNSON: No.

HER HONOUR: No questions, thank you. Mr Johnson, done. No questions?
Mr Low?

20 MR LOW: No, thank you.

HER HONOUR: No questions. Mrs Dixon? Ms Vanderpole is not here.
Mr Adams? Dr Huffman?

25 **<QUESTIONING BY DR HUFFMAN [2.27 pm]**

DR HUFFMAN: Good afternoon, one quick question. You said that you had
a committee without bias and that everyone had provided a technical
expert. Can you confirm how that does not show bias?

30 DR CHILES: In the same way that the experts in this appeal, they are
appointed by different parties but they are all acting on the basis of their
technical expertise. So within the committee the various bodies
appointed essentially independent experts to operate for them.

35 The only exception which I mentioned was the executives of
community boards where they were not able to source an expert, they
felt they wanted a resident and so in that instance it was not someone
with a technical background.

40 DR HUFFMAN: I am not sure I can help answer the question any further.

HER HONOUR: Yes? Just a question?

45 MR KLEIN: Just a quick question.

HER HONOUR: Thank you.

MR KLEIN: Sir, could you please clarify what the point – I must have missed that. I did not quite understand maybe. You said one of the Makara residents was on the committee “keeping you honest” were your words I think. I understand your standards were set up as a draft before Makara was fully operational?

DR CHILES: That is correct.

MR KLEIN: Thank you.

MR HEERDEGEN: Dr Chiles, I think committees such as this always appreciate the opportunity perhaps to have new standards in front of them with the expectation that somehow or other the decision might be in everybody’s opinion better.

So what in your opinion is the most important improvement in these conditions – sorry, in these standards from the earlier standards? So what is the signature thing that you think marks this standard?

DR CHILES: I apologise, I do not have a big bang. The fundamental method from the 1998 version was fundamentally sound, it has worked for a lot of wind farms in New Zealand and it is completely consistent with international practice.

This revision did not seek to make a radical change. It has made a lot of technical refinements and it has made some incremental enhancements, so there is not a single thing. To pick off a few, we have changed the reference wind speed from 10 metres above ground to hub height. There was an error introduced by wind sheer estimation in the working from 10 metres, so we have removed that error and everything is referenced to hub height now.

35 **[2.50 pm]**

We have addressed cumulative effects, we have addressed reverse sensitivity, we have put in the test for special audible characteristics which in West Wind had to be separate conditions. In terms of the selection and the monitoring procedures there is a lot more guidance on those matters. The prediction method previously, the prediction method accounted for distance and air absorption, we have now put in a method that also accounts for terrain screening; it has got to be done in optic bands rather a single frequency, and there is another factor that I cannot think of at the moment.

So all the way along the line the prediction and the measurement methods have been refined, so there is not a “this is the single most important thing”.

5

But if you go back and look at the seven pages of conditions for West Wind, I mean clearly people thought the standard on its own was not sort of adequate, so all of those considerations that came up there and internationally in other places have now been fed into this.

10

So hopefully – I guess the single most important thing is consistency, whereas before, for the last few years our wind farm decisions have been going off in all sorts of different directions, whereas now we have taken best practice from all those cases and hopefully people can look to this to provide a good outcome for communities with sort of consistency across the country.

15

MR HEERDEGEN: From what you have said, would the expectation of you and the committee be that primarily if committees that are making decisions stay with the new conditions basically they are on the right track?

20

DR CHILES: We are not seeking – we have no political position obviously, we are a technical committee. What we are saying to the committee is here is a robust and standardised way of achieving the stated outcome, which is the protection of health and reasonable amenity. So I would dearly love panels to adopt this as the mainstay, having spent so many hours of my life writing it, but that is entirely your decision. But we are putting in front of you a robust method that will achieve those outcomes.

25

30

MR HEERDEGEN: Thank you very much.

MR BUNTING: Yes, thank you very much for coming, it is much appreciated. Just in terms of process you had a technical committee that put together the standard, can you just explain what happens after you as technical committee have completed your work within the standards organisation? I mean is there a legal review, what happens?

35

DR CHILES: Certainly. As I say, we go through our postal ballots. Once we have got through the postal ballot it then goes to the standards council, so the standards council have the final say on whether or not the standard gets published. I am not sure whether within that they do a legal review or not. I suspect not.

40

45

MR BUNTING: It is just there are a couple of things in there that we had some questions about. We will not ask you. We just wondered whether maybe someone did cast a - - -

5

DR CHILES: One of our nominating organisations with resource management law association so - and there was legal review at the public consultation stage and subsequently bits of it were from the - the technical committee can co-opt and co-opt services, and there were bits put out for legal review. As always with legal reviews you come back with conflicting opinions, so it may be where some of the issues you are trying to get at.

10

I am happy to hear about the issues. I am kind of interested now you have raised the questions.

15

MR BUNTING: So who actually does the draft? Writes the words?

DR CHILES: The committee. So where you have got bad English it is a result of writing by committee.

20

I mean as chairman I picked up the lion's share of that work, but originally we are split into working groups looking at different sections of it and the working groups came back and it is endlessly packed about - I mean there is at least 30 or so drafts. I mean this is where I say the likes of - sorry to keep picking on West Wind - but the likes of West Wind where you have got people trying to get an outcome in a space of time, whereas with a standard there is a long period of time that has gone into sort of refining the method, if not maybe some of the wording.

25

30

MR BUNTING: We will hear from Professor Dickinson about his concerns, but for the balance of the committee were there any particularly contentious areas that were subject to really detailed debate - - -

35

DR CHILES: The high amenity noise limits occupied a disproportionate amount of time on the committee. Most of what I thought were the important things, and I have mentioned before in terms of the measurement prediction and so forth, methodologies - other than Professor Dickinson there was very little disagreement on those matters.

40

[2.55 pm]

MR BUNTING: At the high amenity areas?

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5 DR CHILES: But the high amenity area was the area where – in terms of when it applies. As I mentioned before, I think this is to do with the fact that we do not have the sort of idealistic planning background that we can slot into and so we are sort of flailing a bit trying to fill that void.

10 MR BUNTING: Just following from the discussion with Mr Heerdegen, and you said the committee would feel pretty pleased if the consent authority adopted the standard as the conditions?

15 DR CHILES: Yes. I mean I was not expecting – I thought Turitea was too far through the process. But I think what would be really disappointing from the committee’s point of view is if the standard got adopted and then another seven pages of addendums were put on the end of it. We have been through all the issues in a lot of detail and I think to have sort of anxieties sort of force you to keep on writing on all the **(INDISTINCT 00.59)** on vibration condition when there is no need for a condition along those lines, I think it would be shame because then
20 we will have to go back and revise it and work through all those conditions.

25 MR BUNTING: Just one last question then. In terms of – you know this has just been published?

DR CHILES: Yes.

30 MR BUNTING: When will it be reviewed again? Is there a process for taking on board, you know, maybe the findings if there was a decision here?

35 DR CHILES: As I say, I think it is a five yearly review the standards New Zealand require, but there is a note in the front cover saying if anyone finds anything then right to Standards New Zealand and if it is significant they will probably come back to me as the chairman and say, “This new research has been published, is this significant?” If that triggers a review then it will trigger a review. Otherwise it will come up in a periodic review.

40 MR BUNTING: Thank you very much.

45 MR HUDSON: Just one question. You mentioned the list of organisations that are represented and it is noted in the standard, could you just – not now- but leave us the names of the people that did represent those organisations?

DR CHILES: I can if you need it. Generally we work on the basis that those people are confidential within committee.

5 MR HUDSON: Well if it is confidential then I do not want to breach that. When we asked Mr Hegley he said he worked for EECA which I had not anticipated, so it is that - - -

10 DR CHILES: As I was saying, there is no point EECA sending along a bureaucrat to come and talk about how to measure decibels.

MR HUDSON: Yes.

15 DR CHILES: So it is important that all those organisations are represented but they are done so through a technical expert who can then sort of engage meaningfully.

If you need a list, I can provide a list – not if you - - -

20 MR HUDSON: No, if you prefer not I will not push on that. Thank you.

HER HONOUR: You probably were here, were you, when Dr Thorne talked about setbacks and as far as his clients are concerned the importance of those for taking care of, among other things, special audible characteristics. We have been interested, there has been background evidence to what we are doing of a number of countries where setbacks are appropriate and they have named them. I think we had three kilometres in Scotland, five somewhere else, seven somewhere else.

30 Can you tell us why you did not consider setbacks as a - - -

DR CHILES: We did consider them. Dr Phil was very generous with his time and he gave us extensive submissions and there is various improvements as a result of those. Setbacks, as I mentioned in terms of response to questions before, the standards are written with the Resource Management Act in mind. They are written with an effects based assessment in mind and to my mind, a setback has no effects based reason.

40 If you want to be slightly lazy about your assessment and say, “Okay, I am absolutely sure that there is no – I am not going to have any effects beyond 10 kilometres” then you draw a 10 kilometre ring through it and maybe that gets narrowed down to two kilometres, but you are still not actually looking at the effects of the wind farm so the standard is all about assessing the technical effects, so a setback. The appropriate distance for any particular wind farm will depend on the terrain, the

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turbine type the turbine layout, the wind conditions at that particular site, so to think that a setback can actually assess the effects for all those cases just does not hold any water.

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[3.00 pm]

HER HONOUR: Yes. Well thank you. I have some interest around the legality of what you have suggested. The fact that it has to be perhaps a high amenity noise limit should be considered where a plan promotes a higher degree of protection. That of course means that it may be some time before these things are implemented in the plans that are up for review at the moment. Did you consider that issue?

10

DR CHILES: Yes. First of all, on legality, obviously this has no legal force unless it is invoked through a condition or through a plan. But I was trying to explain before that that was the reason – if I turn to that, the same paragraph.

15

HER HONOUR: 5.3.

20

DR CHILES: 5.3.1, towards the end of that that is why we introduced this 40 dB threshold. So we acknowledge the fact that we would like the plans to tell us where the special areas are but they do not and they are not likely to possibly for another 10 years. So we have said, “Okay, we need some other indicator that will be in the plans at the moment, that shows us where the special acoustic areas are”, and we have said, “Well 40 is the normal noise limit that applies to the majority of plans through the country so if they have gone below 40 then that is telling us that this is a special area. So in terms of your question, you were asking about the plan that is still something in the plan but it is something that should be there already.”

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30

HER HONOUR: Yes, I see. Well thank you very much. Thank you, Dr Chiles, for giving up your time to come so late in the piece to give us some information. But everything seems to have collided all at once and I know that it has disadvantaged Dr Thorne, but it has been all beyond our control and we have been very anxious to get as much information as we possibly can to tie down the Turitea noise conditions in a way that is fair to all parties. So thank you, thank you very much indeed.

35

40

DR CHILES: Thank you for accommodating me in the programme, I appreciate it.

45

<THE WITNESS WITHDREW

[3.02 pm]

HER HONOUR: Dr Thorn, I think I will call you back to the stand. Thank you.

<FURTHER CROSS-EXAMINATION BY MS PRICE [3.02 pm]

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MS PRICE: Dr Thorne, just to recap where I think you and I left off. We were talking about vibration and conditions that you may or may not have been proposing for those, and I have just realised through the luncheon adjournment that you and I have been talking slightly at cross purposes.

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15

I have only just today received a copy of your latest proposed conditions, this morning, which have the reference to the British Standard on vibration that you were talking about in them. Because I have only received them today I cannot discuss these with the other experts to get their views as they are all still in the hot-tub with you, so all I have got to go by is the caucus statement from those experts that says your new proposed conditions are rejected by them. So we are going to have to nut it out in that context. So as a mere lawyer, I am going to try.

20

In your new proposed conditions you have a vibration dose value of 0.26 metres per second at night, is that correct?

25

DR THORNE: Yes. Number 30.

MS PRICE: What is this criterion based on?

30

DR THORNE: The New South Wales standard.

MS PRICE: Is it below human perception?

DR THORNE: No, that is why it is the New South Wales standard.

35

MS PRICE: What levels have you measured from other wind farms you have been involved in?

DR THORNE: We have not measured to these levels.

40

MS PRICE: Does that mean you have measured to other levels?

DR THORNE: We have measured other levels.

45

MS PRICE: Can you tell us about those?

DR THORNE: No.

MS PRICE: Those other levels, what distances are they found at?

5

DR THORNE: 2200 metres and 150 metres of course.

MS PRICE: Is it the confidentiality associated with the negotiations of the other wind farm that means you cannot - - -

10

DR THORNE: Definitely.

MS PRICE: Is there anything that you can talk to us objectively about those levels that is not tied to a specific wind farm?

[3.00 pm]

15

DR THORNE: Yes, certainly. The vibration levels are the standards that we use for human perception inside all dwellings, especially in Brisbane where - this is from my colleague – he does what is called condition monitoring for dwellings for the tunnel designs where he has to measure houses for vibration analysis, and this is both your previous building one that you mentioned and for human perception.

20

So this is the primary standard used in Queensland and New South Wales.

25

MS PRICE: Okay. So I am keen to learn more about your 2200 metre.

DR THORNE: I am sorry, you cannot.

30

MS PRICE: Did it inform your 2000 metre setback?

DR THORNE: No.

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MS PRICE: So now I would like to take you back to the start of this examination. You answered my question about the dBA level predicted at Huatau and said that the calculations supporting that were in your evidence?

40

DR THORNE: Yes.

MS PRICE: Over lunch I have looked at all your various briefs of evidence and I cannot find any calculations. Can you please take us to that in your evidence?

45

DR THORNE: Certainly, 3.3 deals with the Hegley information which is to say that Mr Hegley did background sound surveys and therefore are

part of the assessment. The predicted sound levels and in my evidence, I would have to find it, it is all in section topic B. Now in my evidence at that time I did not have any major difficulty or difference of opinion with Hegley and Day.

5

If Mr Hegley's levels are now different from mine, and I have not changed my model at all except taking out some turbines, then I am sorry that is not a question that I can answer. All that I did was remove turbines out of my original model or shift their location slightly as we found them being shifted.

10

So in my original work we were in good agreement and I would not have disagreed with Mr Hegley or Mr Day, and I do not think I did.

15

Now to turn to your comment again, I have given a great deal of detail I felt in the methods of assessment and the assumptions that I made in my predictions and how they were done. I did cumulative analysis. I put out my verification and modelling assumptions that is in topic A of all my work, predictions, approach and limitation. I do not see that produced by your people and so therefore I find your question a bit awkward to answer.

20

I have produced the evidence as best as I can. I have stood up and given my assumptions to be critiqued by yourself. I have given my calculations as I see them under 3.3. I saw no reason to set up another set of tables when this was to give an analysis of a redesign. I did not see that this inquiry would want to see yet another set of assumptions that would be exactly the same as the previous assumptions.

25

30 MS PRICE: Okay. So I am really wanting to get to the heart of what is happening at the Huatau monitoring point because I think there has perhaps been a mistake here. Did you get an opportunity over lunch to check Mr Hegley and Mr Day's predictions for Huatau following the redesign – that is when the four turbines come out?

35

DR THORNE: Well I assume they were the numbers that you gave me before?

MS PRICE: Yes.

40

DR THORNE: At MP9.

MS PRICE: Right. So you were able to check those over the lunch?

45

DR THORNE: No. You gave me the references.

MS PRICE: Okay. What I am wanting to get us to is a point where we agree that if you apply the noise attenuation which you agree should be applied to those figures from Mr Hegley and Mr Day, at Huatau Marae the night time recommendation that you have given us of 30 dBA which is also the WHO guidelines, we are now well within it because simple maths says it is 13 dBA at Huatau Marae.

DR THORNE: No. I disagree with you. The levels by Mr Day and Mr Hegley in their evidence, I do not know how they got to those. My levels are calculated at 41 and 40 dBA that is what my 3.3 says.

[3.10 pm]

Now I have that in my previous evidence. I have illustrated in my previous evidence how I got to my numbers. I have put this by comparison in the Huatau evidence and the previous documentation, and I have it all listed in my predictions. All that I did was remove the turbines. Now I got a dB of difference. I could accept that maybe we have got slightly different heights or something different, but in practical effect I am standing by my numbers and I am not acknowledging or accepting Mr Hegley's numbers.

Evidence has already been adduced I believe that show variation between his calculations and previous calculations. I am willing to stand by mine.

MS PRICE: Okay. You also said in that earlier session that we had that you had modelled the two kilometre setback that you were recommending in your conditions and that there was a plan in your evidence.

Again, over the luncheon adjournment I have gone through all your evidence and I cannot find that plan. Can you show it to me please?

DR THORNE: Certainly. I will take you to – I will have to find the correct number in my documentation but if I might tender to the inquiry the A3 size version out of my documents. This will be figure 6 of my evidence page 19.

MS PRICE: Dr Thorne, I am not an acoustic expert, can you explain to me how that plan shows me the effect of the two kilometre setback and which turbines will be left?

DR THORNE: No. What I am going to say is that I have calculated out distances to my contour levels and I have given metres from the turbines, from the clusters of turbines. That was to inform my decision on how many houses would be within those two kilometre zones and I

was also keeping in mind the buffer zones, or existing dwelling zones of the original drawing. So 2000 metres has been derived from my studies at Makara and other wind farms.

5 MS PRICE: And where does that leave the Turitea wind farm when you apply the 2000 metres?

DR THORNE: It depends on which turbines you want to remove.

10 MS PRICE: Which turbines does your analysis show would need to be removed?

DR THORNE: I have got that in my evidence.

