ENVIRONMENTAL PROTECTION AUTHORITY
BEFORE AN EXPERT CONSENTING PANEL

IN THE MATTER OF THE FAST-TRACK APPROVALS ACT 2024

AND IN THE MATTER OF AN APPLICATION BY MATAKUNUI GOLD LIMITED UNDER SECTION 42 OF THE FTAA

FOR THE BENDIGO-OPHIR GOLD PROJECT

APPLICATION NO: FTAA-2507-1089

Hearing:	Held in Monarch Room, Willeston Conference Centre, 11-15 Willeston Street, Wellington Central
Date:	12 June 2026
Panel:	Hon Matthew Muir KC (Chair) Gina Sweetman Phillip Barry Roger MacGibbon Peter Kensington
Counsel:	Joshua Leckie and Mia Turner, Lane Neave, for the Applicant Dean van Mierlo for Department of Conservation David Randal for Otago Regional Council Sally Gepp for Sustainable Tarras Rob Enright and Jen Vella for Environmental Defence Society Mike Holm and Nicole Buxeda for Kā Rūnaka
Experts:	Dr Matt Baber, David Norton, Jeroen Lurling, Keither Barber, Dr Graham Ussher, Zac Milner, Robyn Simcock (via AVL) for Applicant Warren Chinn, Rogan Colbourne (via AVL), Max Crowe, Justyna Giejsztowt for Department of Conservation Rebecca Teele, Trudy Anderson, Lisa Milliken (via AVL) for Otago Regional Council Dr Geoff Rogers for Sustainable Tarras Mike Harding for Central Otago District Council Nicolas Head for Environmental Defence Society Matt Dale for Kā Rūnaka

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Mr Muir: Morning, and welcome to this fourth day of concurrent hearings. Today, a very solid day in relation to invertebrates, lizards, avifauna, terrestrial vegetation and, at the end of the day, effects management in relation to all of the above. We have broken the day up, as I think everyone's aware, into those five sessions, with defined timeslots. Like us betterments, we don't need to drive to 1 o'clock. We can conclude earlier because I suspect that there are going to be some pressure points a little later in the day and I'd rather be ahead of schedule than behind. But we're going to start with the invertebrates' session. For those members – for those experts sitting here who are not familiar with the panel, we'll just do a quick introduction. I'm Matthew Muir and Chair of the EPP panel. To my left, Peter Kensington, landscape architect, and Gina Sweetman, known probably to all of you, a highly experienced planner and the Hearings Commissioner; and Mr Roger MacGibbon, who will be your interlocate today because he is, of course, the ecologist on our panel. Now we also have joining us in about 10 minutes time Mr Phil Barry, our economist. He's just running a little bit — it's entirely my fault because I had forgot somehow between [inaudible 00:38:01] forgot to tell him that we'd moved our commencement time to 9 o'clock, so you can blame me for that.

If I can just have some introductions. Mr Barber, you're seated there in the middle there, aren't you?

Mr Barber: Yes.

Mr Muir: Yes, yes, good morning to you, Mr Barber, and Mr Chinn, yes, thank you, for DoC. And Ms Teele, you're for the ORC. Do I have any other experts participating in this first panel, this first concurrent hearing online? I didn't anticipate that there would be any for this session. Right.

Could I just now go just to counsel to make sure that I have everyone here accounted for. Obviously, we have Mr Leckie, and we have Ms Gepp. Ms Gepp, you're wearing your hat today for Sustainable Tarras, correct? Right. Mr Randal, yes, and Mr van Mierlo.

Mr van Mierlo: Yes, good morning.

Mr Muir: Yes, good morning, Mr van Mierlo. Welcome to our little — our session today. And online I'm anticipating I've got Mr Holm and/or Ms Buxeda, is that correct? Perhaps not yet. Okay. They might have — their interests might be in later, later sessions. And Mr Enright. Is Mr Enright here today?

Ms Vella: Ms Vella for EDS, Sir, and Mr Enright will join shortly. He's had to travel this morning.

Mr Muir: Oh yes, thank you very much, Ms Vella, right, thank you. Right. Okay.

INVERTEBRATES:

Mr Muir: Now the experts that we have empanelled here will have heard that having put a lot of effort into developing a programme for these concurrent hearings, we sort of jettisoned that earlier in the week and we got to defining very early on in the session and putting on a whiteboard what we saw as the – perhaps up to four or five key issues that had dropped out of the relevant experts' conferences and reflected in the joint witness statements, and I anticipate that that message has got through to you and that you may have even had some discussions about what you think they are. If not, we will settle them quite quickly, and we're going to get them on a board, and Ms Sweetman's fine hand will ensure that we have them there. So, have you had an opportunity to have a discussion about the key issues that we're going to discuss today? Right, okay. And you're agreed? Could I have one spokesperson.

Mr Barber: We're largely agreed. There may some differences. We didn't have full - - -

Mr Muir: Excellent, excellent. Let's get the subjects of agreement first, and then we can have a miscellaneous category to deal with the other issues. Okay, thank you, Mr Barber. If you could be – if you could dictate and Ms Sweetman will be our scribe.

Mr Barber: One first topic was the focus of notable species in the assessments was deliberate, not methodologically unsound. So that difference between whether we take a community view of invertebrates for assessment, versus the notable species or the species view.

Mr Muir: Yes.

Mr Baber: The second point is about net loss, and so the fact there is net loss in invertebrate values is agreed, and there's quite extensive discussion notes on that.

Mr Muir: Yes.

Mr Baber: However, it's a disputed scale of loss, and that's where we - - -

Mr Muir: Yes, disputed loss, yes.

Mr Baber: Disputed loss. There's an element of contention around the assessed impact area is conservative, not an under-estimate. That's mine. So it's around

where does the assessment or how does the assessment of the area impact land? There's contention whether it's conservative or whether it's - - -

Ms Sweetman: The impact area.

Mr Barber: - - - the impact area.

Mr Muir: Is the area identified by the applicant conservative or not.

Mr Barber: There's another point dealing with the offset package and whether the types of gains that it delivers, whether it delivers gains at all. Two more: one was around the management plan and certainty, just following on from the last point; and point six was lighting, the effect on invertebrates.

Mr Muir: Thank you.

Ms Sweetman: How do you pronounce – how do you spell that?

Mr Muir: Lighting. Mr Chinn, can I just come back to you? Are there any subsidiary points in there that you want us to highlight on the board?

Mr Chinn: Well, the issue of translocation of species and trial experimentation. I don't know if they could fall underneath some of the categories, but that was a topic we - - -

Mr Muir: Would it be related to net loss?

Ms Sweetman: Or offsetting.

Mr Chinn: Oh sorry, thank you, yes, you could park it under there. So that the notion of experimentation, trials, and translocation is a component of that.

Mr Muir: Thank you.

Mr Barber: That may well fit under management plan uncertainty. That would be a good place for it.

Mr Muir: It's going to overlap quite a few categories. I mean, we may re-order as we go through the higher point on our timetable. And Ms Teele, did you - - -

Ms Teele: I'm comfortable with those.

Mr Muir: You're comfortable with that, right. Okay. Well, in the format that we have found useful, we're going to start with the first of those topics, and we start typically with the applicant's expert and with very brief comments, two or three minutes at most, just to set out the position which you are advancing, and we will then follow that up with questions from the Panel in relation to this sub-topic, and I will invite cross-examination and we'll round back to the Panel on that topic for any final questions. And then we will move on sequentially through the list. So Mr Barber, on the subject of the method, the methodology.

TOPIC 1: THE FOCUS OF NOTABLE SPECIES IN THE ASSESSMENTS WAS DELIBERATE, NOT METHODOLOGICALLY UNSOUND

Mr Barber: Okay, so – thank you. The first point to make in this is that there's no directly comparable studies to benchmark against. There's a certain element of this is slightly unchartered territories in developing a methodology for assessing invertebrates at the site. With that in mind, we did look at both community aspects and species composition, and when we are looking at the effects on each species and breaking it down to a more traditional, I guess, effects management kind of view. And we chose that available species focus directs the attention to where conservation is needed most for the individual species.

Even doing that, there's quite a large amount of uncertainty. When we deal with invertebrate species, there's a large amount that isn't known, and we pretty quickly start introducing supposition and we start getting into guesswork. That becomes in order of magnitude more difficult when you start aggregating into community ecosystems and communities of invertebrates.

So for that reason there, we're – one of the reasons, we end up coming back to getting a list of notable invertebrates which are those of recognised as highest conservation value and focusing a discussion on them because even though there's not vast amounts of facts known about them, that is where there's the greatest amount of detail known as facts. I guess that's the – yeah, I'll leave it there. That's my main points.

Mr Muir: Good morning, Mr Barry. I've already indicated it's entirely my fault.

Mr Barry: Good morning, everyone.

Mr Muir: So, Commissioner Barry, we're just dealing with invertebrates, and Mr Baber has just given his brief summation. The first of these, some issues about methodology, and we'll make sure that you are infilled on that later in the day. Right. Mr Chinn.

Mr Chinn: Thank you. So I take a slightly different approach with this sort of work with the intention to offset or make good the disturbance regime that will be put upon the invertebrate fauna. There's a handful of weaknesses with taking a species approach. Effectively, it's cherry-picking, charismatic tack, So that's either interesting or on a threatened species list which although that's important of course, in this case it's sort of ecologically incoherent in that you can't mix a suite of desirable species together and plonk them in a sanctuary. For example, we wouldn't put a cat, a kiwi, a stoat, a lizard and a flightless beetle all together. We need to put together synonymous and appropriate units to have a meaningful and long-lasting community of invertebrates in any kind of reservoir or reserve.

So we need to augment the interesting species with the appropriate community members. There's no confidence that taking those species will survive. A single species approach leads to, also to the monetarisation if you like of individuals and that they can therefore be costed. So the classic example of course is the

Powelliphanta snails in the fridges in Hokitika. They were taken from Mount Augustus and put in the fridge. And that – the species is doing fine. The population is going gangbusters, but they have nowhere to live once the – we've decided what to do with them. So that is a concern to a species approach.

It's convenient in these kind of cases because they are units that can be enumerated. They can be collected and banked, and they represent numbers but not emergent properties which is an important part of community ecology. But most importantly, a species-only approach risks losing or ignoring, as I said, the emerging information that's available at the community or higher levels. And these include things like the ecosystem services, soil bioturbation with worms and so forth, herbivory, pollination, predation, and detritivores that clean up the surface of habitats.

So there's also processes of competition. There are mutualisms, there's succession, there's diversity, biotypes, physical variation within a community. There's behaviour as an emergent property of a community. There's even evolutionary effects. So it appears to me to be a convenient, expedient and quite cheap way of coping with an important and interesting suite of invertebrates that haven't fully been enumerated or collated. Whereas on the community side of things, if they took a community approach, you then have a suite of metrics from which you can derive useful information about how to offset the impacts or how to create a reserve or the size of a reserve. For example, understanding the structure and the function includes things like the trifocals, the hierarchy of what feeds on what and how many are doing so. The proportion of native taxa versus introduced taxa. This is an important gradualism where we're dealing with gradual effects rather than black and white cutoffs.

There are ecosystem services, there are vulnerable taxa which we will collect but there will be more that you collect if you take a community approach. There are indices such as relative abundance, species diversity, a thing called the species evenness score which determines whether or not some are outstanding more so than others. There's a classic curve where you have very few species dominating a community and very many species that are quite rare. There's a classic reverse curve; a hollow shallow curve called the species abundance curve.

I haven't found any of that information that would be of any use for developing something like the Ardgour restoration area. It would be useful to know what's going to happen in these other places. Population metrics, population densities, the phenology, the timing of organisms when they come and go, and then successional processes, and particularly if you are going to take a species approach, are these going to be keystone species that have strong ecological function, or are they going to be foundational species which are dominant and affect the suite of species around them? And so there's a lot of utility in taking a community ecology approach. Yes, it's complex, it's data heavy, it is expensive, but it has a great conservation outcome in my opinion. Thank you, Sir.

Mr Muir: Thank you. Ms Teele.

Ms Teele: Thank you. In terms of the methodology as per the joint witness statement, I have no issues with the methodology itself. How it has then been applied or interpreted into the management plan and offset package that's where my concerns lie. So from a purely methodological point of view, I consider it adequate.

Mr Muir: Just rounding to you, Mr Barber, any comments on that?

Mr Barber: Yes, what I will end up or finish on is that while Mr Chinn contends there a large number of things that could be looked at, there are no examples of that actually ever being done and been done successfully. And my view of that would be you could have a whole herd of PhDs working for extended periods of time and we could come back in a number of years and still have the same discussion because there's not enough information. And so what that means is you have to introduce more assumption into the discussion, and more assumption doesn't equal better assessment, in my opinion. So I'll leave it there.

Mr Muir: Do any of the panel members wish to ask questions, apart from Mr MacGibbon? No. Mr MacGibbon.

QUESTIONS FROM THE PANEL:

Mr MacGibbon: Is that still working? Is that working now? Okay, hopefully you can hear me. Mr Chinn, can you, in response to Mr Barber's comment then that there's no previous sort of example of that sort of work being done, do you agree with that and, if not, what are the examples you can could refer to where this sort of community-based approach analysis assessment has been done.

Mr Chinn: The academic literature and community ecology is full of examples, either in forest or dryland systems. Even in a single shrub has been surveyed for the community structure in Otago. José Derraik, a multi-author paper on the suite of moth fauna that existed in olearia odorata and lineata shrublands. So in all these studies and particularly in forest studies, the structure of the forest canopy right through from the forest floor to the emerging canopy, there's plenty of examples of community structure of invertebrates in these systems. And I might add, if Mr Barber contends that there are few studies, I ask him and Santana, the applicant, have they got any examples of their ecological efforts using the species only that we could track as well as being effective, if there's some doubt about a community approach.