15 HER HONOUR: Would you like to remind us?

DR THORNE: Sorry, your Honour.

HER HONOUR: Thank you.

20 DR THORNE: It is in 4.24, and in my addenda I have restated that under the recommendations.

25 MS PRICE: Well my apologies, Dr Thorne, because I have never read that as applying a 2000 metre setback over the whole of the wind turbine and that made me come down to the words you have used there where you have said it is a 2000 metre setback from Huatau, Hautika and residences highly likely to be adversely affected. Can you explain what residences highly likely to be adversely affected are? Which ones they are?

30

DR THORNE: Yes, certainly. Huatau is my primary client, or my primary people that I am working for. Their interest is primary to my report. The report proper deals in figure with the setbacks for the whole of the wind farm and the distances. Now I did not go into further detail within those because I assumed that people would be able to pick up the figure, have a look at it and see there is a 35 dB contour.

35

[3.15 pm]

40 I have done an analysis and assessment against the previous design which is all that I understood that I was needed to do. I have identified the noise levels at my clients' positions, and instead of having to select houses which I had no authority to do because of privacy laws I guess work over here. I was not going to identify different homes but quite clearly if reading my previous evidence which this is only part of - - -

45

MS PRICE: This is the previous evidence prior to the redesign?

5 DR THORNE: Prior to the redesign. This is the redesign itself. I saw the two working hand in hand. Now I am here on behalf Huatau and the community groups that I work with and this is where the evidence is coming through. There may be a confusion in the sense that I have simply exemplified Huatau.

10 But if one looks at figure 6, it bears back to my original work in the earlier report, I do not see a need to revisit each individual house. In hindsight quite frankly I could have but I did not see the sense. The issue was please explain the effect of the redesign in comparison to the previous study and that is what I have done.

15 MS PRICE: I am not going to belabour, Dr Thorne, but I will ask you one more question. This figure 6, I read that you have drawn a two kilometre line around the wind farm?

20 DR THORNE: No. Beca did that.

MS PRICE: Okay.

DR THORNE: It is your evidence, not mine.

25 MS PRICE: Okay. Earlier you also told us that you invited the other experts to caucus on your conditions?

30 DR THORNE: No, I did not. I said it was available. Once it left from my office to the community groups that requested that I provide information in broad terms - - -

MS PRICE: So - - -

35 DR THORNE: It was at that point it is their property. They then had meetings with different people. I was there to answer technical questions, my colleagues were there to answer technical questions, the barristers were there to answer legal questions, and so the document was changed as comments came by.

40 The final one would have been with the community groups early February.

45 MS PRICE: Okay. For example, the vibration standard condition which I have only just received today, you are saying was available for the other acoustic experts to discuss because it was given to the community earlier?

DR THORNE: Yes. Once it is to the community it is their decision where it goes.

5 MS PRICE: Well I have not been able to discuss this with the experts because again they have been in the hot-tub and I cannot speak with them. But I am not aware that any of them have received your proposed conditions which is why we are now in the situation that I cannot discuss these vibration standards with them.

10 DR THORNE: Conversely, you did not send me yours. We were available to you – sorry, not to you. We were available to your client and therefore the client’s consultants. This was the requirement of the Board. We did our homework, we got the stuff in place. Rightly or wrongly we went through our process so that when Mighty River Power or whomever got in touch – now I believe there were discussions but I am not party to those discussions between different people – we were ready to roll before Christmas and after Christmas and before the tendering of evidence.

20 MS PRICE: So you were ready to roll prior to the redesign being finalised?

DR THORNE: Yes, of course because I could not wait four months for somebody to come along and say, “Hey, we would like to have some new conditions. The Board of Inquiry had as I understand it, and certainly I took from the last hearing, some very clear questions and it was my role to try to answer those questions.

[3.20 pm]

30 The redesign was almost secondary to those questions.

MS PRICE: Okay. So I understand that the conditions that you formulated were available to the community?

35 DR THORNE: Yes.

MS PRICE: So you could fairly accept that perhaps the other noise experts had not received those conditions until quite recently?

40 DR THORNE: It is not my issue.

MS PRICE: No, but you could accept that that is possible?

45 DR THORNE: That is not my issue.

MS PRICE: Okay. You also said earlier that the new standard came at you
“out of the blue”. Dr Thorne, I put it to you that that reason cannot be
credible because your evidence-in-chief dated May 2009 has a section
in it entitled topic C with an extensive discussion of the then draft
5 standard that became the 2010 standard. In fact, pages 552 to 554 of
the then draft standard?

DR THORNE: I am sorry to say this but you are wrong. A draft standard has
no relevance whatsoever to the final standard. It could change, and I
10 would have to bring you to what Dr Chiles said. There was a large
amount of discussion between parties. I can only work with what tools
I am given.

Now whatever happened to come out to 2010 quite frankly was not an
15 issue for me because it said quite clearly, and this current edition says
quite clearly, that it does not apply. Now that is my reading of it and I
have not been persuaded through listening at this hearing that that is
wrong.

MS PRICE: Okay. We will have a little change of tack. If I understand, and I
20 think you have confirmed, that you have presented yourself before the
Board as a psycho-acoustic expert? Acoustics trained I think you said
but with a specific field in human perception, is that fair?

DR THORNE: Yes.

MS PRICE: Now, Dr Thorne, I would like to take you to a paper you
presented last June, to the third international meeting on wind turbine
noise. Do you recall this paper?

30

DR THORNE: I did not present this paper, I was a co-author on this paper.

MS PRICE: Okay. That paper concerned the Tararua Ranges and something
you termed as an author “the seismic vibrations from wind farms”. The
35 resident that was the subject of the study was Mr Martin, is that correct?

DR THORNE: I have no authority to acknowledge a person in private
capacity.

MS PRICE: Okay. That resident claimed that the onset of noise problems
40 coincided with the installation of the new V90s at TrustPower’s Tararua
wind farm, is that correct?

DR THORNE: I have no authority to speak on the privacy of another person.

45

MS PRICE: Well I am actually taking paragraphs out of your paper.

DR THORNE: It is not my paper. I am a co-author of that paper.

5 MS PRICE: The paper that you co-authored stated that the resident complained a lot, did he not, and that TrustPower installed hush glass in the master bedroom, is that correct?

DR THORNE: Yes.

10 MS PRICE: The resident then continued to complain about noise issues in spite of that acoustic treatment, did he not?

DR THORNE: I would say again I cannot comment on the privacy of another person.

15 MS PRICE: Again, it comes out of that paper you co-authored. Was the resident able to be specific about the noise and did your paper state that the resident found it audible when the wind was from a particular direction?

20 DR THORNE: Yes, that would be true.

MS PRICE: Can you remember what direction that was?

25 DR THORNE: From the southeast.

MS PRICE: Did the resident say that the noise was more noticeable at night when he was lying down?

30 DR THORNE: Yes.

MS PRICE: You undertook seismic measurements with amongst other things a geophone – or was it someone else that was a co-author?

35 DR THORNE: Someone else, yes.

MS PRICE: Okay. Do you know whether that geophone was calibrated?

40 DR THORNE: I do not.

MS PRICE: In the paper the information or the data from the geophone output was expressed in volts rather than vibrations as millimetres per second, is that correct?

45 DR THORNE: Yes.

MS PRICE: In the paper you co-authored, did you or any of your colleagues eliminate any events that did not correlate with the timing of the resident's perception?

5 DR THORNE: Yes.

MS PRICE: This means that the true source of vibrations may not have been identified, correct?

10 [3.25 pm]

DR THORNE: That is correct, and we have acknowledged that.

15 MS PRICE: Your paper also notes, does it not, that neighbours also reported disturbances but at different times from that resident?

DR THORNE: Yes.

20 MS PRICE: Is there any consideration in your paper of other possible sources of the events being identified by the resident? These are sources such as the wind shaking nearby trees or the tree roots then shaking the house, or indeed the wind at certain speed and direction on the house itself?

25 DR THORNE: Yes, quite right.

MS PRICE: So did you consider those other effects? Potentials?

30 DR THORNE: We have and I think you will see the caveat there that this is a research paper, and a research paper by definition is to get people to respond.

35 MS PRICE: Okay. So we will turn to it being a research paper. Because you have offered this paper that you have co-authored as a single residence as your study, can you please advise the following parameters which are very important in social science; how long had that resident resided there?

40 DR THORNE: I am not going to enter into this debate, I am sorry.

MS PRICE: Did that resident oppose the Tararua wind farm?

DR THORNE: I am not going to enter into that debate.

45 MS PRICE: Did you investigate such things as his health status?

DR THORNE: I am not going to enter into that debate.

MS PRICE: Financial status, family issues?

5 DR THORNE: Likewise.

MS PRICE: Or other stress issues.

DR THORNE: I - - -

10 MS PRICE: Do you know why I have asked you those questions?

DR THORNE: I find I understand your approach and it is quite common in the legal fraternity, and I refuse to answer any of those questions.

15 MS PRICE: Well I would say to you, Dr Thorne, it has less to do with the legal fraternity and more to do with the social sciences and the health fraternity?

20 DR THORNE: No. I would disagree and with due respect that is not something that I would discuss in any shape and form on a particular singular person.

MS PRICE: But we have not identified the person.

25 DR THORNE: You have.

MS PRICE: Well I put it to you that all those factors are relevant background for any study within the social sciences that considers wakefulness in respect of the turbines.

30
Now turning to your opening statement you gave us, yesterday, and unfortunately I do not have the transcript available yet, but if I recorded you correctly when you described your work at Makara you said, "I observe my people, my stations". Now again, if I have understood you right these stations were not just monitoring points where you were recording noise, were they? Rather they were people that you were asking to tell you of their perceptions. Have I got that right?

40 DR THORNE: Yes.

MS PRICE: Okay. So how many people were you talking about? I think you mentioned about 40 but again - - -

45 DR THORNE: In total about 40.

MS PRICE: Okay, are those 40 all at Makara?

5

DR THORNE: Yes, as far as I am aware. Yes.

MS PRICE: How did you find them?

10

DR THORNE: By asking people out there. I was involved with the Makara hearing. I made inquiries back through the Makara residents' groups, and this was through a colleague here in New Zealand, for people who would be willing to talk with me concerning noise issues.

MS PRICE: Okay. So in that respect they are self selected?

15

DR THORNE: They are self selected.

MS PRICE: Okay. What background information did you seek from those people for your study of psycho-acoustics?

20

DR THORNE: I am not studying them for psycho-acoustics.

25

MS PRICE: Okay. I will phrase it again, what background information did you seek from those participants in your study to give you the background for it? Their state of health, their financial state, their stress levels, did you seek any of that information?

DR THORNE: That is not possible to be asked.

30

MS PRICE: Did you confirm whether or not they had been an opposer of the Makara or Mill Creek wind farms?

DR THORNE: That is not relevant to my work.

35

MS PRICE: Okay. What control groups did you establish in addition to your cohort study?

40

DR THORNE: I think unfortunately you have got the wrong end of what I do. The human perception study has been peer reviewed and is in my thesis. This deals with the Manawatu.

[3.30 pm]

45

Cohort study and all the relevant material was critiqued in the previous hearing by Dr Philips I think was the social impact person. He wished to know all of those questions that you asked, or a great deal of those questions, and there are certain things – all of my work at that time is

fully documented and you are fully able to purchase a copy from Massey, or download it I guess for free.

5 MS PRICE: Just while we are discussing your thesis. When did you start that?

DR THORNE: 2002.

10 MS PRICE: When did you finish it?

DR THORNE: 2008.

MS PRICE: Who was your supervisor?

15 DR THORNE: Dr Dickinson.

20 MS PRICE: Thank you. You see the reason I am asking these questions is that one of the serious deficiencies that has been identified in Nina Pierpont's work is that she has made a study of self selected people, that is the people who have come forward, and she has no control group for her cohort study and therefore she cannot meet the most basic of tests for conclusive science. Are you aware of these criticisms?

25 DR THORNE: I am well aware of the critiques levelled against Nina Pierpont.

MS PRICE: From your psycho-acoustic perspective are you aware of the scientific phenomenon termed the Nocebo Effect?

30 DR THORNE: A very long time ago, yes.

MS PRICE: Have you received the report which was filed earlier, exhibit 113 I think, given that these issues are so core to your practice, are they not?

35 DR THORNE: I am sorry, I do not understand what you said.

40 MS PRICE: The December 2009 report prepared in North America by that expert panel canvasses the issues which are very critical components of your practice. Have you reviewed it because they are so core to your practice?

45 DR THORNE: I have had a very interesting read of it. This is the Leventhal self selected group I believe. They only considered published data, published reports. However, I must also say that their work was then severely critiqued by another group immediately afterwards, by the Society for Wind Vigilance. I looked at both sets of papers, and

because both to my mind cancelled each other out, I had left them where they were.

5 MS PRICE: Okay. Going back to that report that we talked about with the resident up in the Tararua Ranges. You were aware at the time that you prepared that work of the work of Professor Peter Styles and others at the Keele University?

10 DR THORNE: Yes.

MS PRICE: In the United Kingdom?

DR THORNE: We have referenced Peter Styles.

15 MS PRICE: Yes. Their work regarded the effects of low level vibration on that?

DR THORNE: Yes.

20 MS PRICE: Forgive me if I pronounce it wrong, the S de la Mer seismic array?

DR THORNE: I am.

25 MS PRICE: That array is one of the most sensitive seismic installations in the world and is designed to detect distant nuclear tests, is it not?

DR THORNE: Yes.

30 MS PRICE: The Styles report showed that the levels of vibration from wind turbines are well below human perception levels and so will not cause health effects. Do you accept that the uncalibrated equipment recording in data for one single residence in the Tararuas cannot compare with such sophisticated instrumentation and data processing?

35 DR THORNE: Yes, that is a good point.

40 MS PRICE: Please confirm that the last paragraph in that report that you co-authored says, and I quote, "Several hypotheses have been suggested for the source of the seismic spectral peaks involving the wind farm but the data available cannot confirm or disprove any of them"?

45 DR THORNE: Yes, I would be happy to go with that. I would have to look it up, but if you are quoting it then I am sure it is correct.

MS PRICE: Thank you, Dr Thorne. No further questions.

HER HONOUR: We will take the afternoon adjournment.

ADJOURNED [3.34 pm]

5

RESUMED [3.52 pm]

HER HONOUR: Have you finished, Ms Price?

10 MS PRICE: Thank you.

HER HONOUR: Yes, thank you. Mr Maassen?

15 MR MAASSEN: No, thank you, your Honour.

HER HONOUR: Thank you. Mr Johnston?

<CROSS-EXAMINATION BY MR JOHNSON [3.53 pm]

20 MR JOHNSON: Dr Thorne, you are entitled to know that I am acting for four
of the private land owners in the area of the reserve on whose property
turbines may be sited if the wind farm goes ahead. There are only two
matters that I want to raise with you. The first arises out of a series of
25 questions that you were asked earlier in the day relating to this map,
which is originally I think a Beca map but which is appended to your
evidence. Do you have that still in front of you?

DR THORNE: I do.

30 MR JOHNSON: Now, it may just be that I did not understand matters
correctly. So you just tell me if I have got this wrong. But that map
drawn by Beca appeared, to me at least, to be an attempt to identify
zones, five of them between one and five kilometres, outside the
extremities of the wind farm in order to determine how many residences
35 fell within each of those zones. Is that your understanding as well?

[3.55 pm]

40 DR THORNE: Yes, that would be my understanding.

MR JOHNSON: I am right that far at least. Yet you, as I understood it in
response to Ms Price, indicated that the additions that you had made to
that document were intended to identify how many turbines could
remain if your two kilometre buffer was imposed. Is that right?

45

DR THORNE: Yes, that was my attempt in this particular graph, chart.

MR JOHNSON: But, and we may have reached the part that I do not understand properly, wouldn't one have to carry out that analysis not by starting with a line around the extremity of the wind farm, but rather on a turbine zone by turbine zone analysis?

DR THORNE: Yes, that is what is being done.

MR JOHNSON: Are you indicating that that is what has been done on this map?

DR THORNE: On this map.

MR JOHNSON: Maybe you can expand on that because I cannot see how this map relates to a two kilometre buffer around each turbine zone. So just explain it to me, if you would?

DR THORNE: The noise contours that we calculated, that I calculated, are presented around the wind farm. Now, what we had to do was superimpose the redesign over the existing Beca map. It is the only one we had to give – or only one I had, I should say – to give an indication of the affected dwellings. Then to try to get some sense to that, I have drawn straight lines out from the wind turbines or from the clusters, out to the 30, 35 and 40 dBA noise contours and put distances. From that I could work out, or if anybody wanted to, they could work out, where these particular homes lay within that type of analysis.

MR JOHNSON: I see. So these are the black lines, are they?

DR THORNE: That is the black line, dark red and orange. They are the noise contours and then the black lines come out from what I would call the turbine clusters.

MR JOHNSON: I see. So you have tried to do that on a cluster by cluster basis?

DR THORNE: I did try to do it on a cluster. I do acknowledge though that it is not very clear. But that was the best I could do.

MR JOHNSON: But the point I am trying to get at, and I think with your help I finally understood it, you have tried to do it on a cluster of turbines basis as opposed to an individual turbines basis.

DR THORNE: Yes, not an individual turbine basis.

MR JOHNSON: And how many clusters have you identified, just looking roughly? One, two - - -

5 DR THORNE: Eight I think I went around on.

MR JOHNSON: Eight.

DR THORNE: Sorry, I would have to count them. But – one, two, three - - -

10 MR JOHNSON: Very crudely speaking, what you then do is identify where your black line intersected with the two kilometre red line and - - -

DR THORNE: No. People would say “Okay, my house is about here in accordance with this Beca plan, point X” and they should be able to get an idea of the approximate distance back to the turbine cluster.

MR JOHNSON: Yes. Well, I am going to suggest to you that there is a significant extent in which you are comparing apples with oranges by starting with a map that is used for one purpose and then applying it.

20

DR THORNE: Quite so. But we do not run a full GIS system, I am afraid.

MR JOHNSON: Right. I am going to leave that point and pass on to my second, which is a little different. In your most recent evidence you have referred to a published book, a very recently published book, called “Sound, Noise, Flicker and the Human Perception of Wind Farm Activity” by Rapley and Bakker. Is that - - -

25

DR THORNE: Yes.

30

MR JOHNSON: Am I pronouncing that correctly? Is it Bakker?

DR THORNE: Yes, that is correct, Bakker.

MR JOHNSON: Now, amongst the source material that is referred to in that text is a book – sorry, referred to in the book is some material by Dr R Phipps which was evidence given to the RMA inquiry relating to Motorimu in March 2007. Are you familiar with that work?

35

40

[4.00 pm]

DR THORNE: Yes, I am familiar with that.

MR JOHNSON: Well then, are you also familiar with the evidence given by Mr J McOmish (**ph 4.00.31**) to the Environment Court I think on the Mill Creek inquiry, which roundly criticised Dr Phipps’ methodology?

45

DR THORNE: No, I have not read that evidence.

5 MR JOHNSON: Was that paper – sorry, was that evidence not drawn to your attention as part of the preparation for this hearing?

DR THORNE: No, it would not form part of it.

10 MR JOHNSON: You see, it is just that they are both in evidence before this Board as appendices 1 and 2 to Mr Jo Poff's evidence. But you say you have not had an opportunity to review Mr McOmish's evidence and if that is so, it would be unfair for me to ask you anything about it.

15 DR THORNE: No, sir. It is a fair question. If I may answer that, your Honour? I do not rely on Dr Phipps' work in my own work and I must repeat that I could not discuss another person without their prior approval.

20 MR JOHNSON: Well, it is a danger of getting a little too precious about that sort of thing, Dr Thorne. But if you have not read Mr McOmish's material, I cannot take it any further and I will leave it there, if your Honour pleases.

25 HER HONOUR: Yes, certainly.

DR THORNE: Your Honour, may I make a comment at that point? I was critiqued a little while ago by a barrister and who mentioned a certain name of a person who lives in this area that I had had his name in my paper, or my colleague in my paper. I have checked that paper and the name does not appear. Now, I am quite disturbed and I am not being precious. In the environment that I work in, personal privacy is an absolute benchmark of my being able to talk with people. They have to know that I will not disclose their personal identity to any third party. In fact, when counsel from Wellington sent us the noise complaints, they very correctly removed all those identifiers. When Dr Phipps sent me her raw data for Motorimu she very correctly removed all the identifiers.

40 Now, I do not wish to take that any further but, as I say, I have checked my source, I have asked my colleagues, two of whom are here today with the gentleman that was cited previously. I really find this awkward because I am here to present evidence as best I can. If people give me their approval to cite their names, then I would, but I try not to for this very reason, that they are then held in a somewhat negative vein if I may say, ma'am. It is not what I would want to put my colleagues and my friends into and I would not put that, even with my colleagues,

45

on this table without their permission. I would not mention their names, even if – in another hearing if they gave me evidence in confidence.

5 HER HONOUR: This occurs in Australia too, does it, Dr Thorne?

MR JOHNSON: Very much so, ma'am. If I did that, I would be in real strife, very real strife.

10 HER HONOUR: Yes. Right, we will leave the matter there. Thank you very much indeed. Now, submitters who might like to ask questions? Mr Low?

MR LOW: No, thank you, ma'am.

15

HER HONOUR: Mrs Dixon? Joy Vanderpole? Mr Adams? Thank you. He is your witness, Mr Adams.

MR ADAMS: Good afternoon, your Honour and members of the Board.
20 Good afternoon Dr Thorne.

DR THORNE: Good afternoon.

MR ADAMS: Did your monitoring include MPO7?

25

DR THORNE: Sorry, my noise predictions included (**INDISTINCT 4.05.15**).

MR ADAMS: Thank you. Thank you Dr Thorne.

30 HER HONOUR: Dr Huffman?

DR HUFFMAN: No, your Honour.

HER HONOUR: Mrs Grassick? Members of the Board?

35

MR HEERDEGEN: Dr Thorne, with reference to your statement of evidence submitted in February 2010 on behalf of Huatau Marae, on page 9, paragraph 4.13, you state there that a wind farm sound level of 42 dBA measured as a background level is therefore the measure for severe annoyance. Mr Lloyd I think today stated that 40 dBA was regarded as a satisfactory lower level for an acceptable noise limit. So what justification do you have for stating that 40 dBA is a severe annoyance when, in fact, Mr Lloyd's statement would suggest that it is just simply a limit for acceptable noise, if I have understood Mr Lloyd correctly.

45

DR THORNE: The history goes back to the Makara hearing, sir. Mr Hayes, in his affidavit, was saying that the intent of NZS 6808 1998 is not in inaudibility, but the prevention of severe annoyance. From that, I took, and I had in my notes when I was taking notes last year, that the 40 dBA background or background plus five, whichever is the greater, is that marker for severe annoyance? Now, Mr Hayes at that time of the hearing had been involved in some, if I remember correctly, 240 hearings of wind farms. So I was, when somebody of that calibre and experience says this is the marker – what I take, this is the marker for severe annoyance, then I have used that as my marker myself for my own work. I really would think now, after just doing the few months of work at Makara, that severe annoyance is occurring at around about 30-32 dBA outside the dwellings. So 40, I am reasonably comfortable now to stay with 40 as severe annoyance.

MR HEERDEGEN: Okay. The second question relates to the document called “Second Agreement Reached at Acoustic Expert Caucusing, 22 March”, which is signed by Lloyd, Hegley and Day and it includes your set of conditions I think as a major part of that, Turitea wind farm noise management conditions. At the bottom of page 3 you say “no wind turbine shall be installed within 2,000 metres of any dwelling or noise sensitive place” etcetera. This condition would suggest that you use setback as a method of redressing potential effects, I take it. My question is should this be part of a hearing determination that is actually at this stage when we have a plan in front of us and you are suggesting that we ought to have consent conditions which apply to setback, or is it perhaps more realistic that it is contained within some sort of district planning instruments whereby, if you like, the basic frame for – the spatial frame for building a wind farm can then be established, in which case it provides for a somewhat different set of criteria.

[4.10 pm]

DR THORNE: Yes, sir, I would agree with you. It is a planning instrument. In the context of this hearing I have offered it up as a best practice option. In the context of where we would have been discussing with the other parties, my view, after working now on a number of wind farms and with resident groups, is that it is very hard to measure sound as it occurs, as the complaint occurs. I believe at Motorimu I made the same point, probably not very well, that to do all this technical stuff with wind variations, turbine configurations, land configurations, it made more sense to me, and I have come to this gradually I confess, that a setback distance was the most practical method of giving surety to both parties.

5 Now at 2,000 metres we can still say there will be problems under
certain wind conditions for some families. But my brief and my
comment to the residents group was that I was not – I was having to
offer up some evidence that I could support. I am conscious of people
10 wanting three and a half and five kilometre setbacks. So I saw it as
being a best practice solution, even in the context of this case. So that if
you come into 2,000 metres, there are known now, I believe, well
known, issues, problems with some wind turbines under some weather
conditions. Now, after our research work we have got some pretty fair
15 ideas of what makes those things work. But they still become really
complex and when you are talking about 40 dBAs and background plus
and the wind direction going at six metres per second or calm or
whatever, it just seemed to be an unmanageable, practical – in a
practical sense, an unmanageable process and so - - -

15 MR HEERDEGEN: I think you have probably answered my question. The
only other small question I would add is that how does one deal with
the situation of, and you mentioned it, several distances, two, three,
20 four, five kilometres because whenever you change the line then
obviously you end up including or excluding so-called affected
residents.

25 DR THORNE: Yes, sir. I think it requires good wind farm design for noise,
not only wind harvest. That, to my mind, I believe is the key to this,
that the effects that I have been researching and working with are now
quantifiable, the effects on people are quantifiable, the wake in
turbulence effects from the wind farms are quantifiable. Therefore we
can set down and design a practical wind farm. I am not saying it will
30 not cause noise at 2,000 metres and I do agree with my colleagues here.
They will be audible under certain situations. But they would not be
designed to create noise. That is the difference.

35 MR HEERDEGEN: That is fine, thank you. I think you answered the
question.

DR THORNE: Thank you, sir.

HER HONOUR: Mr Bunting?

40 MR BUNTING: Thank you. Dr Thorne, referring also to the same document,
these draft set of conditions, are these conditions that you have put
together yourself, have you proposed these in other wind farms, perhaps
in Australia?

45 DR THORNE: Yes, sir. They have been critiqued at two wind farms so far.
They have been developed after consideration of the National

5 Environmental Protection Council's guidelines that came out last year. The draft prior to that, they are the Australia New Zealand NEPC Council guidelines on wind farms. I am working with people in Victoria and with the planning hearings there and they have got some very clear ideas on what they want and how to measure and not so much setback distance, but they have very clear concerns with wind farms, especially the cumulative effect of wind farms.

[4.15 pm]

10 MR BUNTING: But at the moment that proposes rather than – have they been accepted by anyone?

15 DR THORNE: Yes, sir, they have been accepted and why it is germane to here is that they implement NZS6808 1998 in its purest form, I might add.

20 MR BUNTING: It surprises me that condition 2 for instance, that a condition would be acceptable to a consenting authority that referred to a noise level that was acceptable to the landowner?

25 DR THORNE: Yes, sir. A lot of the landowners are accepting of wind turbines within 2000 metres, I must say that. But equally they are compensated.

MR BUNTING: Because I would have thought the noise levels would apply, you know, within a district plan rather than each landowner saying it is acceptable to me. I mean, why would you go so far?

30 DR THORNE: Sorry, sir. No, it is a sign-off procedure in Victoria. Sorry, sign-off means that I could introduce a wind farm anywhere within the rural environment and as long as I had a sufficient number of farmers or people who would like to have wind turbines on their farm, NZS6808 would then flow. The procedure goes to the minister. The minister sets the conditions or the broad conditions before the hearing so that people know what they are talking about.

35
40 One of those conditions draws up on NZS6808 in the form we have now, not with what I would call the Makara additions. They have more recently introduced more complex requirements as they have found problems with wind farms, or – I should not say how they have found problems with wind farms, as issues have arisen. So we are having to answer more and more complex questions on each hearing.

45 MR BUNTING: Can I just take you just – I have only had a quick look through this but condition 24, it is on page 40.

DR THORNE: Yes.

5 MR BUNTING: There it says that noise with transformer units and operational noise from switchyards or substations shall be inaudible?

DR THORNE: Yes, we can calculate back from - - -

10 MR BUNTING: Is such a condition accepted by an authority?

DR THORNE: It gets raised. I do not know what happens to them in the end but inaudibility is a standard of Queensland. We work on inaudibility all the time. So my quarry clients work on inaudibility or background plus 3, background plus 0 requirements for 24 hour operation. So we are well experienced with even in the Australian situation with working on background and background minus requirements.

MR BUNTING: Can I just ask one question, one further last question. Throughout your cross-examination you have used the term 'we' a lot.

20 DR THORNE: Yes.

MR BUNTING: Who are we?

25 DR THORNE: We is my company, of course I have got colleagues in there. Two young guys who work with me; my son who is a lawyer, my colleagues who have helped me with all the research over here. It is – I am sorry, it has become a habit just the 'we' rather than the 'I' because I do not prepare and work with the all the – do all my work by myself.

30 Obviously if I do research for my wind farms, I come to my own conclusions and do my own research. But I need people every now and again to help me do mapping for argument's sake. So we are a "we" at that point because I am not any good at mapping.

35 MR BUNTING: In terms of today, can we assume - - -

DR THORNE: I am an "I".

40 MR BUNTING: - - - that it is "I" rather than - - -

DR THORNE: Yes, I am an "I".

45 MR BUNTING: Thank you very much.

HER HONOUR: Mr Hudson.

5 MR HUDSON: Dr Thorne, we had in Mr Day's opening statement at
 paragraph 16 he says that there is still geographical distribution of
 complainants. It was generally along the Makara Valley. But it is
 interesting, three of the complainants were located well up the north
 east at Takarau Gorge Road towards the proposed Mill Creek wind
 farm approximately five kilometres from the Makara turbines.

10

[4.20 pm]

DR THORNE: Yes.

15 MR HUDSON: Now, but I heard what you had said in answer to the question
 just before about two kilometres and three and a half, it is a response to
 an alternative, to a complex alternative.

DR THORNE: Yes.

20

MR HUDSON: But in this type of situation would there still be people who
 would be falling through the net, so to speak?

25 DR THORNE: Yes, sir, there is. In my earlier work when I did my research
 here in Manawatu and that was peer reviewed, I must say. I gathered
 evidence or information from people who were affected, so they said, at
 10 kilometres. Now, I could not hear those sounds at 10 kilometres
 when I did my surveys so they did not form part of my evidence.

30 I need to be able to hear it, sir, operating you know so that – I could not
 give you evidence before this hearing if I had not personally
 experienced it, heard it. So even though people tell me that, yes, there
 is an effect I can accept that on a technical level but I would not be able
 to raise it before this hearing if I had not got some measurements or
 35 heard it myself.

MR HUDSON: So this is the downside of the other method?

40 DR THORNE: It is, sir, yes it is. My 3.5 kilometres is really a good working,
 best practice but 2,000 is probably a – where I can legitimately say I
 have got research data evidence that I am satisfied with that can be
 produced if need be. But it has in fact been produced in part in my
 documentation. At five kilometres I know one of my colleagues has
 done some work at that level at that distance, but I have not.

45

MR HUDSON: The other thing I was going to ask you, I think I heard you say in answer to Commissioner Bunting's question about the resident having the power to have the turbine turned off. That they would forego – they were being compensated, is that what you said?
5

DR THORNE: No, sir, no. In Victoria once you accept the payment, that is it you cannot - - -

10 MR HUDSON: Have they got them on their land?

DR THORNE: Yes.

MR HUDSON: So they are a resident with a turbine on their own land?
15

DR THORNE: Yes, my friend has got two of them on his place now he is getting crook.

MR HUDSON: And it is those residents who have that option of having it turned off. What about if there is a resident in a similar distance who is not on their land, is it the same - - -
20

DR THORNE: They were turned down on the grounds of visual amenity.

25 MR HUDSON: Well.

DR THORNE: Not noise, they were compensated. I can only say that because it was actually in the newspaper and it was a case between two large limbs of the wind farm. But now once people accept an honorarium or whatever payment of compensation, they are not allowed to do anything that will jeopardise the owner of the turbine, the right of the owner of the turbine to operate those turbines and that included us doing noise measurements. So we had to be very careful.
30

35 MR HUDSON: I am not clear, I am sorry. Is this like people getting rental?

DR THORNE: Yes.

MR HUDSON: And if the neighbour who it is not on their land, they do not get rental?
40

DR THORNE: They do not get rental.

MR HUDSON: Just like it is operating here?
45

DR THORNE: Yes.

MR HUDSON: All right.

DR THORNE: Yes, it is a problem.

5

MR HUDSON: And what you are saying is the person who gets the rental has got that option in the agreement to request that it is turned off?

DR THORNE: No, no they cannot, sorry.

10

MR HUDSON: They cannot?

DR THORNE: No, they cannot request it to turn off.

15

MR HUDSON: So you suggest the condition is the neighbour whose land it is not on does have that?

DR THORNE: Yes, our condition was to respond to the enquiry to say how could somebody who does not have a beneficial compensation from the wind farm, can get some immediate redress for a complaint.

20

MR HUDSON: Okay, I understand you. Thank you, no further questions, your Honour.

25

DR THORNE: Thank you.

HER HONOUR: Dr Thorne, you say that you have advised on the Queensland noise level policy.

30

DR THORNE: Yes.

[4.25 pm]

35

HER HONOUR: Did you advise that on the basis of the Australian New Zealand standard that you have quoted to us from time to time?

DR THORNE: This was back in 95, your Honour. It is - in Queensland, sorry, on wind turbines?

40

HER HONOUR: Yes.

45

DR THORNE: In Queensland when we developed the noise policy the overarching legislation said that noise shall not create a nuisance. We needed a definition of nuisance and nuisance then became disturbance to sleep. When we wrote that report there were no wind turbines in Queensland. Queensland normally puts them in Victoria.

5 But we now have one wind farm in Toowoomba. Prior to coming to this hearing I asked them what conditions they had and they said we do not have conditions. Now, that means under Queensland's legislation they are open to an immediate claim of nuisance. Under Queensland conditions and like here, once you have a condition, you are entitled to have the protection and enjoy that condition.

10 So Queensland, I think, they forgot this problem. But we do not have many turbines. In Victoria the nuisance condition applies under the Health Act and that is the issue there. It does not apply underneath the planning legislation.