Mr MacGibbon: Thank you. Ms Teele, I'm just interested that you, or as I understood it, you support the method that was used, or you felt it was adequate. What's your response to this community versus known species programme?

Ms Teele: In the application of survey inside characterisation followed up by the impact assessment, the survey method is in line with what I would do professionally in the – and what I have seen across my experience having been done. Where the community aspect in my mind is brought in as in that impact assessment side where

you're dealing with vegetation communities and when you go through that ecological value management effect, you're taking into account – you should take into account the invertebrate communities as they relate to the vegetation to ensure you have captured that. So that's where I have no – I had initial queries over this early methodology but they were – I got the information I required in workshopping with the applicant that I was satisfied with the survey, but in terms of the community aspect, in my mind that has brought in, in the impact assessment stage based on what you've done in your site characterisation.

Mr MacGibbon: Thank you.

Mr Muir: Cross-examination on this topic? Ms Gepp. No. Thank you. Mr Randal.

Mr Randal: No Sir.

Mr Muir: Mr van Mierlo?

Mr van Mierlo: No, no questions, thank you.

Mr Muir: Mr Enright or Ms Vella? No, thank you. And Mr Leckie?

Mr Leckie: No questions, Sir.

Mr Muir: Right, thank you. Topic two, scale of loss. Thank you, Mr Baber?

TOPIC 2: SCALE OF LOSS

Mr Barber: So we do – all three experts agree that will be a net loss from – on invertebrate, indigenous invertebrate values at the site should the project go ahead. As I said, the dispute is around the scale of that loss and the timeframe for effects management and how benefits will be delivered and when. And one of the key questions I believe that lies at the centre of this is does the disputed scale materially change the weight given to any effects assessment or the offset package.

Part of that discussion is that is that the assessment of invertebrate effects are not greatly reduced through the offset package. So in weighing up and calculating how much benefit may be received from the offset package, that calculation doesn't include much discount or reduction for including potential benefits from that offset.

So rounding that one off is – even if there were high residual effects and that was accepted, for a good number of the key invertebrates that we discussed in effect and particularly some of the newer species, which are really quite special in ways, is that the effects are already very high, what I – which you can't get any higher than very high in the assessment method that we've used. So there is a large number of significant effects and that's what we're talking about here. And are we just talking about the rats and mice down the bottom that, at the end of the day, won't change the overall view of where the relative level on invertebrates sits. I'll leave that there.

Mr Muir: Thank you. Mr Chinn.

Mr Chinn: Thank you. So yes, we are agreed that there'll be a negative impact on invertebrate communities. I go a bit further. It's actually quite subtle. It's more of a net loss of invertebrate biomass and that's including introduced and native invertebrates, and there may be a reduction in the species diversity. But you'd only know that if you took a community level approach. And with the restoration area, the Ardgour restoration area, that is a kind of a band-aid approach to losing the entire system through Shepherds Gully which is where the direct effect of the mine will be; and that's a disturbance regime.

And what we're dealing with is the long-term and subtle change in the ratio of introduced to exotic invertebrates, and over the entire Dunstan Mountain range, you could definitely point to there being a loss in indigenous invertebrate iota. And this is because the restoration effects of planting exotic grasses will see a suite of more introduced invertebrates arriving and colonising the disturbance because the current suite of invertebrates that are there are adapted to stable, albeit grazed and periodically burnt, but a stable system and that — what I mean by that is the soil is stable, the rock tor is stable, the ridges and wetlands are stable, and snowbanks. Whereas the approach to mining will completely extirpate that system and replace it with a high-energy more disturbed system that will be favourable to introduced organisms, invertebrates in this case I mean. So that's the angle that I take to there being a net loss.

Mr Muir: Thank you.

Mr Chinn: Thank you, Sir.

Mr Muir: Ms Teele.

Ms Teele: We are all in agreement there is net loss for invertebrate values due to this proposal the scale which I think is greater than what is currently contended for reasons that actually sit under items three to six. But, in general, the ability to implement the management plan that's been put forward and in part those are draft management plans which is inherent in that issue. And also the magnitude of residual effect on a few species I think is higher than what has been stated in the impact assessment and the injury defects, in particular lighting on invertebrates. So I don't disagree there's any loss. I just believe, for the reasons I've stated, the scale is greater than what has been put forward.

Mr Muir: Thank you, Ms Teele. Any questions from the panel, apart from Mr MacGibbon? Mr MacGibbon, did you have any questions of Ms Teele?

QUESTIONS FROM THE PANEL:

Mr MacGibbon: I do have just a quick one. Ms Teele, just responding to what you've just said, your feeling that the magnitude of effects may be greater than stated, is that an areal thing? So are suggesting that a greater extent of area is affected, or that the effects within the project area are more substantial?

Ms Teele: I'm referring in terms of the potential significance of the species. So as noted for one of the moth species, that this could be a potential strong – population stronghold and it has a corresponding low level which now – we've tried to do as much expert conferencing as we can, but we haven't go the nub of every issue and there is – in part, that means your residual effect, you should – takes into account the management, and I'm not sure the management will achieve what's going to be said. So I think what the residual – the residual effect is higher than what's stated for, in some cases, these could be stronghold populations which is noted in the documentation, and again in the – what's been relied upon to be achieved in the proposed management.

Mr MacGibbon: Thank you. Thank you.

Mr Muir: Any cross-examination by any party? Yes, thank you very much, Mr Randal.

CROSS-EXAMINATION BY MR RANDAL:

Mr Randal: Thank you, Sir. Good morning, Mr Barber. I'm Dave Randal appearing for Otago Regional Council. So there are a couple of questions. Picking up on that last exchange between Mr MacGibbon and Ms Teele, and the questions are by reference to paragraphs 21 and 22 of the joint witness statement in respect of invertebrates, dated 7 May. I'm not sure if you have that in front of you but I can read the relevant paragraphs very quickly, encapsulating this issue just discussed: "Ms Teele and Mr Chinn consider that the magnitude of residual effects for specific invertebrate species is likely higher than what was assessed in the AEE". And then, Mr Barber, you note that: "Even if the magnitude of residual effects for specific invertebrate species are higher", which you don't accept, "this may not necessarily result in a different outcome in terms of overall level of residual effects for those species". I think there may be some tautology in that statement but just to drill into that a little bit. You'd accept, wouldn't you, that if the magnitude of residual effects for a specific species was higher, then that does result in a different outcome, doesn't it, by definition? If the residual effect is higher, it's higher?

Mr Barber: Not necessarily. So if it was very high already, you can't be a higher state of very high?

Mr Randal: I see, yeah. And you mentioned this before that if that's the case for certain species, the others we're dealing with might be "the rats and mice" I think you put it. I think I see the thrust of what you're getting at there. But just to pick up one specific example – I'm not sure that's borne out. It's got a great name. Ichneutica sistens, so a moth, which you evaluate the effects on that in your report. The threat status of that moth is at risk uncommon. That's the case, isn't it?