15 HER HONOUR: Now, the work that you have been doing here is that pro bono that you have been doing in New Zealand?

DR THORNE: I live in the expectation I might get paid one day, your Honour. But no, it is pro bono apart from expenses.

20 HER HONOUR: I see so you are flying over here, you are undertaking this for the community at your own expense?

DR THORNE: Yes, it has been.

25 HER HONOUR: Yes.

DR THORNE: The community has supported me a great deal, your Honour.

30 HER HONOUR: Yes, I am sure.

DR THORNE: With the airfares and accommodation and vehicles and such.

HER HONOUR: Yes.

35 DR THORNE: If I may come back to my comments before why I am quite so severe on – I can only work with the confidence of the people that I am working with. So if I give out their names or try to identify them, then all that confidence is gone.

40 HER HONOUR: Yes, that is very understandable particularly in small communities.

DR THORNE: Yes, ma'am.

45 HER HONOUR: Following on from some of the questions raised by Ms Price and given that you were feeling very tender when you came on the

stand this morning. may I just say that everyone on this case in respect of noise has been running to the wire on absolutely everything.

5 DR THORNE: Yes.

HER HONOUR: We got the Makara report on Sunday.

DR THORNE: Yes.

10 HER HONOUR: We know we are very lucky to have it. We got the New Zealand new standard last week, some of my colleagues on the board still do not have it.

15 DR THORNE: Yes.

HER HONOUR: It has not been anybody's malicious intent to upset all of this and having known the noise consultants that are on the hot tubbing platform with you I have not known them to behave in a difficult way in terms of interchange of information before. I am sure it was not
20 intended.

DR THORNE: I am sure of that too, ma'am.

25 HER HONOUR: I cannot take it any further than that because I have not spoken with them. But in terms of what Ms Price began a dialogue with you, would you be prepared to reconsider the draft that has come before us, and some of the objections you have made?

30 DR THORNE: Most definitely, ma'am. I would not in any way wish to hinder the work of this enquiry. It is just that I am really stretched time wise today. I have to go to another wind farm hearing on Wednesday. I am not saying that to mean anything other than that. I moved it from tomorrow to Thursday but I am all day travelling tomorrow.

35 HER HONOUR: Yes.

DR THORNE: But I am willing to come back, I guess, I would have to talk with the community. But it got to the point where it is no longer financially feasible for me to keep doing this.
40

HER HONOUR: Yes, well we might look at that issue.

45 DR THORNE: But I am only too happy to sit with all parties if we can to resolve issues.

[4.30 pm]

- 5 HER HONOUR: Yes. And Mr Mills' facilitator has indicated that he is happy to continue on but he felt that perhaps this quite was not the time. Maybe later, later down the track.
- DR THORNE: I do ask though, ma'am, that if we do – your Honour, if we do go to further work that I do have at least one of my other colleagues - - -
- 10 HER HONOUR: Yes.
- DR THORNE: - - - because they – as I say, I link between the real acoustic world and the psychoacoustics, the people. We have very real ability to measure the sound that – the problem sounds at Makara and quantify them. But part of this now has, the intellectual property has now become quite valuable commercially. So I do hesitate to put too much into the public arena. But that said, as long as I have somebody of one of my colleagues to work with me so I can feel comfortable where I am going, I am more than happy to work with this inquiry.
- 15
- 20 HER HONOUR: Well, acoustics are a science. Lawyers cannot poke at clouds they have got to be able to deal with the realities. Realities have to come from the lawyers and the experts onto our pages when we make the report. We cannot have big silences, we cannot have many closed off areas in a board of inquiry like this. So I think you do need to understand that.
- 25
- DR THORNE: I do, your Honour. The nub of the problem, if I may say, is the definition of reasonable/unreasonable noise.
- 30 HER HONOUR: Yes.
- DR THORNE: Now, I have a quite defined opinion on that because I have researched it now for nearly four/five years. I need the balancing of one of my colleagues who is also involved heavily in this field. The acoustic side with noise is relatively straightforward.
- 35
- HER HONOUR: Yes.
- 40 DR THORNE: The measurement instrumentation, as I said to Mr Day in my comments in the acoustic consultants report, is that I have no great problem with any of the technical issues at all. They are from the point of view of application.
- 45 HER HONOUR: Yes.

5 DR THORNE: And that as I from my history in public administration and local government and in public service, I would see all of this work being done out of council. Because I cannot and I would never accept that an applicant should be in charge of his or her own right – his or her own conditions, monitor his or her own conditions - - -

10 HER HONOUR: I do not think that is an issue in New Zealand, it really is not.

15 DR THORNE: I would disagree, your Honour, because I am listening to what my colleagues here are saying and if they are having difficulty measuring this noise and if you cannot get a compliance report until today, whereas we could generate a compliance report on a daily basis from all of these turbines, update them on a seven daily basis and have them in real time on the web. I cannot see – I have no confidence in what they tell me.

20 HER HONOUR: Well, I think the background to all of that we do not know on this point.

DR THORNE: Yes.

25 HER HONOUR: But I think down the track I am sure that people will take account of what you have said, and if they agree, it will move forward.

DR THORNE: Thank you, your Honour.

30 HER HONOUR: So thank you very much for involvement and for coming all this way. Thank you, Dr Thorne.

DR THORNE: Thank you.

35 <THE WITNESSES WITHDREW [4.33 pm]

40 HER HONOUR: Now, we would like to have Dr Dickinson. We are running late. We have Mr Botha to get back to Wellington this evening also. So I wonder please if Dr Dickinson could come to the platform. Dr Dickinson we have had two of your reports before us and we would like you to just outline to the assembled throng just what you see as the main issues.

45 PROFESSOR DICKINSON: Would it be possible for me to show pictures on a screen because it is a lot easier for me to talk to a picture. If we could (INDISTINCT 4.34 pm).

HER HONOUR: Yes, have you any idea of the time involved in this?

PROFESSOR DICKINSON: Quarter of an hour, 20 minutes.

5 HER HONOUR: Right, okay. 20 minutes it is and that would be fine. Do
you mind if we sit late. If I could have some feedback on that if there
are lots of no's then we will have to resume in the morning but I am
very conscious that we really do need to get Mr Botha back to
Wellington tonight. No no's? Well thank you very much, that is very
10 kind because we kept you late last night too.

Yes, please do feel free to come up, and even further up if you wish
around here. Mr Baker, can you make the screen go back a little bit or is
it sort of stuck?

15 MR BAKER: Yes, I can make room.

HER HONOUR: Well that is kind, thank you.

20 PROFESSOR DICKINSON: Is it all right, your Honour, for me to sit down?

HER HONOUR: Yes, of course, Professor, make yourself comfortable.

PROFESSOR DICKINSON: Thank you.

25 HER HONOUR: Yes, Professor?

PROFESSOR DICKINSON: I was the one dissenting vote on the standard,
and it's really because I'm a pragmatist. I have studied acoustics now
30 for 60 years or more, and I know full well that a lot of the things that
consultants and statisticians say are just not possible. The most
expensive sound level meter that you can buy is not more accurate than
plus or minus one decibel, so whenever I see reports that have 'point so
much of a decibel' I think, "Well, I don't even know what a decibel is."
35 I'm very conscious also of the difficulties of sound propagation and
how one predicts it. I designed probably the third computer model in
the world on sound propagation, way back many years ago and it's one
that's been used quite a lot in the aircraft world. I know full well the
difficulties that are involved.

40 And that if you have a very conscientious computer programmer you
can make that programme give whatever answer you like. And frankly
when I talk about acoustics I like things to be real, I like to think of
things that "yes, I can measure those." I don't like to think of things in
45 the abstract sense when we say "yes" it's going to be this, I want to
know why it is that.

Now if you can sort out my - - -

5 MR.....: Just having a few technical difficulties.

PROFESSOR DICKINSON: Okay, yeah.

10 HER HONOUR: Professor, would you like to tell us in the interim why you –
well what do you think about the new standard?

15 PROFESSOR DICKINSON: I was on the team representing Massey
University and working with a group of 12 people advising me. I think I
was the only member of the working group that actually had an
advisory team. It was the science perhaps of the standard I felt was not
making much sense. The mathematics in the standard I felt were
suspicious and I also felt that the ethics had been completely forgotten.

20 Very difficult to work with colleagues, as you know, I did put all of
these to the standards group, but they in a way were hamstrung in that
they had to go on things that they had read and had been published
worldwide, whereas I didn't need to do that. Although I took that into
consideration, I was able to go out and take measurements. I doubt
whether any other member of the working group had actually been out
at night taking measurements as I have.

25

[4.40 pm]

30 I believe I was the only person that actually put to the committee actual
measurements, which they felt shouldn't be taken into consideration
because the international reports didn't seem to agree with those sorts
of measurements. I was also fairly scathing of the way that the criteria
was being used. I was an initial member of the World Health
Organisation group bringing out the community noise
recommendations. I know the person that did the noise/sleep studies
extremely well, Professor Barbara Grefant(**Ph 1.08**) is a friend of mine
35 for about the last 30 years, she is a medical doctor. I know how the
research was carried out. I know how the results were obtained, but
they have been twisted out of proportion.

40 From the sleep point of view, the 30 decibels that was recommended in
a bedroom by the World Health Organisations group were one metre
from the sleeping person. Here we relate that to a spatial average within
the room, and so when they say that an open window is going to give a
sound attenuation of 10 decibels that applies to the average over the
45 whole of the room. For instance, we've got a door open down there.
Yes, I guarantee that in here we have a sound attenuation of 15 decibels

from outside, but that is the spatial average throughout the whole room. Now the lady that is sitting or was sitting down there by the door would have no attenuation whatsoever. She would receive all the sound that was coming through.

5

Now if you are in your bedroom, how close to the window do you sleep? If it's a hot night in the summer do you have the window wide open or if you're in the country and you don't have air conditioning do you like to sleep on your patio at night or on the deck? Because if you do there is no attenuation whatsoever. So I believe that the criteria that we use has really got to be the outside criteria, so the 30 decibels that Barbara Grefant came out with should be the level that people should not receive more than when they are out on their deck at night. I don't have a problem with noise levels during the daytime because lots of other things are going around.

10

15

Another problem that I have on this is that the way the methodology is actually carried out. We are basing it on an L_{90} the level that is there 90 percent of the time that we call "the background sound level". The only reason we are doing that is so that the people perhaps in the wind farm management can operate monitors without being there. Now it is all very well taking a noise measurement at night, but unless you're there how can you guarantee that the noise level is coming from a particular facility—there is no way you can do that.

20

25

I believe the way the methodology has been worked is one in which the wind farms can always show compliance. I think they would find it very difficult not to show compliance the way the standard is written, this is my own personal view of it.

30

Still not success with that? Well that's a pity because I wanted to show some of the measurements that the people have actually been taking.

35

Quite often when they take these background measurements they take so many hundreds of measurements around the area, I believe it's more than 1400 measurements. And from that, they plot them onto a graph that has the wind speed at the hub of the turbine or where it's going to be and the background level around the area. Now when they are actually measuring that background level, there is only a certain amount of instrumentation that they can actually use, and quite often that instrumentation has various limitations in it.

40

[4.45 pm]

5 Some of the instrumentation that I've actually seen being used doesn't
 measure down below 29 decibels. So that means that whenever you are
 taking the background level, anything that is below 29 decibels is
 written as 29 or 30, so you are immediately bringing in a bias that you
 are showing that the background noise level is higher than it really is.
 And the way that I see it on this is that there is actually no way you can
 be lower than the background level, it is always going to be higher your
 measurements. Unless you're actually there and you can stand up with a
 10 meter and you could say, "Yes, I was there, the sound was coming from
 the general background level, there was nothing else there and this is
 what the sound is," that is the only way I believe you can do it.

15 Similarly, if the wind turbine is operating the only way you can actually
 do it is to say, "I was at this position, while I was there I measured the
 sound, the sound was coming from that turbine and the sound was this
 and I used the best instrumentation, the noise floor of the
 instrumentation was much lower than the levels I was measuring." I
 believe you have to do this. I don't think there is any other way you can
 20 get over it.

(Still no luck on that?)

25 MR.....: I'm just rebooting the **(INDISTINCT 1.27)**.

PROFESSOR DICKINSON: Right, and there is one further problem. I have a
 little noise thermometer here, the top of the scale is 90 decibels. If I just
 blow very gently, you are probably seeing that the little thing goes right
 up to the top. When we are measuring in acoustics we are very, very
 30 careful that the wind does not exceed more than five metres per second
 if we are measuring sounds of 40 decibels or so. Because at five metres
 per second we are actually going to get 35-40 decibels on the metre and
 it is nothing to do with the sound, it is just the wind on the microphone
 grid. If we want to measure down to 30, we would have to drop that
 35 wind speed down to about three metres per second.

The wind turbine standard allows you to measure at any wind speed,
 and I'm afraid that in measuring at any wind speed most of that is
 simply going to be the noise of the wind on the microphone, it is not
 40 going to be the noise of anything else, and there is no way then that you
 could compare one noise with another.

HER HONOUR: What about masks on the microphones?

45 PROFESSOR DICKINSON: A little windshield on the microphone, yes, I
 have a little picture that that does, it drops it down 10/15 decibels. But

even with that mask in place, we would not measure sound when the wind is more than five metres per second because we would know full well that out of that, that we're measuring about 35 decibels of it is going to be purely the wind over the microphone grid.

5

So what we are having in our measurements there and the way it's done in the standard is that the majority of it is going to be the wind over the microphone grid and not the actual sound that we want to measure, that's my worry.

10

The second worry that I have is that the levels at which – sorry, the area in which they will actually take measurements is based on a prediction, it is based on the predicted 35 decibel contour. The predictions themselves worry me because the predictions are based on an ISO standard that actually says that it is not relevant for aircraft noise for a start. Now if it is not relevant for aircraft noise, which is a propeller, how can it be relevant to wind turbines? It also says that it is not regarded or shouldn't be – it is not recommended to be used over one kilometre away because of the difficulties involved in the problems with tolerances and so on.

15

20

It also states that the conditions at the source should be approximately the same as the conditions at the receiver and we know full well that with wind turbines they are not, the turbine can be in quite a high wind, the receiver can be in calm. And it also assumes that we have a stable atmosphere between the source and the receiver.

25

[4.50 pm]

30

Unfortunately, we can predict the parameters between the source and the receiver just about as accurately as we can predict the weather at the next total eclipse of Jupiter. We have no way that we can do it. We can know what the weather conditions are at the source, we know what the weather conditions are at the receiver, but in-between we have no idea whatsoever. If we had then it would be possible for us to remove a lot of the problems in the world.

35

For instance, there is a 20,000 tonne boat sunk in off Sheerness in the Thames Estuary, it has got 20,000 tonnes of TNT on board from World War II. They aren't blow it up because they don't know which way the weather pattern would go and if they choose the wrong weather pattern then all of the mass will be deposited on one of the cities around with 10 million people or whatever there is. These sort of things we can't do at all.

40

45

5 The sound itself from the wind turbine, I think you have seen pictures
of the turbine and perhaps a noise camera showing the colours of where
the maximum sound is, it is caused by the wind actually sliding down
the blade and when it can't retain its boundary layer it comes off as an
eddy and that is a noise - but the majority of it comes off at the tip. So
you got a tip that is going round once a second, each blade is replacing
the previous one in a second. So what you have is a sort of wave of
sound, it is actually in the form of a helix that is coming out towards
10 you like this, like a spring in which each wave is being repeated at one
second intervals or thereabouts.

15 Now that wave contains lots of other sounds within it, but it is like a
package being thrown at you. Now it has been argued that this
modulation is not low frequency. Well it just depends how you actually
define low frequency because if you've got a packet being thrown at
you once every one second, that is certainly low frequency, it is
infrasound.

20 (Still nothing up there, unfortunately.)

25 Now I have taken measurements at several wind farms. I've been to
wind farms in Denmark, South Australia, Western Australia, I've been
to Ravenshoe in Queensland and I have taken measurements here. On
some of the conditions I have actually measured 50 decibels, I have
measured more than 50 decibels I think now on 12 or 13 occasions, and
I try to predict them using the prediction method in the standard. If I use
the one in the old standard it said the level should have been 30. This
new standard using all of the facilities within it would give me 33. That
30 s still way short of the 50 I have been measuring.

35 If we use a line source we get a bit closer, 49, but it's still not there. I
believe we should not predict the sound in a standard. I think the
standard should be based on measurement alone and that the local
authority should say, "Look, yes, you can put in your wind farm, but it
must make no more than this amount of sound at this particular
position." The amounts of sound that I believe should be possible are
based on the old Board of Health report which is the only research
report I have come across in New Zealand, it actually looks at what
40 should be acceptable for people, and if you look at the Board of Health
report you will see that in a rural community they recommend 25
decibels, no more.

45 You're saying "40" or at least the standard is saying "40". But do you
realise that if by the means of which they judge the background level to
be they get 40, it means the wind farm can make 45. If you look in New

Zealand standard 6803 on construction noise that is the maximum amount of noise that you can make for short term construction. So how is it that a wind farm standard which is there, is continuous noise, is permitted to make more than construction on the short term.

5

Still nothing there and my meter says I have two minutes so I'll keep to my 20 minutes.

10

So the problems I have got with the standard is it utilises a criteria that may contravene the World Health Organisation recommendations. It employs a methodology that may overstate the background sound level on which the controls are based, by several decibels. It may underestimate the noise it makes at a remote location by an order of magnitude.