Mr Muir: We've just got to pop that into the record so rather than nodding your head, just say "yes".

Mr Barber: Oh yes, yes.

Mr Randal: I can point you to the specific parts of your report to the extent that's useful to answer these questions. But I think you found that that species is present in large numbers within the direct disturbance footprint and its preferred habitat covers basically all of the DDF, about a thousand hectares worth. Does that sound correct?

Mr Barber: Yes.

Mr Randal: And that its habitat's obviously assumed lost, in your assessment.

Mr Barber: Yeah.

Mr Randal: You've assessed the magnitude of effect on that species as low - - -

Mr Baber: Yeah.

Mr Randal: - - - and in line with ECIA guidelines. That means having a minor effect on the known population. That's right, isn't it?

Mr Barber: Yes.

Mr Randal: Yes. And in making that assessment, obviously scale's important there when you make that assessment, isn't it, under the ECIA guidelines? So you're looking at the site area and the zone of influence there but also considering the broader context, you know, if this is a, if it's a species that's very widespread and in large numbers everywhere, then that's relevant to coming up with that low assessment, isn't it?

Mr Barber: Yes.

Mr Randal: And by the way the matrix works in those guidelines. You know, although the ecological value of this moth species is high, in combination with your low effect magnitude rating, that gives an assigned level of residual effect of low, doesn't it?

Mr Barber: Yes.

Mr Randal: Low, low being not normally of concern under the guidelines, that's right, isn't it?

Mr Barber: Yes.

Mr Randal: And the proposal here by the applicant in the usual way I think is to address – is to focus in on residual effects assessed as being moderate or worse than proposed specific offsets or other measures to, you know, tailored, focused on those effects.

Mr Barber: Yes, where possible.

Mr Randal: Where possible, right. So you'd accept though, notwithstanding what you told us before, that for Ichneutica sistens, if you'd assessed the effect on that species as being moderate, or higher, by operation of the matrix in the guidelines, that wouldn't have led to a residual effects outcome of low, would it? That would a high or worse residual effects outcome, do you accept that?

Mr Barber: Yes, although that would be overlooking the fact that the Ichneutica sistens is a moth that is widely spread from the central North Island south, so looking at the scale and discretion of the population.

Mr Randal: Yes. I understand that scale point. But this is – notwithstanding that, this is at-risk species that rated as uncommon, isn't it?

Mr Barber: Yes.

Mr Randal: And while you've signalled – while you've assessed the level of residual effect as low, you also signalled the possibility that plants and tussocks might be of benefit to the species. And so you're expected overall outcome, in your assessment, is listed as uncertain, by which you mean you're uncertain as to whether there'll be a net benefit for the species or a net loss.

Mr Barber: Correct.

Mr Randal: I appreciate the Panel asked a specific question about that uncertainty and you didn't have time to get to that conferencing, as I understand it.

Mr Barber: Correct.

Mr Randal: But I put it to you that both your effect magnitude rating of low and your predicted outcome of uncertain likely underestimate the project's adverse effects on the species, would you accept that proposition?

Mr Barber: No, and the reason I wouldn't is that discussion of uncertainty has been – is important as being the basis of much contention through the discussions with the experts in conferencing. It is because, as I say there, that the planting may well have and I believe is potentially will have positive benefits for that moth, that species, as will many others. However, the burden of proof, I cannot prove that, I cannot say that as a fact as, if to put it in the loss category, you would have to prove that it's not going to work, and I don't believe that can be done either.

And so there's many cases through the documentation where we use uncertain for exactly that reason. It's uncertain. I deeply believe that many of these activities will end in a positive outcome. However, I can't state that with confidence. So it would be improper of me to suggest that as a fact. And we go back to this supposition where I'd be supposing something to happen and not being able to prove it. So that would be my comment to that.

Mr Randal: Thank you. I did give you a two-part question, and you answered the second part I think about the uncertainty. I'll come back to that. But taking you back, first of all to the effect magnitude rating of low, when I say the species is found in very high numbers in the DDF, in fact, it's there in such high numbers that you consider the site may represent an important population stronghold, don't you?

Mr Barber: Potentiality, yes.

Mr Randal: I mean, in those circumstances, again you're looking at the effects at that site scale and the zone of influence scale and, of course, you're having regard to the broader context, but the loss of an important population stronghold, a moderate or even a higher magnitude of effect would be a fairer rating for that, for that impact, wouldn't it?

Mr Barber: When we consider that that moth was also found at similar levels throughout the telling [check 01:12:10] landscape and the assessment of the wider area, that, that indicated that the immediate impact area in the DDF, for want of a better term, was not the significant part of that population at that site so it's not as if that is the only show in town for this moth. If we take that out, then that moth is suddenly what you see as drastic and irreparable effects. And there was a large discussion on this with Dr Robert Core and myself as to where we were going and where I would take this assessment because it's, you're right, it's not a clear-cut and that's common of most of these assessments and most of these species where there is a large amount.

I think we know, we know the complete range. We did an intensive study in the area and surrounding landscape to understand what that means. We did identify that while there are large numbers of this moth in the landscape there, as the pit, also wider, we didn't know how far that goes. But what we could say with confidence is that this project is unlikely to mean that those moths will disappear from the area because it's not as if they're only in the DDF, and then we get to the limit of our knowledge of the species and we have to start inferring and that supposition comes in, so.

Mr Randal: So I think I understand you to be saying that while you've describe this population on this site as an important population stronghold, you're suggesting that your assessment, while perhaps not in the report, for reasons of brevity or something else, there are other important population strongholds dotted around within the same ecological district, is that what you're, what you're saying?

Mr Barber: I'm not saying there is because I don't have that information. There may well be. We do know it is, it is common over a large geographical range. One of the issues here is that this goes back to setting the precedent of where, where are there intensive studies of this nature that we can look at. And because this is — we've looked a lot more intensely than anyone else has looked in the past. We find does that mean they're nowhere else. We know they are in other places. So we may well be just finding a pattern that we haven't identified in other areas yet. However, we can't state that as a fact because all we know about is what we found on the site. So we don't know there are other populations.

Mr Randal: I see, I think. I think I understand. This uncommon species you say may be common, but you haven't done the tests to find it but nonetheless you're comfortable with your assessment of a low magnitude impact.

Mr Barber: Yes, I am. And I think you've hit the nail on the head of a key fact of most discussions around invertebrates, particularly Lepidoptera as we're – we perhaps

quickly reached the limits of our knowledge not to say we understand them well, just what we understand is a very small part, and with the level of funding in New Zealand we don't often get the chance to study these species in depth as to the level that the taxonomists would like.

Mr Randal: In terms of the uncertain outcome, notwithstanding the answer you gave a couple of minutes ago - - -

Mr Barber: Yeah.

Mr Randal: - - - you'd accept, wouldn't you, that you can't confidently assume that rehabilitation efforts will benefit this particular species I'm asking you about, can you?

Mr Barber: I accept that. And I also accept that we can't confidently assume that they will have no benefits.

Mr Randal: So bringing you back to paragraph 22 of the joint witness statement where you say "the magnitude": "Even if the magnitude of residual effects for a specific species", say this moth "was higher, this may not necessarily result in a different outcome in terms of the overall level of residual effects". I'm still confused at that. I think you've – you're sticking with your magnitude assessment of low, which I think you accept if that was higher, then the overall residual effects rating would be higher and push you into an offset response under the guidelines, but you don't – and you want to stick with an uncertain outcome, notwithstanding that if that magnitude were higher, that offset's required, and an offset here is not required, which leads to a clear net loss. I'm just trying to wrap it up. You're still comfortable with the assessment as you framed it?

Mr Barber: Yes, I am, and also that you would then look at if there was an effects management action needed, are they available, are they known and is there something you could do, and then could that – and should it be done. I guess there's a large flow-on discussion from that.

Mr Randal: Right. Thanks Mr Barber.

Mr Muir: Any other cross-examination?

CROSS-EXAMINATION BY MR VAN MIERLO:

Mr van Mierlo: Just picking on that theme, you were involved in the preparation of the AEE with regards to invertebrates?

Mr Barber: I was to a limited extent.

Mr van Mierlo: To a limited extent. Table 26 in the AEE, this various invertebrate species and the expected outcome for all of them is described as uncertain. Can you speak to that?

Mr Barber: I can to a degree, yes.

Mr van Mierlo: Okay. So that is, was quite a – 2,000 or so species there including nationally critical or nationally endangered species. So in terms of uncertain, that means that there could be a net loss outcome or a positive outcome, is that right?

Mr Barber: Correct, yeah.

Mr van Mierlo: And so it could be a significant loss?

Mr Barber: Or potentially could be a significant positive gain.

Mr van Mierlo: And there's nothing in the table that indicates the likelihood of loss or gain?

Mr Barber: No, there's not.

Mr van Mierlo: So if there was a small chance of gain, but a large chance of loss, would that still be described as uncertain?

Mr Barber: It could be, yes.

Mr van Mierlo: And one of the factors contributing to uncertainty for invertebrates, would that relate to the success or otherwise of predator – pest control, impacts on invertebrates?

Mr Barber: It could potentially rely on that although there are a large number of factors that it can rely on.

Mr van Mierlo: And one of those other factors would be the success or otherwise of rehabilitation planting.

Mr Barber: Yes.

Mr van Mierlo: So in assessing the overall magnitude of effects, how did you account for the uncertainty of outcomes? Was that neutral, positive, negative?

Mr Barber: So how we accounted for the uncertainty was that there was no positive benefit accounted for it, and essentially the assessment of the impacts on the population without those future benefits is, is what I based my information putting into the tables in the AEE.

Mr van Mierlo: And was there any sensitivity analysis as to the uncertainty? Not all uncertainty's equal is it?

Mr Barber: No, there wasn't a sensitivity analysis done.

Mr van Mierlo: Right, thank you.

Mr Muir: Mr MacGibbon, was there any issue arising out of cross-examination?

Mr MacGibbon: No, thank you.

Mr Muir: No, thank you very much. Right, topic three, the appropriateness of the identified area of impact. Mr Barber.

TOPIC 3: APPROPRIATENESS OF THE IDENTIFIED AREA OF IMPACT:

Mr Barber: Thank you. So the impact area I will note again here is that we are considering a different impact area for invertebrates than is referenced for the other impact area. It is much larger. It's around about 1,183 hectares as opposed to the 610 hectares that you might be commonly referred to. So that's the, in effect, the invertebrate impact area.

And the reason that's larger is that there was this notion of reverse sensitivity, particularly when we get to aspects such as artificial light at night. And there's a lot of unknowns in that, adding to a lot of unknowns generally. And so where we ended up with was we put a buffer on the outside of that DDF and we looked at what that should be and there's, once again, there's no referenced "this is what you should do, you should have X metres". There was a difference of opinion, and I do notice that Brian Patrick suggested 50 metres might be appropriate for lighting effects, and that to me seemed a little bit on the light side. So we ended up with 150 metres. Once again, there was lots of discussion with lots of other people, and that's where my soul-searching ended up. So either way, we ended up with quite a large area of impact.

So for the invertebrate assessment of effects, and when I considered what effects there may be, it uses that whole area and says essentially everything within that can be ground zero for invertebrates. That's my starting point. Now unlikely to be the case. Worst case scenario, and even in a worse case, I can't see it getting to that. However, once again, there's supposition — don't know, can't prove that it won't.

So ultimately that 150 metre buffer of the DDF gives us an area of 50 per cent larger than we would of otherwise considered. So there's this quite a [inaudible 01:22:17] there. And then on to that, there's no discount or reduction, any uplift that we might get for rehabilitation, should it actually occur and then at some stage in the future. So that's assuming it's a scorched earth and there's no discounting or uplift there: that that's the view and that is what we considered to be the impact.

So effectively as a worse case scenario, we've gone for a fairly wide net and we're not – and even though there may well be some parts of that that aren't, aren't impacted, we're just saying well, that whole area is – you're not going to get any reduction for the uplift, that's our assessment, and that's what the assessment's largely based on. So from that point of view is where I don't see the other statement coming into it and I can't see how we've understated the impacts - - -

Mr Muir: Thank you.

Mr Baber: - - - from that angle.

Mr Muir: Mr Chinn, you still don't think it's big enough?

Mr Chinn: Thank you. Not really. I think because the impact area is a continuum, there's no hard edge and, particularly as I've mentioned before, with invertebrate ecology, things are usually on a continuum. There are thresholds in time and space

which will be triggered for the behaviour of invertebrates to respond to and, in this case, the issues of disturbance to the invertebrate bio to the extent indigenous invertebrate bio to there are things like dust, edge effects and, of course, lighting, which we've just talked about now, and the overspill of light. Now I'll just read three paragraphs if you don't mind from my expert advice about lighting.

Mr Muir: Yes.

Mr Chinn: In number 66, starting part-way in: "The key points about lighting is that any lighting is a problem for all nocturnal invertebrates and the more lighting, the greater the impact. There is a confident and growing body of scientific literature on the effects of light emitting diodes, LEDs, on invertebrates and these lights are being widely used in New Zealand. The intensity of these lights and their residual blue spectrum wavelength is a serious problem for invertebrates. Moths are particularly susceptible to LEDs as they are attracted to the lights since the brightness is more significant than colour temperature. Once attracted, moths will fly around rapidly until they're exhausted, fall to the ground and then they can be eaten by any number of nocturnal predators", and there's a suite of references to back that up with. "Now while moths are positively phototactic, they fly towards lights, we all know, there are many ground-dwelling invertebrates that are negatively phototactic, they are repelled by light, and they'll be forced away from any surfaces that they may have previously occupied at night should artificial light be present. And in both cases broadscale artificial light at night, ALAN – A-L-A-N – will be anathema to the light history traits for the indigenous invertebrate fauna at Bendigo and it will be on a continua and very hard to appropriately document". Thank you.