15

[4.55 pm]

20

And finally, one thing I haven't dealt with, the way the standard is written there is no way that a local authority can actually manage the noise and fulfil its requirement under the RMA. The local authority usually has the responsibility for the management of noise in its area. There is no way in the standard that a local authority could actually go through these measurements, they have not the equipment nor the time nor the personnel.

25

30

If it is to be done properly, and it could be done very easily, you could say, "Yes, we would simply make it that at no time should the wind turbine exceed 30 decibels at a residence over a 10 minute period, nor should the lower frequencies (below 125) exceed 20," because each room has a resonance. If you hit that resonance, the sounds will be amplified.

35

And I was going to put up some measurements of resonances in a bedroom and in my own bedroom; quite a number of them are below 125 hertz and that is where 96 percent of the energy from a wind turbine comes, 96 percent of it or thereabouts is low frequency noise, below 125 hertz. Eighty percent or more is below 20 hertz which you would define as infrasound.

40

So that I believe is what we should have in the standard and those are my main disagreements with the standards working group. But I can see that poor Dr Chiles was rather hampered by having to follow what is done universally which I believe is for the protection of the energy industry, not for the protection of public health. Thank you.

45

5 HER HONOUR: Thank you very much, Professor, for coming along and giving us your time. I am very sorry that the slides are not able to be produced, but maybe there can be some discussion about how we might further that at some later point.

PROFESSOR DICKINSON: Right.

10 HER HONOUR: If I can just make you available for questions. Ms Price?

MS PRICE: Thank you, Professor Dickinson.

15 As I understand it, one of your concerns with the new standard was the averaging to be applied and you said in your paper, "Nonsense on Stilts" that you can't do averaging on wind farm standards," is that correct?

20 PROFESSOR DICKINSON: I'm sorry, I don't understand the sentence there and unfortunately I'm very deaf, so it doesn't make much sense, I realise that.

MS PRICE: Okay, so - - -

25 PROFESSOR DICKINSON: Now I can hear you.

30 MS PRICE: As I understand it, one of your concerns with the new standard was the averaging to be applied and you mentioned this also in your paper "Nonsense on Stilts" that you can't do averaging in wind farm standard, is that correct? Have I understood you correctly?

35 PROFESSOR DICKINSON: Yes. The averaging should not come into it. The recommendations are built on the maximum level at the sleeper not to disturb sleep or if you are awake to allow you to go to sleep. That is not an average over a period of time.

MS PRICE: Okay, thank you.

PROFESSOR DICKINSON: If you like, that's a maximum level.

40 MS PRICE: Thank you. So as I understand it, Professor Dickinson, you were a member, in fact probably a lead author of several other technical noise standard committees which have applied averaging and I'm referring here - - -

45 PROFESSOR DICKINSON: That's right.

MS PRICE: - - -specifically to the 1992 airport standard - - -

PROFESSOR DICKINSON: Yes.

5 MS PRICE: - - -that is 6805 which has three month averaging which has three month averaging and the 1994 helicopter standard 6807 which has seven day averaging. Can you explain why wind farms shouldn't be averaged?

10 PROFESSOR DICKINSON: Yes. The noise is different. Wind farms are continuous noise when they are in operation in your particular direction. Airports are transient noise, the sound comes and it goes. For that particular averaging, the averaging was a political decision, it was not my decision. It was a political decision by the civil aviation authority because the airlines could not change their flight numbers except on a seasonal basis. I wanted that to be a daily average. They wanted a yearly average. In the end we had a compromise on three months. It is because people adapt to aircraft.

20 [5.00 pm]

I believe we have mentioned the flats at Maupuia earlier this morning. I would love to live there. It is a beautiful place to live. You see the aeroplanes taking off and going away. The sound comes and the sound goes. You have probably 60 aeroplanes a day, maybe more, maybe less, but there is interest and they come and they go. At night it is quiet. With a wind turbine it is not quiet. The noise level is low, but it is irritant and if we are going to base it on the background plus five, it is rather like saying well, that the maximum level that a person would take without it becoming really a serious legal issue.

I took part in a minor way in – I have taken part in a lot of surveys, particularly the ones at Heathrow Airport in London and various other places. The results that came out was that if we exceeded a background level plus seven, there was severe annoyance. People would really start to be angry. At 10 that annoyance was boiling over, but it has not reached the stage when people were willing to give up their hard work and savings to pay for lawyers to take the case to Court. But at 13 there was no question, they would all gang together because they could not stand it. Here we have got a background level compared to a new background level of five, which is the equivalent of that 10. It is the maximum that people will accept without there being really severe implications. So it is not really to protect public health, it is the way that planners work so that we can get something done without being stopped by very severe legal action.

MS PRICE: So if I interpret you correctly then, and going back to that earlier standard for airports and helicopters, it is almost like you are saying that as a society we have accepted airports and helicopters and the fact that we need them.

5

PROFESSOR DICKINSON: We have accepted them, yes.

MS PRICE: So therefore your objection to the wind farm standard and your refusal to allow averaging as something that should be permitted in that standard is because you believe we have not accepted wind farm noise.

10

PROFESSOR DICKINSON: No, because it is a different type of noise. It is a continuous irritant at night, whereas these other noises come and go. When something comes and goes, your sleep may be changed one sector but then you go back again. But if the noise is there as an irritant, you cannot do that.

15

MS PRICE: Well, that might be true of an airport with only an occasional night flight. But for the residents in the noise contours surrounding a very busy airport that has operations going well into the night or well early in the morning, which is the area where it most gets caught by the noise standards, I do not think occasional irritant is what they would accept as happening to them.

20

PROFESSOR DICKINSON: Remember that we set boundaries around the airport and that in those boundaries we have very strict land use planning. So all the houses within a certain area will be sound insulated to a certain value or bought up by the airport. So in that case we are actually protecting the sleep of the people.

25

30

MS PRICE: So let us turn to sound insulation and attenuation with the windows. Are you aware that the generally accepted attenuation into a house with windows open for ventilation is 15 dBA. I put this to your student, Dr Thorne, and he accepted that. Do you agree with that?

35

PROFESSOR DICKINSON: No. I do not have to agree with my students admittedly.

MS PRICE: Sure.

40

PROFESSOR DICKINSON: But yes, this was one of the pictures of tables I would put up on the board there to show you. But no, only if the level is – sorry, if the window area is less than three percent of the wall, well you would get 15 decibels, and then only as a spatial average of the room, which I tried to explain with that door open there. If you are actually inside the room, the level that you receive is not the spatial

45

average. You will receive a level that comes straight through the window and there may be no attenuation at all.

5 MS PRICE: Are you aware then that the New Zealand Building Code, clause G4, set five percent of the floor area as the required ventilation opening?

[5.05 pm]

10 PROFESSOR DICKINSON: For ventilation, yes.

MS PRICE: Are you a qualified ventilation expert?

15 PROFESSOR DICKINSON: No, but I was present in some of those building standards and it does not say, I believe, it has to be open. I said it has to be openable. Is that correct? You may have it there in front of you. My memory is going in my old age and it is a very big, long code, the Building Code, but doesn't it say openable? I believe you can also have passive ventilation by having your internal door open and a window open on the other side. Does it not say it there? I am not an expert on this. I am just trying to remember it.

20

MS PRICE: Are you aware of the 2006 open and closed windows research document from the Building Performance Centre at Napier University? It looked at a large number of windows and their attenuation.

25

PROFESSOR DICKINSON: No, I do not know that one.

MS PRICE: Napier University. I cannot take that any further then.

30

PROFESSOR DICKINSON: I did not even know there was a university in Napier. Sorry, that is Brunel, yes, all right.

MS PRICE: Are you aware of a Marshall Day study on Auckland Airport - - -

35

PROFESSOR DICKINSON: Yes.

MS PRICE: - - - showing that 18 decibels in windows partially opened had an attenuation range of 14 to 18 decibels? So you are aware of that study?

40

PROFESSOR DICKINSON: I have seen that, yes. It does not mean to say I would agree with that.

MS PRICE: Okay. Is it a fair summary of your position then that 40 dBA is too loud for any noise source?

45

5 PROFESSOR DICKINSON: I believe it is too loud and particularly the thing I do not like is basing it on the background plus. I believe it should be a fixed level that does not vary at all so that everybody knows just where they are. 40 is too much, 30 I think is right. I would have made a compromise to the Standards Committee of 35 if they would have accepted that. But, no.

MS PRICE: Okay.

10 PROFESSOR DICKINSON: Because they did want to have it variable with a background sound, which I think is wrong.

15 MS PRICE: So listening to you, is it also a fair summary that you think it is reasonable that all people should be able to sleep with all their doors and windows wide open, indeed outside if they choose?

20 PROFESSOR DICKINSON: I believe if you live in the country, and most country people do not have air conditioning, that you should be allowed to sleep undisturbed on your deck if you want to.

MS PRICE: So you are recommending the WHO criteria of 30 decibels for sleeping inside and you are recommending it must be adopted outside?

25 PROFESSOR DICKINSON: I am recommending that it should be adopted outside, yes.

MS PRICE: Isn't this - - -

30 PROFESSOR DICKINSON: Because there is no attenuation by an open window if you are sleeping immediately the other side of the open window.

35 MS PRICE: Isn't this is the same then as saying that the WHO got it wrong by even creating a standard for inside sleeping noise levels?

40 PROFESSOR DICKINSON: I would say that Baguita Bergland (**ph 5.08.00**), who is also a friend of mine, did not quite get the right words in the document and that it should have made it clear that that was at the sleeper. It does not actually say that and so everybody has assumed it is the spatial average over the whole of the room.

45 MS PRICE: If I have read your submission on the Standard correctly and your other papers, you are recommending a 10 kilometre distance from the wind farms.

5 PROFESSOR DICKINSON: No. With respect, what I said was that if the local authority was to be absolutely certain that the wind farm was going to cause no problem and they did not want to do any measurements, then they should set back 10 kilometres. If they are willing to do the measurements, then I think possibly between two and five kilometres would be sufficient.

10 MS PRICE: Okay.

PROFESSOR DICKINSON: So that is where the 10 came in, if nobody was going to take any measurements, because at five we can measure the wind farm sound. At 10 I do not think anybody has.

15 MS PRICE: Okay. So at the 10 kilometre distance that would cover half of Palmerston North in respect of this wind farm. Was that what you intend, by saying that - - -

20 PROFESSOR DICKINSON: No, this was a general statement. It has got nothing to do with any of the hearings here. I know nothing about the evidence that has been given here. I do not even know the names of the different wind farms here.

25 MS PRICE: Okay. Well, there is a wind farm up there. It is one of the existing ones. We describe it as T3. It falls into this category where half of Palmerston North would be included in the 10 kilometre line and a good deal of residents would be in the five kilometre line. Are you aware of a lot of residents complaining about different kinds of sound or noise effects at that level of distance?

30 PROFESSOR DICKINSON: No. You have taken it slightly out of context. This was a distance given so that the local authority could take the responsibility of the management, but not have to do anything more than that. They would not need to take measurements. I was not saying that that is what the setback should have been.

35

[5.10 pm]

40 MS PRICE: So that was your attempt to ease an administrative burden on the council?

PROFESSOR DICKINSON: To ease a burden that the local authorities just could not take up. There is no way, the way that the Standard is written, that they can actually measure the noise.

45

MS PRICE: Okay. In your commentary to us you gave us a definition of infrasound and low frequency in terms of hertz. What the inquiry is very keen to hear is a definition of infrasound that causes adverse health effects on humans and similarly I am interested to hear your definition on low frequency sound that causes adverse health effects on humans and your definition of vibrations that cause adverse health effects on humans. Do you have those levels for us?

10 PROFESSOR DICKINSON: It is extremely difficult to do that, because remember how many years it has taken for us to realise that tobacco can actually cause death. It is going to take even longer to show that alcohol is causing death. Now, sound is something that is not – you are not able to relate to because the damage that happens with sound is so slight, little by little, it is insidious, but it is very difficult to go back and say “Well, look, that is what caused it”. Except in my case. I know I have got a very nice smiling face. That was experiments that went wrong with low frequency noise 40 years ago. So yes, if we can call that a health effect, I am not unhealthy.

20 But every part of our body is a cell, a small cell filled with liquid. If you blow on a bottle you know it makes a noise. Well, if you can get the actual frequency of those cells you cause them to vibrate. If the cells have an opening they will eject the liquid. So that is how perhaps we interrogate people. We play them the sounds that relate to their stomach and they all eject the things in their stomach and they look real miserable. I think you will find that published on the web about lots of thing. I was unfortunately involved in other things in the military. Yes, we can cause all sorts of damage to the cells, but it takes time, and by 25 the time you have got to surgery you have forgotten what caused it and you cannot relate it to noise. But we are pretty certain that that is what does it because we know that higher levels of noise do cause problems.

MS PRICE: Okay, I am quite concerned about the level of noise and its effects on human health. In page 4, paragraph 1 of your submission on the Standard you proposed a low frequency noise limit of 20 decibels and 125 hertz outside any residence. Am I correct?

40 PROFESSOR DICKINSON: Yes, that was for a different reason. The low frequency sounds can excite the natural room resonances and make the sound much louder inside than you actually hear outside and this was a way of actually reducing the possibility of getting room resonances, and it was based loosely on what the Danes are doing. They have, I believe, a restriction on low frequency noise around about like that (**ph 5.13.38**).
45 If the wind farm experts say there is no low frequency noise then what is the problem?

MS PRICE: Okay.

5 PROFESSOR DICKINSON: If we set that standard they would be able to meet it very easily.

MS PRICE: So if you made an ambient noise measurement outside a typical rural residential house in this area out there, what would be the 125 hertz ambient noise level typically? Just roughly.

10 PROFESSOR DICKINSON: I have no idea. It will vary day to day.

MS PRICE: Okay. So to assist, if Mr Hegley measured an ambient noise level of 35 decibels L_{eq} at one of the residences, what would the 125 hertz noise level be roughly?

PROFESSOR DICKINSON: This is from a wind turbine?

MS PRICE: Yes.

PROFESSOR DICKINSON: In the day time?

MS PRICE: Yes.

25 PROFESSOR DICKINSON: Well, I have got my own measurement from a wind turbine in the day time. You said at 125 it was – sorry, you said what was the total?

MS PRICE: If the ambient noise level is 35 dBAs L_{eq} at one of the residences, what would the 125 hertz noise level be?

PROFESSOR DICKINSON: The component would be - - -

MS PRICE: You do not have to be exact, just rough.

PROFESSOR DICKINSON: 80.

MS PRICE: Would the 125 hertz value - - -

40 PROFESSOR DICKINSON: Below, the average of 125 and below. Is that what you meant, or did you mean the average at 125 or the third octave (**INDISTINCT 5.15.14**) or the octave (**INDISTINCT 5.15.16**) or what?

45 **[5.15 pm]**

MS PRICE: You have gone beyond me with that.

PROFESSOR DICKINSON: No, you see, when you say at 125, I do not know what you mean.

5

HER HONOUR: Ms Price, I think you are on a fishing expedition and I think it is too late in the day for that.

MS PRICE: Okay, I will change and just give you my last couple of questions. Professor Dickinson, you did a study in the 1970s aiming to determine whether infrasound was responsible for sudden infant death.

10

PROFESSOR DICKINSON: Correct.

MS PRICE: And that was published.

15

PROFESSOR DICKINSON: Gosh, was it?

MS PRICE: Yes, in the Journal of Acoustic Society of America.

20

PROFESSOR DICKINSON: I was not aware of that. Okay.

MS PRICE: You investigated, as I understand it, three years of cot death data and concluded it is strongly suggested the influence of an environmental trigger or stimulus.

25

PROFESSOR DICKINSON: Right, yes.

MS PRICE: You said the leading candidate, from your perspective, was low frequency noise either naturally occurring in some sizes of family homes or produced by a moving automobile. Have I got that right, that is what the study was about?

30

PROFESSOR DICKINSON: Yes, I think so. My memory can just about stretch back that far.

35

MS PRICE: I could not find anything else in the literature about it.

PROFESSOR DICKINSON: No, you won't. It was – oh dear, can you make this (**INDISTINCT 5.16.38**), not take it as evidence? Otherwise I cannot tell you why, so if it is not written down.

40

HER HONOUR: Only if you would like to (**INDISTINCT 5.16.50**).

PROFESSOR DICKINSON: No, perhaps I better not say that. It was a government political reason.

45

MS PRICE: Okay, thank you. I do not have any further questions.

5 PROFESSOR DICKINSON: It was to do with money and I think I had better
not answer that one, yes. I can say that the leader of the group was
Robert Redford's wife, Lola Hart.

MS PRICE: Okay, thank you. I do not have any further questions.

10 HER HONOUR: Mr Maassen?

MR MAASSEN: Thank you, your Honour. I only have a few questions, if
that is all right? Shall I address you as Dr or Professor Dickinson?

15 PROFESSOR DICKINSON: It does not really matter. Mr is good enough.

MR MAASSEN: Well, I will call you Professor then. I would not have had a
chance to be introduced, but my name is John Maassen and I am
appearing for the council, which has an interest in this matter. So I am
20 sorry I have not had a chance to meet you. Do you have a copy of the
Standard in front of you?

PROFESSOR DICKINSON: I can have it in front of me, yes.

25 MR MAASSEN: My questions are specifically directed at issues relating to
the implementation of the standard, which are of particular interest to
my client. If I could ask you please to go to paragraph 22 and look at
the paragraph number 5.3.2?

30 PROFESSOR DICKINSON: You mean page 22?

MR MAASSEN: Page 22, paragraph 5.3.2.

35 PROFESSOR DICKINSON: Right.

MR MAASSEN: Now, you won't have an independent memory of that
clause, or perhaps you will.

40 PROFESSOR DICKINSON: Yes.

MR MAASSEN: But it relates to how the high amenity noise limit shall be
applied.

45 PROFESSOR DICKINSON: Yes.

MR MAASSEN: In this case we have turbines proposed in a range of topographical locations or physical locations and a diversity of houses at different levels and so forth, some of which may attract the high amenity noise standard, which is 35 dBA.

PROFESSOR DICKINSON: Instead of the 40.

MR MAASSEN: Instead of the 40.

PROFESSOR DICKINSON: Right.

MR MAASSEN: The standard appears to propose some form of correlation between the wind speed at the hub height or at the turbine level.

PROFESSOR DICKINSON: Yes.

MR MAASSEN: And a correlation with low background noise at the residential property.

PROFESSOR DICKINSON: Yes.

MR MAASSEN: In your paper, which is called "Nonsense on Stilts", there is a section in section 3 which appears to critique the mathematical validity of determining the correlation through the use of the regression curve.

[5.20 pm]

PROFESSOR DICKINSON: Right. Yes, I do question that because in the mathematics what one is doing, one is trying to relate the L_{90} (which is mathematically a 10 percentile level) with a linear progression along the bottom and then taking a 50 percentile regression curve.

Now, to me, you have either got to take a 10 percentile regression curve or you have got to take the averaging and one or two standard deviations below it to be accurate.

So what you are actually doing is you are saying that the background sound level is actually higher than it really is.

MR MAASSEN: And my question is this - as I put to Mr Day who is one of the noise consultants for the applicant, and I put this to him today - the standard provides a threshold which is a very crude six metres per second or some other threshold that may be justified on meteorological, topographical and acoustical grounds.

It does not seem to suggest that the justification may arise or provide for the situation where there is a dispute between acoustic consultants as to the method of correlation and the use of statistical method.

5

My question is, does the standard enable a meaningful resolution of the debate that you have postulated in your paper between yourself and other acoustic consultants?

10 PROFESSOR DICKINSON: I am afraid to say no because I do not understand what it says in the standard and throughout the committee. I did not understand why there was this cut off at six metres per second, whatever it meant. I have actually no idea what it means.

15 MR MAASSEN: Right.

PROFESSOR DICKINSON: The wind speed at the hub, as far as I am concerned, has very little relationship to the background sound level at a remote location. It does at 100 metres - I will agree with that because
20 that is where the sound power level is actually measured, or at least those are the measurements they take to estimate the sound power level of a wind turbine. But elsewhere, remotely – no, I cannot see where that comes in.

25 MR MAASSEN: So do you have confidence that the recognition of areas as high amenity with the consequential provisions of the standard will actually adequately provide for people who currently experience aural amenity?

30 PROFESSOR DICKINSON: No, I do not believe it will. There was an awful lot of argument about this, mainly because when you set a district plan – and I am sorry, I should not be talking to somebody that knows all about this – but when you set a district plan you set something that has to be applicable to everybody there. So you set limits that the local
35 people can work to otherwise if you set the limits too low they may perhaps infringe the law.

For instance, if you said in your district plan no-one must make a maximum noise of more than 55 at night it would mean that you cannot
40 drive your car out of your driveway, you cannot say goodbye to people leaving your front door, you cannot actually go and talk in the garden. So you have to set it to a limit that people can work with, and that is not setting it to a limit that people can sleep with.

45 So this high amenity, as far as I can see, is a red herring in a way. I believe that if you live in a country area and you are not close to a

motorway or some rather noisy factory, or some industry, and your noise levels are generally below 25 then I think that is a high amenity area. But that is not how it was defined here, which I think came from the Resource Management Association.

5

MR MAASSEN: Thank you. Now just moving - - -

PROFESSOR DICKINSON: I am not certain about that.

10

MR MAASSEN: Thank you.

Just moving briefly now to one other topic which relates to special audible characteristics. Is that a topic I can ask you questions on and you will feel comfortable with?

15

PROFESSOR DICKINSON: You can ask me questions, yes.

MR MAASSEN: I am looking specifically at page 39 of the New Zealand standard which comes in as appendix B - - -

20

PROFESSOR DICKINSON: Right.

[5.25 pm]

25

MR MAASSEN: - - - and relates to amplitude modulation.

I asked Dr Chiles some questions about the interim test method and he explained that it was indeed an interim method as exploration was further undertaken.

30

It says in relation to the interim test method that, for example, special audible characteristics are deemed to exist if the measured A weighted peaked to trough levels exceed 5 dBA on a regular, varying basis. The words "regular, varying basis" are not defined?

35

PROFESSOR DICKINSON: No.

MR MAASSEN: In the Makara compliance report which I have just received, in relation to amplitude modulation, it identifies without specifying the number that there have been complaints in the complaints log about "whooshing" (**ph 0.55**) sounds which relates to amplitude modulation, does it not?

40

PROFESSOR DICKINSON: Yes.

45

5 MR MAASSEN: And then it goes on to say that because of the short periods over which that noise occurs, roughly over a 10 second period in each minute, that it does not qualify as justifying a penalty for special audible characteristics.

10 My question is, should we be having in a standard words like “regular, varying basis” or are those sorts of words productive of a high degree of ambiguity and therefore argument as to whether or not the noise has special audible characteristics?

PROFESSOR DICKINSON: Yes, I do take your point. I come to Palmerston North on a regular basis, every three weeks or so.

15 MR MAASSEN: Yes.

20 PROFESSOR DICKINSON: But I think it is the very nature of the English language, the way it has been twisted. It certainly is ambiguous. It means that it is coming and going regularly for a period of time. I would have been surprised if it was only 10 seconds because I have certainly measured it at a matter of two hours perhaps – 10 seconds sounds wrong.

25 MR MAASSEN: Yes. Thank you very much, Professor. Thank you, your Honour.

HER HONOUR: Mr Johnson?

30 MR JOHNSON: I have no questions, your Honour.

HER HONOUR: Thank you. Mr Johnston at the back?

MR JOHNSTON: No questions, your Honour.

35 HER HONOUR: Thank you. Mr Low?

MR LOW: No questions, your Honour.

40 HER HONOUR: Thank you. Mrs Dixon? Joy Vanderpole? Mr Adams?

MR ADAMS: No questions, your Honour.

45 HER HONOUR: Dr Huffman? Angela Crassick? Mr Bunting?

MR BUNTING: Yes, Dr Dickinson, from what you have said you have been involved in being a member of a number of standards committees. Such committees, as for this wind farm noise standard, represent a range of interests?

5

PROFESSOR DICKINSON: Correct.

MR BUNTING: And I just wondered if you could describe in general terms the process under which agreements are reached, because different interests may have different priorities in terms of their involvement.

10

In this case you were not able to agree so you stood aside. I just wondered if - - -

PROFESSOR DICKINSON: Well I did not stand aside, no. I just could not agree.

15

MR BUNTING: You did not agree with the standard?

PROFESSOR DICKINSON: Correct, yes.

20

MR BUNTING: Perhaps that was the wrong description, but does that happen very often?

PROFESSOR DICKINSON: It has never happened before. I have been a member of many standards groups, including international ones. I am on the 1996 revision at the moment, so it is three parts.

25

There is always a disagreement but then one works a little bit towards it saying well, if we give a little bit here perhaps you will give a little bit there and we will come to something that is not ideal but it is the best that we can do in the circumstances.

30

Every standard I have been on except this one has gone that way. So this is the only standard that I have ever disagreed with in 60 years.

35

[5.30 pm]

MR BUNTING: So when you started the process did you have a personal expectation that - - -

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PROFESSOR DICKINSON: No.

MR BUNTING: - - - what the outcome could be from your perspective?

45

PROFESSOR DICKINSON: No, I just went through all the evidence I could find and I have got students now all across the world, including some very great social scientists at the moment that have reached the heights that I could only aspire to.

I have been through all their evidence and I have taken my own and I came to these particular conclusions and said look, this is New Zealand, we have got here a lovely country, we have got only a tiny population in the country compared to those in Europe – why are we having these problems?

The Board of Health gave various recommendations those years ago, there is no reason why we cannot have them now. So what is the problem? Why are we having to put wind turbines so close to people? Is it simply because they want to save money? They what the infrastructure in place so they do not have to spend the money on it, or what is it, and why do we really need them when they are so inefficient?

MR BUNTING: Say if you had been involved in a similar committee, say in a European country, would you have had the same view or is there a New Zealand factor in your - - -

PROFESSOR DICKINSON: There would be a New Zealand factor in this because in some European countries there is no way that you can actually do otherwise.

I have taken measurements in Copenhagen when the background level in the middle of the night is 70 but everybody has accepted that because there are so many people around there is no way it can be anything less. Similarly in Hong Kong, you have always got the sound of people right the way through the night because that is the way they live.

Here, we go to the country to be quiet and the country is quiet. I have been unable to measure some of the noise levels in our country areas, whereas in America, for instance, I have taken measurements at the bottom of the Grand Canyon (which is supposed to be their quietest place) and you never go below 30 because of the air routes overhead. Here we can go into the country, we can be miles away from anywhere and it is quite.

Just at the back of Matamata we measured nine decibels at night with a student measuring team. Now there is no way we can actually measure under 20 but that is what the sound level meter said – nine, it was so quiet.

So yes, we have the quietest background noise levels in the world here and now we want to spoil it.

5 MR BUNTING: Okay, that is very helpful and thank you very much. Thank you, your Honour.

HER HONOUR: Thank you very much, Professor. I have no further questions.

10

PROFESSOR DICKINSON: No, thank you.

HER HONOUR: Thank you for giving up your time.

15 PROFESSOR DICKINSON: I am sorry that I could not show you the pictures because it would have made it so much more easy to understand.

HER HONOUR: Well we simply could not arrange with you (**INDISTINCT 3.12**) show them to this group at some other time. Otherwise, we are very appreciative that you have come because there were some puzzles for us in New Zealand (**INDISTINCT 3.26**) standard that we could not understand.

20

HER HONOUR: Mr Botha, it is really getting very late and I know that so many people want to question you. Are you able to stay overnight by any chance? Is that just really difficult? Just tell us honestly.

25

MR BOTHA: I could come back in the morning.

30 HER HONOUR: It means you have to go home and come back?

MR BOTHA: (**INDISTINCT 4.01**)

HER HONOUR: How are people generally feeling about staying on? If we took a five minute break?

35

MS: Yes, sure.

40 **ADJOURNED** [4.34 pm]

RESUMED [4.39 pm]

<**PAUL BOTHA, sworn** [4.40 pm]

45 HER HONOUR: Good evening, sir.

MR BOTHA: Good evening.

HER HONOUR: We meet again.

5 MR BOTHA: Yes.

HER HONOUR: Mr Botha, you very kindly showed us around the Makara
wind farm as a Board and I must say we were very impressed of what
we saw. Would you like to explain to the general audience your
10 position in Mighty River Power?

[5.40 pm]

We know what you have done and that you are a co-author of this latest
15 report, and then explain what has come out of the report so that people
here are informed. Then I guess we will open it up to some questions.
Thank you.

MR BOTHA: Okay. Rather than working for Mighty River Power, I work for
20 Meridian Energy.

HER HONOUR: Sorry, there I go.

MR BOTHA: I thought you might have just been testing me.
25

HER HONOUR: Sorry, it has been long days. Yes, they will have you.

MR BOTHA: My role within Meridian, I have the grand title of wind
technical strategy manager and I am a mechanical engineer by
30 qualification and my role is principally responsible for the design and
layout of Meridian's wind farms. So a lot of assessment of the wind
speed energy, the output from the wind farm and the layout – it goes to
the core of the layout.

35 HER HONOUR: Can you hear at the back?

MR BOTHA: So I am principally involved with the layout of the wind farm.
I have been involved in the wind industry for about 18 or 19 years now,
and all during that time I have been closely involved with the acoustics.
40 So on a number of our developments I sort of liaise between our wind
team and acoustic consultants. On one of our more recent projects I
have given evidence on the noise acoustics issues myself, so I have
done it in-house.

45 On West Wind for instance I did not give the noise or acoustic
evidence, we engaged external consultants for that, but I worked very

closely with them. So predominantly I am involved with the layout of the wind farm and assessing wind speed and energy and then where the turbines go.

5 The West Wind compliance report that we have issued, and you will notice it has been issued jointly in Meridian's name and Hayes McKenzie partnership. The consent conditions for West Wind required that Meridian install a minimum of four, maximum of five permanent monitoring stations and we operate that and report on the data that is
10 collected from those terminals. There is a huge amount of data that comes from those meters and we have been analysing progressively as that data has been available.

15 Prior to this report we were issued four sort of brief updates on the measurements that we had taken from those five locations and given that information to the council and also to the community liaison group, so there were four interim updates on the broadband noise levels, so the scatter graphs that show the regression curves.

20 Hayes McKenzie have been responsible for doing most of the special audible characteristic assessments detailed in the compliance report and independently they took the data from the five monitoring terminals and did their own assessment of at least one of those – yes, of one, and compared their results to what we got so they could stand behind what
25 was presented in here, although they had not analysed all five locations – and that is the broadband analysis.

I guess the report is broadly divided into some discussion of the compliance logs and the analysis of the broadband levels which I was
30 principally responsible for writing, and then on special audible characteristics the tonal assessment measurements close to the turbines and the amplitude modulation were written by Hayes McKenzie.

35 HER HONOUR: If I could just explain to the others that Hayes McKenzie, Mr Hayes from Britain was involved in the initial noise evidence for Meridian and was a strong part of the Meridian team at that point and he has come back to do this exercise I understand?

40 MR BOTHA: That is correct, yes. Do you want me to go on to discuss some of the findings in that report or?

HER HONOUR: I think if you could discuss the problems that the residents have had and then discuss the findings in the light of that. Thank you.

45 [5.45 pm]

MR BOTHA: Okay. The first turbines commenced operation in about July 2009 and these were the turbines closest to the residents. There was a group of 10 or 12 further away that had been operating prior to that but they were so far away nobody could hear them, or there were not any noise complaints during that time.

Once we commissioned turbines closer to the residents we received a number of calls to the 0800 number that was set – the complaints line that was set up. We looked at the data and from the complaints logged and noise measurements there was not a clear indication of the cause or the reason. It was not consistent. The best way to describe it, it seemed apparently random, there was not a clear correlation between the times of noise complaints and what the wind farm was doing or what the turbines were doing.

The other thing, initially there was a lot of discussion about amplitude modulation so when the turbines were first heard a lot of the complaints referred to amplitude modulation. I guess early on, it would have been August/September we spent a lot of time investigating or looking at and trying to quantify the extent of the amplitude modulation.

I was going out to Makara sort of once every two week at least, perhaps more regularly, and visited all the noise monitoring stations and you certainly get an idea on what was audible. In all my times there I did not hear the amplitude modulation to the extent that was being described. On a couple of nights I had been out there and you could hear the turbine – certainly the turbine aerodynamic blade noise from them but it was not at a level that would either fail the penalty or was loud amplitude modulation.

At that stage we got Siemens out and Siemens did some sound power level measurements close to the turbines, so actually measuring 100 metres from the turbine and those measurements showed three tones from the turbines. There was one at 50 hertz which was due to a converter problem, or converter software setting, and the converters are the box of tricks that converts electricity into AC so at fixed frequency, it is not the bit that controls the turbine. So there has been a lot of discussion in Makara about potentially changing the turbine controller to control the noise levels, you know, how the turbine operates. But the converter that was changed, it does not control the turbine, this function is to change the electrical power. It was causing the 50 hertz tone. By implementing a change to the software that was rectified immediately – it was the next day they were able to implement that to all the turbines that were operational, and then the turbines that went up after that had that change in place.

5 The two other tones, one was 62 hertz and the other 119 hertz. In the report I discuss it coming from the drive train so it is from the rotating bits in the nacelle, a combination of the gearbox and the low speed shaft and the generator. At low wind speeds, about 200-300 kilowatts, so five or six metres per second, the 62 hertz is evident from the turbine. I do not believe many of the complaints were linked to that frequency. It happened in very, very, low wind speed conditions.

10 In collecting data from Makara I had heard it but it was such a low level that you actually had to sort of concentrate to hear this noise, the 62 hertz, and invariably because the turbines are experiencing different wind speeds and it happens with low wind speeds it was highly unlikely you would get a whole wind farm or a whole number of turbines going at a very low speed simultaneously so the effect at a residence would be a contribution of the 62 hertz from perhaps the handful of turbines rather than the whole wind farm.

[5.50 pm]

20 That tone has been remedied by fitting some equipment, tuned absorbers, into the turbines. So there are some mechanical bits that have now been included into the turbine and absorbs that energy, and that reduced that tone by about, measurements Hayes McKenzie did show, about nine decibels.

25 And the 119 hertz tones happens when the turbine reaches its full rotational speed. If I can refer to the generator speed which is going at 1550 revolutions per minute, as soon as the generator got to that speed, and that would be before it got to the maximum power, so once it got to I think it was about 1300 to 1500 kilowatts the turbine reaches its maximum speed and from then on all increasing wind speeds that tone was present, and it was present to a higher level than the 62 hertz. This is the one that I believe has been the cause of the audibility in the Makara community.