Mr Muir: Ms Teele.

Ms Teele: Based on the proposed management measures, I don't see the lights being contained to within the 1,183 hectares which is the DDF area plus the 150 that the assessment has allowed for. And noting that there is not a light – lighting management plan as part of that application, there is a lighting report, which I'm not a lighting expert but I have looked at figures from that to try and get an idea of how far the light will go and, from what I have seen, it looks like it will go further than 180 hectares and it is unclear - - -

Mr Muir: 1,183.

Ms Teele: Yes, that's in our joint witness statement so that's – I don't see the light being contained to that and I don't see the management measures to ensure that clearly stated in the application.

Mr Muir: Thank you. Questions from the panel? Mr MacGibbon.

QUESTIONS FROM THE PANEL:

Mr MacGibbon: So to Mr Chinn and Ms Teele, if the 150-metre buffer around this area is not sufficient, what is?

Mr Chinn: A kilometre, at least.

Ms Teele: I would contend that the practicalities it comes down to management measures in my mind, the light will go a very long distance, if I have understood it correctly. Therefore, as the onsite management measures to decrease it as much as possible and then having the lighting expert predict what the levels will be, what kelvins they'll be, at what distance, to determine where that boundary is with your management measures.

Mr MacGibbon: So do you think there are management measures that could constrain that light effect to 150 metres?

Ms Teele: There are some measures that can help constrain it, but I – from a mining point of view I'm assuming – generally in other projects I've worked on, for health and safety reasons, or for safety reasons, there's generally reasons that that there need to be high-powered lights in some locations. So again, it would be understanding what is required for the proposed development for lighting and putting in the management measures that can be put in place and then assessing where is the light at that point. And that is what you are — have to take into account as your indirect effects in your assessment.

Mr MacGibbon: Thank you.

Mr Muir: Any cross-examination on this issue? Yes, Ms Gepp.

CROSS EXAMINATION BY MS GEPP:

Ms Gepp: Thank you, Sir, thank you. You've mentioned lighting as a potential effect that extends that area. Have you considered the effects of blasting and is that an issue for invertebrates?

Mr Barber: The effects of blasting wasn't specifically assessed through any calculations in the effects assessment. There's very, very little information to go off in the published media around what effects on invertebrates are and it's another field where there's lots more question marks than there are facts available.

Ms Gepp: Okay. So to the extent that the applicant's blasting report back in – on the 3rd of March said that vibrations may exceed three millimetres per second at up to 160 metres from the blasting sites, would that be relevant to setting the zone of impact?

Mr Barber: I haven't reviewed that report, and I haven't had the chance to analyse it and assess it for what effects it may have on invertebrates.

Ms Gepp: Thank you. Same question for – actually, sorry, just before I move on, does anyone else want to comment on that issue of blasting vibrations and invertebrates?

Ms Teele: It would just be an indirect effect that had not been taken into consideration therefore, the scale of loss is likely to be greater than what is stated.

Ms Gepp: Thank you. Same question for exploration drilling which is proposed to be consented across the whole of the consent area., has the effect of that been taken into account?

Mr Barber: Inside the DDF, yes, and so exploratory drilling outside the DDF has not been specifically assessed for its effects on invertebrates. I will say that that area was included in the original surveys, specific assessment of effects on invertebrates were not carried out.

Ms Gepp: Thank you.

Mr Muir: Is there any other cross-examination? No. Thank you. Any issues arising out of that? Mr MacGibbon?

Mr MacGibbon: No.

Mr Muir: Thank you. We've probably squared away, have we issue six, lighting effects?

Mr Barber: 90 percent.

Mr Muir: Do you want to come back to that? Right. Okay.

Mr Baber: We could do that now possibly, it's very quick.

Mr Muir: Yes, of course.

TOPIC 6: LIGHTING EFFECTS

Mr Barber: Yeah, so I do consider that lighting with – there are lighting models that are typically used to understand what the impacts will be, and I do believe the application of them would be useful in determining where the boundaries of effects are likely to be; and light is a physical thing that can be measured and it can be conditioned in and effects of lighting, I believe, could be conditioned into any development.

Mr Muir: Is there anything else that anyone wishes to say on the panel on the subject of lighting, or we can square that one away now. Okay. Well, we've got two topics to go. The offset package. Mr Barber.

TOPIC 4: OFFSET PACKAGE

Mr Barber: So this is another part where this discussion takes place with the understanding that we accept there's going to be net loss. And so this offset package, we're not saying that it is going to, all singing and dancing, cover or replace every, every negative impact of the project. Nor is it designed to be a complete like-for-like for every, every impact.

What it has been to do, it's been designed to deliver genuine ecological improvement for invertebrates. Specific aspects have been addressed in it to address the impacts of notable species where they are known, i.e. the particular host plants of important species, also noting that a host plant of a notable specie is also likely to be a host

plant of other species. So this concept of community is still wrapped up in the conversation of notable invertebrates because they often live on the same tree. And if you look after the habitat of one, by proxy you're looking after the habitat that lives – all, of all those other species that are associated with those trees. And Mr Chinn made the comment earlier about the discussion of community surrounding olearia bushes and it can be quite significant. So I just use that same example.

We have included two further proved sanctuaries which are designed to improve the general ecological condition of areas. That does have benefits for invertebrates, and we're not saying that they are designed specifically for invertebrates. We're saying they will have some benefits. And with that mammalian predator exclusion, that is a step change in habitat quality of some area, and we add to that all the other aspects outside the predator fence areas have some benefits from the remaining predator control as well as the rehab and restoration activities.

Mr Muir: Mr Chinn.

Mr Chinn: Thank you. So I really would quite like to just re-read another paragraph of my expert advice regarding the offset. It's just a summary of the idea that concerns me about the approach. First up, that it's kind of zoo analogy. The effort is to create an invertebrate menagerie of selected species in sanctuaries elsewhere on the landscape. But I say, "to attempt to offset these matters appears to me like a zero sum gain in which one gain is equivalent to one loss. And I would go further and suggest that it would be a net loss for the invertebrate diversity if nothing more than the subtle erosion of indigenous habitat across the Dunstan Mountains, as I mentioned before. Habitats of this character in Central Otago are no longer being formed in the absence of human activity. And what remains of indigenous and somewhat modified habitat is incrementally reducing decade by decade. And I term this process an ecological ratchet because it describes a one-way trajectory of steady habitat modification away from the indigenous toward the more homogenous biota. And the result is a cosmopolitan ecological state with lower intrinsic value, and that's the key concern for the Department". Thank you.

Mr Muir: Thank you. Ms Teele.

Ms Teele: I come back to that the management plans, as I understand it, are still in draft and there are still questions around them, and as I've noted, the proposed captive breeding studies, they're experimental. Of 18 key invertebrate species listed, seven have no targeted management actions. There's just points there that I think need to be addressed before that management plan can be understand as to the gains it is going to deliver as part of an offset package.