HER HONOUR: Is this the one that sounds like an aircraft landing?

40 MR BOTHA: It is a sort of constant hum. Yes, I mean close to the turbines sometimes, if you hear a turbine doing it, you will look up in the sky and think a turbine is coming overhead. Some descriptions, yes, would describe it as an aircraft landing or taking off, or flying in the distance. If you are standing up on the Makara farm – like an aircraft sort of coming from Nelson, it gives that similar sort of a sound.

45

5 Because it happened when the turbines got to this rotational speed and then thereon upwards you would get the situation where a number of turbines, effectively the whole wind farm could be contributing this frequency to the residents and at that point I mean it became the primary focus to reduce that tonal frequency.

10 During this whole time we were taking third octave measurements at the residence and those did not – most of those measurements, or nearly all of those that we looked at did not actually penalise the tone. The third octave analysis is laid out in the West Wind conditions. It would not identify that 125 hertz band as attracting a tone. I guess at that point we were of the belief that this tone was not penalisable. But we believed it needed to be removed or reduced significantly.

15 At that stage Siemens, their first response was to try and generate an absorber to effectively do the same job as the 62 hertz one, and they set about doing some measurements in Denmark on a turbine. After trying I think it was three or four configurations they could not get sufficient attenuation that it would actually be worse going down that route to reduce the tone. But during all their testing they determined that by slowing the turbine down it eliminated that or significantly reduced that tonal frequency, and that is effectively what we have adopted. So the turbines now, instead of that generator getting up to 1550 rpm it gets up to 1475 revolutions per minute.

20 I have got some data that you can actually see it quite clearly that the speed of the turbine has been reduced. I guess the upside from that, too, is it actually reduces the sound power level of the turbine because the rotor is going at a slightly slower speed. So not only do we get the benefit of the reduction in tone but there would have been a slight reduction in the sound power level of the turbine.

25 **[5.55 pm]**

30 So that is in broad terms what we did to correct what we found down in Makara.

35 The compliance report, we presented the night time operational noise levels from five locations, both northerly and southerly direction. Four out of those five locations comply with a margin of more than five decibels. I suppose the reason for pointing that out is that some of those locations even with a penalty would still comply.

40 The fifth location in a northerly direction over a certain wind speed range, they are compliant, so the amount by which we are under the

compliance levels is 2.2 decibels. So if there were still special audible characteristics in the sound character that need to be penalised it is potential that we would have been breaching the consent conditions at that location.

5

We have taken measurements close to the turbine to show the effectiveness of both tonal fixes and the reductions that we see – I think the 119 hertz was about 16 decibels and the 62 hertz was about nine decibels. Those reductions will be directly translated to reductions at the residence.

10

At the time of writing the report we did not have data available from the residents to show the effectiveness of that and we are still in the process of getting more data to show that that has actually been achieved.

15

Just yesterday I looked at some of the third octave levels, and I have them from South Makara Road which is the location at which the compliance limit was closest, and I took a night in December when we received a number of complaints, and a number of complaints on 24 February after the fix. If we look at the spectrum over a 12 hour period you can see the significant change in that 125 hertz third octave band.

20

While that is not potentially conclusive proof to show that this change has effect, you know, I believe it goes a long way to show that what we have done at source is directly translated to the receiver location.

25

HER HONOUR: Well given that, you are obviously still getting complaints even though you have made those reductions?

30

MR BOTHA: That is correct, yes. In the report I spoke about I think it was 780-odd complaints in eight months, roughly 100 a month in that order. I have called them complaints because they are calls to our 0800 complaints line. Over the eight month period I have spoken to a number of people out there and it is clear that if I speak to somebody in the evening they are aware of how many other people have complained that same night. I guess they have not made it a secret that they are on an email users group and if somebody logs a complaint they email the user group to say they have made a complaint and it is difficult to work out how many of those complaints would have originated on their own or have been prompted because somebody else has found the audibility unacceptable. I have had this discussion with members of the community and they acknowledge that out of all the calls we are getting some of them are perhaps not in the category of warranting a noise complaint, but simply people phoning to say that they can hear it.

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40

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5 So, yes, roughly 100 calls a month up until the end of January. I looked just yesterday, February we still had 53 complaints in February and up until the middle of March we have had 33.

10 I think it might be too early to say whether that actually means a change, but I suppose if it continues that way and half the complaints are being received it might be an indication that things have improved, certainly it is not, you know, acceptable to everybody yet, obviously.

15 [6.00 pm]

15 I have heard from the council and I heard Mr Lloyd saying that he had heard from a resident that somebody has acknowledged that the tonal noise has gone but they still find the aerodynamic noise unacceptable.

20 HER HONOUR: We had some evidence from Dr Warren who, I think from memory of your case, was right down the end, she lives in a large ecological situation, quite a heavily treed area, but she has got I think several turbines around her?

25 MR BOTHA: Yes, she is down the bottom end of South Makara Road, one of the noise monitoring location, NMT4, so anywhere that we are discussing NMT No 4, that is actually at Janet Warren's house. And, as I said earlier, the one house that we have come closest to the compliance level is actually at the Warrens property in a northerly condition. I believe there would be six or seven turbines visible on the ridge above that and, indeed, on that trip that I took you down we actually stop right outside her gate, we kind of turned down the bottom
30 end South Makara Road at that point, she is just there on the left hand side.

35 I guess my subjective view of all the measurements and just being around the valley, her property is probably the one where you can hear the turbines the clearest. I have been there since the changes are made and I believe the tonal character has disappeared completely. It is certainly no longer at the level that it was and it would not be at a level that would attract a penalty.

40 There is also a measurement in the report that was taken by the council, and we reproduced it as figure 5.3, and that has been taken inside the Warren's house. Malcolm Hayes, from Hayes McKenzie, superimposed the threshold of audibility curve on that and, indeed, that you can conclude the only bit of the turbine that you would hear inside
45 would be that tonal peak. And I understand from the council at that measurement that it was only that fixed frequency from the turbines that

could be heard, that you could not hear the blade noise inside. Also the measurements that I said I looked at yesterday were actually also from that location.

5 So, yes, my belief - and looking at the data and the changes we have made to all those turbines - would be that that tone is no longer present.

HER HONOUR: And the turbines were largely linear with the residents who have complained apart from the ones up the north, up the gorge?

10

MR BOTHA: Sorry, in - - -?

HER HONOUR: Linear up South Makara Road?

15 MR BOTHA: In the report, we have had complaints I think from 64 different houses, and they dispersed, yes, right from Makara Beach in the north, Takarau Gorge, even Ohariu Valley, you know, we have got people complaining from up there and right down to South Makara Road. So, yes - - -

20

HER HONOUR: They were from all over?

MR BOTHA: From all over, I mean even out as far as 10 kilometres and that is why I say when you are getting people calling up the 0800 number complaining from 10 kilometres away, if you draw a 10 kilometre radius around West Wind you get into the middle of Wellington city sort of thing. We are not getting complaints from people in Karori - yes, so there are some things that are little difficult to reconcile from the geographical location at which people complain from.

30

But I acknowledge that most of the complaints are from Makara and South Makara Road, from the residents that are closest to the turbine. We have got sort of three outliers, as shown in that map, where people are obviously a lot closer to the proposed Mill Creek development and whether or not that is affecting their perception of the noise, I do not know.

35

HER HONOUR: Well, I think I will open it up to questions from other people. I will just hear from counsel first, Mr Adams, please. Ms Price?

40

<CROSS-EXAMINATION BY MS PRICE

[6.05 pm]

MS PRICE: Is it doctor or mister, sorry?

45

MR BOTHA: Sorry?

MS PRICE: Doctor or mister?

MR BOTHA: Mister.

5

MS PRICE: So, Mr Botha, it is very good of you to muscle up to our wind farm hearing and advocate on behalf of the Makara wind farm. You have hear my questioning of Dr Thorne's Cohort Study this morning and I asked him, but he was not prepared to answer, whether he had gathered the background to the Makara complainants. Specifically do you know whether the complainants correlate with submitters in opposition to either the Makara or Mill Creek wind farms?

10

MR BOTHA: Out of the 20 houses that I identified as being responsible for 80 percent of the noise complaints, 19 of them either opposed West Wind or Mill Creek, and one of them happens to be somebody that has moved into the valley. So, yes, I mean we are aware of all these people through the consenting process. Whether they are more sensitised to it, I do not know but that is where the complaints are coming from.

20

MS PRICE: Yes, I am less concerned about that, but for a Cohort Study that is extremely relevant background in the social sciences. Dr Thorne has given us a pie chart, that is in his latest addenda to his evidence, with all the different descriptors given by the various complainants. You may not have even had a chance to read that, have you?

25

MR BOTHA: I did see that pie chart here, I kind of glanced over it.

MS PRICE: Okay, well, it is kind of interesting but what it did is it triggered me to go and obtain from the council direct a copy of the raw data, that is the complaints log - which I note was completely confidential in terms of who it was identifying - so that I could analyse that raw data. And what was interesting was that those descriptors, that have been set out in Dr Thorne's evidence, changed over time, so over time the analysis was quite interesting. That is there would be a complaint where the noise would be described as a "thrum", it is a slightly unusual word, and then there would be a whole lot of complaints coming immediately afterwards describing the noise as a "thrum". A little time later then there would be a new word which then would crop up in the log again and again immediately after. Do you think this the results of the residents talking to each other that you described earlier?

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35

40

MR BOTHA: I suspect it must be. I mean the "thrumming" one when I first saw it, I thought, "Oh, that is a new word", and then it suddenly, as you say, it popped up time and time again shortly thereafter, and being aware that people are in contact with each other via email, I mean they

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see what people are finding about and how they have described it so the description then is fairly constant amongst the residents.

5 And the “wumping” noise was another one that, you know, it is not something I had heard but it then comes up quite regularly. So, yes, I believe a fair amount of that is going on. I recently I got called out – I mean I would really like to understand what it is that is causing these people to complain and I mean I have given (ph 4.41) a residents and said, “Look if, you know, it is not too late, give me a call and I would like to actually experience what you are hearing”. And it was 10 24 February, only because it was a night that I got called, now if somebody called me out at 8 I could not make it immediately and got out at 9.30, and it was a night that, I believe, we got about 10 noise complaints that night.

15

[6.10 pm]

20 So I went to this house and listened to the noise. You could hear it, it was a very low frequency rumble, and I would describe it similar to a road at sort of 10 kilometres or an aeroplane at that sort of distance, a very low level noise but a rumbling that was audible and I could hear it outside. I did not find it annoying and then I asked the owner if she could hear it inside and she said, “Yes, you could both hear it and feel it inside”. So I asked to go inside and I went inside, after turning the TV 25 off and the son’s TV off all I could hear was a clock ticking on a wall somewhere, I could not hear anything inside.

30 Dr Stephen Palmer was called out that same night, and all the residents knew that he was there, and this owner knew that a whole lot of other people had complained. So, you know, they are all in contact with each other so because we got 10 complaints that night I do not know if it was because more people heard it or because they all phoned each other and emailed each other.

35 I then took the opportunity to go down South Makara Road and stop in Takarau Gorge Road too and made subjective assessments of that.

MS PRICE: Thank you, Mr Botha.

40 HER HONOUR: Mr Maassen?

MR MAASSEN: No, thank you, your Honour.

45 HER HONOUR: Thank you. Mr Johnson?

MR JOHNSON: No, thank you, your Honour.

HER HONOUR: Mr Adams?

<QUESTIONING BY MR ADAMS

[6.12 pm]

5

MR ADAMS: Greetings again your Honour and members of the Board and, Mr Botha, I am John Adams. When you were talking about the frequencies there involved in those times, 62 and 119 hertz, have you considered that the phenomena that could be operating here could be a longitudinal standing wave of some sort? Because if we take 62 as the

10

fundamental, if you double a frequency it is approximately 119 which would be the first harmonic, and have you ever considered that?

15

MR BOTHA: It is actually caused within the gearbox basically, and it is a meshing frequency even lower than 62, so both the 62 and the 119 are harmonics of a much lower teeth meshing frequency in the gearbox.

20

MR ADAMS: Yes, but that can be transmitted by the vibration and have the tones actually been measured inside the dwelling?

MR BOTHA: Yes, we have not done those measurements, the Wellington City Council have taken the measurements inside a number of houses. I have seen their data from one of those measurements and it has been reproduced in our report.

25

MR ADAMS: Because it does suggest a longitudinal standing wave of some sort, especially within a dwelling, and if you are at the antinodal point that noise could be a real nuisance and you could be at another part of the room and be at the node and you would not really hear it, have you explored that, Mr Botha?

30

MR BOTHA: No, I mean I have not explored what is happening inside the house, the council have been taking measurements internally. Our compliance conditions are to meet a level outside the house for both tones, amplitude modulation and overall broadband levels.

35

MR ADAMS: But is there a possibility that could be outside between contours or between buildings? It suggests very much so that that could be the phenomena occurring here. When we you double the frequency, you go from a fundamental to a first harmonic and it can be, even though you say it is in the gearbox, that can occur elsewhere?

40

MR BOTHA: I mean we are measuring those frequencies outside the turbine. I mean they are caused from the turbine going at a certain speed and principally from gear teeth meshing, and depending what speed the turbine is rotating at, one can measure the 62 hertz peak and then the

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119 hertz peak close to the turbine. So, you know, it is out in free field, the 119 hertz that we measure in the free field measurements are not being affected by any set up of the house or anything like that.

5 MR ADAMS: But do you believe that could be replicated inside a dwelling?

MR BOTHA: Sorry, that what could be - - -?

10 MR ADAMS: That what is happening in the gearbox, those frequencies, the vibrations could set up secondary vibrations within a dwelling and create the longitudinal standing waves?

[6.15 pm]

15 MR BOTHA: I think if there's enough sound energy, you know, as was discussed earlier, getting plates to rattle and that sort of thing, if there's enough energy in the sound that could be occurring, but whether as if – I mean, that could be due to any noise, not necessarily just wind turbine noise. I mean, in the office building that I work and if you get a diesel truck standing outside the glass starts to vibrate and - - -

20

MR ADAMS: But could it be especially so if you're at an antinodal point?

25 MR BOTHA: No, I don't believe so.

MR ADAMS: And have you done any tests on this?

MR BOTHA: No, we haven't done any test on it, no.

30 MR ADAMS: Okay, I'll leave that point, but it seems to be too much of a coincidence to let it go.

35 With the output from the wind farm, do you have the figures that relate to output?

MR BOTHA: In terms of electrical output?

MR ADAMS: Yes, on any one moment.

40 MR BOTHA: Yes.

MR ADAMS: And you have that historical data?

45 MR BOTHA: Yes, we've got that historical data, yes.

MR ADAMS: And have you matched it up with the nights that you have visited homes and matched it up with the output of the wind farm at those times?

5

MR BOTHA: Yes. I mean, for example there, on the night of the 24th when I was called out – this was just recently – when I got the phone call at 8.00 pm and I said I couldn't make it – I phoned back at half past eight to say that I would make it and got out there at half past nine, and as it happens the resident says, "Oh, it wasn't quite as bad as it was at eight" and, you know, fair enough maybe it's changed a bit. I mean, I did on that particular time go back to look at the closest five turbines to see whether there had been wind speed change, power change, speed change or even direction change.

10

15

At 8 o'clock and at 9.30 when I was there it was basically identical, there was nothing fundamental that had changed in the operation of the wind farm from her making a call to me to say "it's particularly loud tonight" and me arriving.

20

MR ADAMS: But that covered those other factors, but the actual wind farm output compared to the times of your site visits, have you matched those two up?

25

MR BOTHA: We've matched them up when we're investigating a particular issue, yes.

MR ADAMS: Specifically wind farm output?

30

MR BOTHA: Yes.

MR ADAMS: Have you got those figures with you, Mr Botha?

MR BOTHA: No.

35

MR ADAMS: Because I think they are significant. Would you be able to produce them please, it will be interesting.

MR BOTHA: Depending for what period you are talking about.

40

MR ADAMS: Over the period of the complaints.

MR BOTHA: As I say, I mean on times that I have been called out and I have looked at specific evenings where I have matched that data up, where – I haven't matched the wind farm output to every time we receive a call, if that is the question.

45

MR ADAMS: But can that be done?

MR BOTHA: Sorry?

5

MR ADAMS: Can that be done?

MR BOTHA: Um - - -

10 HER HONOUR: To what purpose, Mr Adams? I mean these are hundreds of data points.

MR ADAMS: Okay, I'll move on, but I have a feeling with what I was talking about earlier it is significant, with the physics that was involved in what I was talking about earlier, your Honour.

15

HER HONOUR: Well I think that you could ask for a short period of time rather than a great long, thousands of data points on one turbine and one household.

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MR ADAMS: Your Honour, it's very simple, it is just a power output at that time of the visit.

HER HONOUR: Of the visit.

25

MR ADAMS: So it's only a single data point for each particular visit. So if we take 10 visits, it's only 10 data points.

HER HONOUR: So this is to satisfy your impression of what's going on?

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MR ADAMS: That's right, your Honour.

HER HONOUR: Well I think it is really up to Meridian to agree that - - -

35

MR ADAMS: Thank you.

HER HONOUR: - - -that there is grace in favour to us, and I think it is up to Mr Botha to say, yah or nay.

40

MR ADAMS: Thank you, your Honour. Just one final question, Mr Botha.

You talk about the bush telegraph that gets going. I just wonder, have you analysed the times of the complaints and the actual complaint?