Mr Muir: Thank you. Mr MacGibbon.

QUESTIONS FROM THE PANEL:

Mr MacGibbon: Thank you. Just refer to the joint witness statement, paragraph 32, and I'll just read it: "All experts agree that the proposed invertebrate management will be

an expensive and complex exercise requiring the invertebrate expert knowledge to implement". It implies to me that there is an acceptance that this work could be done, even if it's expensive, particularly Ms Teele or Mr Chinn, is that the case?

Ms Teele: I still think it would be experimental. It could be – you could say you got to a finalised management plan for terrestrial invertebrates with a high degree of expert entomological and restoration skill and knowledge alongside a large amount of funding, you could put it into action. I think you would have to rank the outcomes on – different outcomes would have different probabilities of success even with that, given the lack of having done this, a lot of this before.

Mr Muir: Thank you. Mr Chinn.

Mr Chinn: Anything is possible. You could try this but there are much easier ways of affecting the retention of the invertebrate biota up there by effectively not disturbing the habitat at the outset. So you could try this and whether or not it would work is completely moot because the applicant and the applicant's ecologists have not furnished us with any track record of it having been successful in other applications of this nature.

Mr MacGibbon: So let's assume that there is disturbance so that option's not available, what would you recommend as an alternative management approach then, what Mr Barber has suggested?

Mr Chinn: Reduce as much as possible the footprint and have a conversation about curtailing the enthusiasm of the entire endeavour.

Mr Muir: You're in the category of expert that really ultimately regards this project as irredeemable from your perspective, perspective of invertebrate loss?

Mr Chinn: Sorry, repeat the question.

Mr Muir: So you're in the category of expert that really regards this project as irredeemable from the perspective of invertebrate loss?

Mr Chinn: I think there are challenges to it being reversible. The current state of the invertebrate community on the Dunstan Mountains will be impacted and, as I said before in my paragraph, it will be an increase in the homogeneity of the species diversity, and a decrease if you like of the ratio of indigenous to exotic, and that is the concern. It isn't a black and white phenomenon and we're dealing with continua here, continua in habitat area and continua in the elements that comprise the habitat. And so that's the key point. You could, of course, shift things around and rehabilitate, but it's a quid pro quo; you are losing something and you're gaining something, and that was my point before. Yeah, thank you.

Mr Muir: Any cross-examination on this topic. Yes Mr van Mierlo.

CROSS-EXAMINATION BY MR VAN MIERLO:

Mr van Mierlo: Thank you, Sir. Mr Barber, some of the invertebrate species affected are threatened. I think you've got nationally endangered, nationally vulnerable, and one nationally critical species. Do you accept that?

Mr Barber: Correct, yes.

Mr van Mierlo: And there has been mention that the site could be a stronghold for some threatened species. Is that correct?

Mr Barber: Correct. Sorry, can I just clarify before. So nationally critical species there's a question over what those effects may be. It has been identified – it was in the site -- there was an avoidance mechanism that was built into the planning. And so as it stands at the moment, it is listed as potential effect or definite effect. So just on that that's its profiling.

Mr van Mierlo: Okay. But it is a national critical species - - -

Mr Barber: Correct.

Mr van Mierlo: - - - within the footprint. It could be a stronghold for that species?

Mr Barber: So it's within the consent area, it's not within the DDF, direct disturbance reference. It's not within the footprint of the – of the project, but it is within the area.

Mr van Mierlo: When you say the area, the buffer area or beyond?

Mr Barber: No. No, beyond that. Within the yellow lines of the consent area.

Mr van Mierlo: Would you accept that effects on threatened national critical, nationally endangered species would normally be regarded as beyond the limits to off-set it in normal effects management practice?

Mr Barber: And as far as I understand, that has been open and honest, and that is in the assessment of effects.

Mr van Mierlo: So that's a yes?

Mr Barber: Yes.

Mr van Mierlo: Thank you. Thank you, nothing further sir.

Mr Muir: Is there any other cross-examination?

CROSS-EXAMINATION BY MR LECKIE:

Mr Leckie: Sorry sir, just one line of questions from Mr Leckie - - -

Mr Muir: Yes, yes.

Mr Leckie: - - - for – for Mr Chinn. Just on the exchange earlier. Mr Chinn, in responding to a question you gave your view that the declining indigenous habitats is a key concern for the Department. Did I capture that correctly?

Mr Chinn: Yes.

Mr Leckie: And just focusing on that indigenous habitat aspect for a moment, would you agree that within this ecological district, over the course of time there has already been a decline of indigenous habitat experienced independent of what this project may or may not do?

Mr Chinn: Well of course that was my point.

Mr Leckie: And in terms of the Ardgour restoration area being the 1,263 hectare area, and the mine regeneration zone being the 889 hectare area, acknowledging the difference of view in likelihood of success, you'd agree that the establishment of indigenous habitat is a key objective of the actions within those residual effects areas, wouldn't you?

Mr Chinn: It's one of the objectives, yes absolutely.

Mr Leckie: Thank you sir.

Mr Chinn: Could I add to that? It's already there. It already has an indigenous invertebrate composition.

Mr Muir: I don't think that was the point of the cross-examination. It's on the assumption – like we understand your position, Mr Chinn, that from a DoC's perspective, it would be better if none of this occurred. But we have to focus, legislatively, on a slightly wider picture. And in our ultimate assessment of impacts and benefits, we have to give consideration, of course, to all facets of mitigation, compensation, et cetera. So, the purpose of the question was focused on that issue. Anything Mr Leckie?

Mr Leckie: Nothing further, thank you.

Mr Muir: Thank you. Right. The final topic: the Management Plan. In gestation at the moment. As we know there is a revised – there were revised conditions of management plans going to be made available by the 22nd of this month. With that caveat, Mr Barber.

TOPIC 5: MANAGEMENT PLAN:

Mr Barber: First point I'd like to make here, which has been very intensely discussed, is around we acknowledge that there are a large number of largely experimental practices. Some of the aspects put forward in the management plans to date, which acknowledging there's further work to go and I do acknowledge they would benefit hugely from everyone's input, all parties input, is that there have been some of these techniques, i.e. translocations of weevils, for example, have happened in other parts of the country, and they haven't happened in this area, with these species. They're not completely dreamt up with a napkin at the back of a restaurant one night. They are steeped in some form of experience.

However, a lot of those techniques, as I say, aren't relied upon to reduce the severity or magnitude of effect for these animals. And I make the point quite strongly in my

evidence that if this project goes ahead, and those somewhat experimental actions aren't done, will these invertebrates stand zero chance? The bulldozer's coming in and they get – they're gone anyway.

So if we do the best we can and have some experimental actions, and we try and relocate and we try and salvage, even if some survive there's still more surviving than would've done otherwise. So for those invertebrates that survive, presumably it's a very good thing. And maybe you might have the situation where they all might survive, in which case it will be a very good thing. And you might also have the situation where none survive.