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[6.20 pm]

MR BOTHA: I mean, in my report I have taken those all those noise complaints and represented them on a daily basis just so it was easy to see on which date we got the most number of complaints. And in that way we can go back to the wind farm operation and I've presented wind speed and direction for seven days in which we got the most number of complaints up until the end of January, and the wind speed and direction is there. And that shows that in all cases it was the wind farm going in a high output in which case it is 119 hertz would have been present.

MR ADAMS: And that's why I was asking the question earlier because obviously there is a correlation.

MR BOTHA: Well, yes, and so it has been presented as wind speed and direction and – I could just as well have put in power, but it is then a question of which turbines you choose to put the power in for. So it was far clearer to put in the wind speed and direction which is a central reference on those occasions and clearly from that, you know, a northerly and high wind speeds is when most of the noise complaints were being received.

MR ADAMS: Thanks very much, Mr Botha. I'll leave it at that.

HER HONOUR: Thank you, Mr Adams. Mr Low.

<QUESTIONING BY MR LOW [6.22 pm]

MR LOW: Thank you, ma'am, just a couple of questions please, Mr Botha.

I understood you to say that you had identified three tonal elements sometime during November, and that you considered that they may be breaching consent conditions at some locations, is that correct?

MR BOTHA: I believe what I said was that, at that stage the analysis that we were doing, the tonal assessment was on a third octave basis, and we did not find any that work on a 10 minute average basis, we didn't find any records that would suggest that it needed to attract a penalty.

MR LOW: Right. So in fact, you didn't believe at any stage you actually breached consent conditions?

MR BOTHA: I mean, at that stage we believed that we were complying with the consent conditions. We looked at the third octave bands at the frequencies and within the West Wind conditions the primary assessment for tonality is the third octave band approach. So, you know, we looked at that but then at that stage most of the noise

5 complaints were talking about modulation and I suppose in discussions with the council and the council with the community there was an intensive focus on trying to, “how do we analyse this modulation” and I believe Mr Lloyd – I certainly saw one record from Mr Lloyd where there was an eight second period where the peak(INDISTINCT 3.27) trough would have exceeded – but eight seconds, you know, on one occasion was all that we had.

10 So there was all this focus on amplitude modulation and primarily driven by the complaints log, um – yeah, I think perhaps detracted from what might have been the real cause which was the tonality - - -

MR LOW: Cause of the complaints you mean?

15 MR BOTHA: I believe people being able to hear the turbine noise because of the tonal character of it, it would have attracted people’s attention a lot more readily. And hence, it is the reason why tones are penalised. It sounds 6dB louder than it is or 5dB louder than it is.

20 MR LOW: Yes.

MR BOTHA: You know, once I was aware of these tones that were clearly from the turbine (its source) and you’re aware of the frequency, I mean I could hear it at some neighbouring residences and not in all cases would it be penalised, but it was there and, you know, we’re not trying to hide the fact that it wasn’t there. Whether it breached the consent rules or not it was – I suppose depending on how you analysed the data, yes.

30 [6.20 pm]

MR LOW: Can I put it another way, did you take any move to de-rate the turbines to give relief to those residents or particularly the one resident that you thought might be getting very close to consent conditions?

35 MR BOTHA: Well that – in October not even all the turbines near that resident were actually commissioned. So we weren’t aware at that stage that that location was close to the consent conditions because the turbines down there weren’t operational.

40 So that – yes, that’s true, back when – we had Siemens doing the measurements and we were aware of the tonality, those turbines down the bottom end of south Makara Road in the extent of the turbines weren’t commissioned. And indeed, de-rating the turbines was not necessarily going to give any relief other than turning them off.

45

MR LOW: No, I understand.

MR BOTHA: Yeah.

5 MR LOW: Yeah, okay. Making it difficult to draw any conclusions, but essentially what the conclusion I'd like you to agree with is that the residents complaints were received in an environment where you believed you were within consent conditions?

10 MR BOTHA: We, um - - -

MR LOW: For example, over that period September to the end of November.

15 MR BOTHA: I guess from our early work – they weren't actually reports, I can't remember what we call them – but we sent some analysis to the council and particularly you focused on the broadband that was – I mean, you know, we had these permanent monitors set up and we had a year's worth of background data and the community was expecting a whole lot of operational data so we could get the regression line to
20 compare it to the background data. We were focusing on determining how much under or over the limit we were on broadband basis.

And those initial assessments were showing that the broadband levels were significantly under the compliance margins, so even if you add the penalty on the indication was that we would be complying so, yes.
25

MR LOW: Yeah, I think that answers my question - - -

MR BOTHA: Yes.

30

MR LOW: - - -thank you. I have just one further question, have you ever attempted to sleep out there?

35 MR BOTHA: Yes. We slept – Meridian owns half the wind farm and there is a village up at the top of the hill that used to belong to Telecom and some of the houses were used by construction workers and we spent a night. And fortunately, there was actually a southerly wind direction because the houses are located downwind in the southerly of the turbines and I think the closest turbine was 350 metres away and then
40 400 and 600.

The mattress size that I had was probably more uncomfortable, but I slept and – I mean, the other interesting one for me is we have a staff member that has been staying up on site during construction and still up there renting a house from Meridian and – she did call me one day to
45 say that she could hear them but this was after some months.

So, you know, I acknowledge that close to the turbines it is slightly different character just because you can hear some more high frequency, but certainly, I didn't have difficulty sleeping.

5 MR LOW: Okay, thank you very much. Thanks, ma'am.

HER HONOUR: Thank you. Anyone other wish to question Mr Botha, Mr Heaven - - -

10 MR HEERDEGEN: Heerdegen.

HER HONOUR: Heerdegen.

15 MR HEERDEGEN: It's all right, it's getting late. Mr Botha, just a simple question in terms of just knowledge base, do these various frequency noises have a directional component? Do we sense – what I am saying is that if these noises are present do they come from somewhere, I mean, are we always aware that they're coming from there and not there?

20

MR BOTHA: The low frequency noises, there wouldn't be a significant directional component.

25 MR HEERDEGEN: At present?

25

MR BOTHA: Yeah, yeah, and you know, taking – I was up on site for the 10 days or 12 days that Malcolm Hayes was out doing the sound power level measurements and we had this discussion about there it sounds like aeroplane noise. And indeed, you'll be taking a measurement and then suddenly you'll hear a noise coming from somewhere and you didn't know where it was coming from and it's an aircraft coming in the distance initially you don't know where its coming from, I mean you can hear this noise. And so the low frequency – the lower frequency noise is that, it hasn't got a significant directional component.

35

[6.30 pm]

MR HEERDEGEN: Right, that's fine, thank you. That is all.

40 MR BUNTING: Yes, thanks, Mr Botha, from me, thank you very much for coming.

45 This morning I or this afternoon may be I asked Mr Lloyd if there had been any special audible characteristic problems with turbines at Te Apiti because we had people here from Ashhurst who told us about the noise issues there.

Are you able to provide any comment on that suggestion
(**INDISTINCT 00.44**)?

5 MR BOTHA: We did – I’m just trying to remember now – we certainly wrote
a compliance report on Te Apiti but there was – I can’t remember if it
was part of the compliance report or a separate investigative bit of work
we did. But it turned out that the times that we got the complaints at Te
10 Apiti were times that the system operator (Transpower) imposed a
restriction on the output of the wind farm, so the wind farms rated at
normally 90 megawatts. Due to constraints on the electrical network
and it was typically the DC cable, Transpower would say “the wind
farm cannot make more than 40 megawatts” and it might have been for
15 a three/five hour period, but a limited period of time they put a
restriction up at the wind farm.

And the way that Te Apiti worked initially was that a signal would be
sent to all turbines and they simply down rated the whole wind farm, all
20 55 turbines. And that type of turbines, when it was controlled in that
fashion it ended up making more aerodynamic noise than it would
normally make. So I believe, you know, the amplitude modulation type
issue was heard on occasions down in Ashhurst and we had a figure that
you could see prior to the complaint, the noise levels were fairly
constant and then suddenly you can see it fluctuating.

25 And after that – I mean, once we worked out that it was related to the
Transpower runback situation, we changed the way it controlled the
closest six or 10 turbines to Ashhurst, so they would automatically be
stopped under that scenario. You know, I don’t believe we are getting –
30 if there had been any calls of complaints in Te Apiti in the last year, I
think – I have spoken to the operations people recently and I don’t
believe there had been any complaints on Te Apiti recently.

35 MR BUNTING: That’s good. So identifying and fixing up that problem,
roughly how long did it take?

MR BOTHA: At Te Apiti I suspect it would have taken longer – longer than
what has been happening at West Wind and I think primarily because it
was a fairly rear event. The situation it gave that character of the noise
40 only happened on these runback and it had to be a runback in high wind
speed, if it was forced backwards or restricted in a low wind speed the
phenomena wouldn’t occur.

45 MR BUNTING: So many months, was it?

MR BOTHA: Yes, yes. And indeed, we were only getting complaints from I think sort of five people on a – yes, I stand to be corrected on that, but I think there's about – there were five different houses there, yeah.

5

MR BUNTING: **(INDISTINCT 4.07)** in the background. The turbines you have got at Makara, have they had similar low frequency noise problems in other countries, or have they been explored, do you know?

10 MR BOTHA: The 62 hertz has been apparent before and that is the reason that Siemens actually had the solution I guess readily available. The 119 hertz they certainly hadn't seen it to the extent that it occurred at Makara. I mean, you could probably do research work for years trying to work out exactly why it was the level that it was. I mean, we were
15 solely focused on trying to get a solution implemented, so there hasn't been that much focus on the cause of it.

[6.35 pm]

20 But I mean the one - the 119 hertz was apparent in the - I mean it has always been there it is just the extent to which it is there, and in this propagation report that Hayes McKenzie produced, that 119 hertz does show up, but it was not penalisable as a tone.

25 The towers were specifically designed as more rigid towers for west wing, just because of the higher wind speeds there, and whether that combination together with the turbine has resulted in it being more audible, I do not know, but I imagine it contributed.

30 MR BUNTING: So what you are saying is that the total configuration of the turbine in one country may not be the same as in another country?

MR BOTHA: Correct, yes.

35 MR BUNTING: Okay, good. Just a final point, I live in Karori by the way, and we can see the top half of two of your turbines, and my wife things they look great.

MR BOTHA: I will have to look for your name on the complaints log.

40

MR BUNTING: We do not hear anything, but we are quite a long way away. Thank you.

HER HONOUR: Mr Hudson?

45

MR HUDSON: Having had several days of noise evidence I am glad I deal with such a precise area. I see in your table 4.3 of your report, and thank you for making this report available to us, and indeed for coming up here today too.

In measuring point 3 and 10, and I know 10 is a mobile one, they are quite close to each other. Is there anyway where you can start to get a - and I want to be very delicate how I phrase this - increase or gauge the extent that you should place weight on the complaints from different places, such that you might be able to say, "well, this one here is only complaining occasionally and when they do it correlates more greatly with recognised conditions", is that able to contribute to your analysis?

MR BOTHA: Yeah, looking at when we get the complaints and looking back at what the wind farm is doing, it has been difficult to try and pinpoint a condition that seems to give us the complaints - it is difficult to do it sort of instantaneously. I mean, I have found it easier going back and looking at the data now that we know what we are looking for, and earlier on in those figures where I have analysed what days did we get the most number of complaints, and then look at the conditions on those days. That has been more useful in terms of identifying conditions that have given rise to increased complaints. Yes, I mean, having the two close together, I do not think it is - there is anything we can conclude from that, the two measurement points very close together.

MR HUDSON: Okay. Now, you would have heard earlier Dr Childs' comments about the West Wind conditions and I think he described them as cumbersome or words to that effect. Have you found that to be the case? And also the second part of that question is he recommends using the new standard is the way, and what is your comment on the comparison?

MR BOTHA: The West Wind conditions are complex and one of the - they are very complex, and one of the discussion points on the committee for the review of 608 was consultation with the community, and I think it is mentioned a number of times about informing people that the noise is going to be audible et cetera, et cetera. So I think with the West Wind conditions, you know, we ended up with this complex set of conditions.

[6.40 pm]

People in the community aren't - I almost want to interpret how they read into it or what they read into it, and because they are so complex I don't know that I have spoken to anybody that completely understands the full suite of conditions, so I mean - yes, and I think having a simpler

5 set of conditions might have actually helped the community. I mean, if everybody understands them, they might not necessarily agree with them, but if they set out a control, what has been wanting to control to a reasonable level, I think the simpler the better, and I mean the wind speed measurement one at the house location at West Wind is, I think, where the word cumbersome came out and it is very difficult to take spot measurements elsewhere because of the requirement to do the wind speed measurement at the resident location too.

10 In the revised version of the standard, that has been transferred to a wind speed at the wind farm site, so that measurement is being taken anyhow, and it is simply a matter of taking the noise measurements as you would have done pre West Wind. I would certainly support the adoption of the recommended conditions in the 2010 version, and it is, it is a point that we have raised with the potential review conditions of West Wind. I guess, potentially the council can review those conditions at some stage and it is one that perhaps we will put forward as simplifying the whole compliance thing in the future.

20 MR HUDSON: And would that include the proposed high amenity area, I think it is 3.9.1 of the new standard, the conditions relating to that?

25 MR BOTHA: I guess the only comment I can make, in the Wellington district plan, the plan already calls for 35, so it does trigger the high amenity - sorry, the Wellington city one, yes, so in and around West Wind, if 2010 had been in place when the West Wind decision was made, it would have triggered the high amenity limit.

30 MR HUDSON: Following that through from your experience, would you have ended up with the same outcomes that you have now got via another path?

35 MR BOTHA: I suppose if you are asking me "would West Wind comply with the new standard" or would we have got to the current position - - -

40 MR HUDSON: Well, would you have gone down the path of identifying those characteristics and you may, because it is special audible characteristics and suppliers said they wouldn't have them, that could have been fixed by another path, but say that was not the case, then would the new standard have also resulted you in identifying these characteristics and - - -

45 MR BOTHA: Yes, I mean, I think the new standard, the special characteristic in the new standard I think places more focus on the reference - if we talk about tonality, it places more emphasis on the tonality part of it. I think in the West Wind conditions just the way they were drafted, we

had this table on the third octave basis, and then underneath it, it said if this didn't show a tone then possibly you need to do narrow band analysis. I think the whole tonality appendix in the new standard would potentially place more weight on the narrow band ISO standard.

5

[6.45 pm]

So we would have got to the same position, would we have got there earlier, it is difficult to say. We would have got to the same outcome, and in terms of the new - I believe the new standard would provide a higher level of amenity to the residents in the low wind speed end. If you look at the compliance limits in the graphs, you can see - if I just - I mean in figure B2 for instance, that residence is not benefiting at all from the 35 dB limit in the West Wind conditions, whereas they would have got the benefit of a 35 limit under the new standard.

10

15

MR HUDSON: Yes. Which is a characteristic to the Wellington district plan?

MR BOTHA: Yes.

20

MR HUDSON: In setting conditions it is relevant to note what the applicable district plan is and, as Her Honour has mentioned, there can be some time in changing a district plan. So if the current provisions are acceptable, then that is something for us to consider.

25

MR BOTHA: Yes, I suppose if the current conditions are acceptable for all other noises, are they not acceptable for wind farms? That is the debate.

30

MR HUDSON: The final thing which, and I am only asking this because it has been brought up by, I think it was Dr Dickenson in his paper, the suggestion that as things wear they get noisier. What is your comment on that?

35

MR BOTHA: Well, we have had a turbine operating in Brooklyn for, I think, 17 years now. Houses have been built closer and closer to that turbine and admittedly it is a single turbine, but it has not shown significant changes in noise levels.

40

MR HUDSON: You have measured that to determine that, have you?

45

MR BOTHA: We have had measurements undertaken but we extended the consent two years ago and as part of the re consenting we had some noise measurements done and looked at the levels of that turbine. I mean, I suppose also to add to that, you know, the conditions for West Wind are in place for as long as the project is there. It is unlikely that the absolute levels of the turbines are going to change, if anything is

likely to change it is the special audible, so wear on a gearbox for instance, but generally if a gearbox starts to exhibit that sort of noise you want to replace it because it is going to do more damage.

5 The turbines are fitted with vibration analysis gear and they will detect major changes in, for instance, bearing failure or gear test failure, and I would like to believe that we would change the component out before it became noisy.

10 MR HUDSON: All right, thank you. Thank you for coming.

 HER HONOUR: Thank you very much, Mr Botha, for coming all this way. I am sure it has been helpful to everyone and certainly it has been to us, and I thank Mr Beatson too for accompanying you. I hope you have a
15 safe journey home. Thank you very much.

 MR BOTHA: If I can just make - I mean, you have been to visit West Wind, and I mean we would encourage anybody to go back again if noise continues to be or West Wind continues to be an issue and go and listen
20 for yourself in the community.

 HER HONOUR: Mr Low might be able to organise a group to go down. He has been very persuasive and influential in coordinating the residents here, so if you really mean that and Mr Low and his group would like to
25 come, I am sure they would take up the offer because it is very interesting landscape.

 MR BOTHA: Yes.

30 HER HONOUR: Thank you. Sorry to have kept you. Thank you very much.

 9 o'clock tomorrow? Sorry about that. Thank you.

35 **MATTER ADJOURNED AT 6.49 PM UNTIL
 WEDNESDAY, 24 MARCH 2010**