In that situation, and presuming you do the monitoring that goes along with that, then you have new knowledge. You have the knowledge that perhaps there was methodology that wasn't right, but the outcome was it was a failure. And there may well be a situation in future where someone does a similar activity. Or maybe there's a situation where a conservation outcome is needed, where a species is in decline and maybe its habitat's threatened through climate change or something else, and there's this knowledge that comes through this activity, can add to how you're going to conserve and protect that species.

So, there are a large number of aspects of the management plans, as they are. Granted they can be improved. That while they're not load bearing parts of the calculated benefits from the programme, they are important aspects, and I do believe should be there.

And my last point on it is, a lot of that supposition of whether they will succeed or not, it's evidentiary. Is that we can't prove it. And so it may happen, may not. And summing it up, to where I started, was well giving it a chance is a good thing. It can be done. There are methods, then I don't see any reason why not, putting aspects in the Management Plan which give invertebrates a better chance.

Mr Muir: Aspirational?

Mr Barber: Aspirational.

Mr Muir: Aspirational. Mr Chinn.

Mr Chinn: Thank you. Coming back to your comment before, yes if this happens, I think that the approach has merit, except I would – I mean it's an investment in possibility. And, one way of reducing the uncertainty of the whole process is to pretty much carry out some trial runs on some of the more easy low-hanging fruit of these ideas, potentially this summer. And that would give the applicant's ecologist a bit of leverage, positive or negative, whether or not their proposals are going to be successful. Thank you.

Mr Muir: Ms Teele.

Ms Teele: Speaking to the management plans and that some aspects may have been done – have been done elsewhere I should say, components have been, it's, as far as

I'm aware and please correct me if I'm wrong, not in Central Otago in our dry land environment. And I think that will – there's a consistent theme across ecology is this is a very harsh environment, a very unique environment, and from a restoration perspective, there have been efforts, but not in this particular area, and they've been very limited.

Further, I agree it's better to do some – in this case, it's better to do something than nothing. But I think it still underplays the overall net loss. I think we can do the best we can. We can give it a shot. But, given the environment, given the experimental nature of what is being proposed, the net loss is greater than what is stated, and things like the knowledge that Keith talked about, that we will gain from doing this, agreed. We – it would be great to have this knowledge specifically for Central Otago's dry land environments for invertebrates. It would be fantastic. But the only way you get that knowledge is if you then publish in scientific peer reviewed journals because a lot of projects that I've seen gain this knowledge, and it goes out the door as soon as staff leave, or people move on. It gets lost over time.

So a mechanism for preventing that is publishing and I would argue – I appreciate there is reporting going to be potentially required, if this is approved, to DoC, to Councils, et cetera. Those reports are very difficult to find. So publishing in a peer-reviewed literature is actually the best place to make sure, if there is weight to be given to what we will learn from doing this, those learnings then need to actually be available for other ecologists and entomologists to be able to use.

Mr Muir: Well we'll have to chat with Ms Sweetman. That would be a most unusual condition but I can see the utility in what you're saying. Yes, thank you very much Ms Teele.

QUESTIONS FROM THE PANEL:

Mr Muir: Mr Barber could I just round back to you on those comments. Is there anything that wish to respond to there?

Mr Barber: No.

Mr Muir: Right. Mr MacGibbon.

Mr MacGibbon: No, I'm fine thank you.

Mr Muir: Right, okay. Any other Panel Members? No. Any cross-examination on this topic?

Ms Gepp: Sir I have one question, but it's not actually on any of those topics.

Mr Muir: That's fine.

Ms Gepp: It's on the covenant. So I'd like to ask that at some point, if that's all right?

Mr Muir: Yes, well we're probably almost at the end of this session, Ms Gepp so fire away.

CROSS-EXAMINATION BY MS GEPP:

Ms Gepp: Thank you. Mr Barber, have you considered the covenant revocation and the criteria that the Panel needs to consider in relation to whether to approve that covenant revocation?

Mr Barber: No, that hasn't been part of my assessment of invertebrate effects.

Ms Gepp: Have you assessed the invertebrate communities within the covenant revocation area specifically?

Mr Barber: That area was within the surrounding landscape part of our original surveys. However, we didn't specifically analyse or we didn't subgroup them. We didn't specifically look at that covenant revocation area.

Ms Gepp: Thank you.

Mr Muir: No issue arising out of that? Thank you. That concludes this particular session. We're running a little behind schedule, but not dramatically so. Could I thank all of the experts for their very professional input this morning, and if we could then reassemble the next panel of experts, although I expect Mr Barber are you remaining in your seat, are you, for the next sessions? No.

LIZARDS:

Ms Sweetman: No, but Ms Teele is.

Mr Muir: Oh very good. Yes, let me have a look here at the list.

Ms Teele: Is it lizards or birds next, because the agenda it's - - -

Mr Muir: My list has lizards. I have to say that possibly at the back of my mind I'd anticipated it was going to be birds.

Ms Teele: I had that as well but I'm not sure where I got it from, because it's not what's written in black and white.

Ms Sweetman: So we are only expecting the four of them in person, and we've got two remote.

Mr Muir: Right.

Ms Sweetman: Dr Rogers and Matthew Dale.

Mr Muir: Could I just check in firstly that we have Dr Rogers and Mr Dale on-line?

Mr Dale: Mōrena, koutou, Matt Dale here.

Mr Muir: Yes, good morning Mr Dale. And Dr Rogers, yes I can see that you're there on line also. Thank you. And we have Ms Teele thank you. And could the other experts just kindly introduce themselves, please.

Ms Anderson: Sure, I'm Trudy Anderson [inaudible 1:54:39].

Mr Muir: And we have Dr Ussher.

Dr Ussher: That's correct. Ussher, sir.

Mr Muir: Ussher, I'm sorry. Dr Ussher, thank you. And Dr Baber.

Dr Baber: Yes sir.

Mr Muir: Thank you very much. Right, now have the experts had an opportunity to confer in advance and to assist us in identifying the topics that we need to address this morning?

Dr Ussher: We have.

Mr Muir: Good thank you. And is there consensus on that Dr Ussher?

Dr Ussher: There - - -

Mr Muir: Broad consensus.

Dr Ussher: Broad consensus.

Mr Muir: Right, okay. We always can come back to anything at the end of it. I'm going to ask Ms Sweetman if we can just identify now on the whiteboard the topics that you consider we need to address.

Dr Ussher: Certainly. There are six topics that we've identified. So topic 1 is: Present species present and uncertainty; Topic 2 - - -

Mr Muir: Just one moment there, Dr Ussher. Topic 2, yes.

Dr Ussher: Significance of impact. Temporary versus permanent nature of effects. Number 4, is salvage. Number 5 is Overall effects; and number 6, if we have time, is uplift for rehabilitation. We appreciate that a couple of these topics may stray into effects management.

Mr Muir: Yes.

Dr Ussher: However, we'll be guided by yourselves. We have thought to add these, to provide a complete picture for the Panel.

Mr Muir: Yes.

Dr Ussher: However, if you feel that a couple of these topics are best deferred to later in the day, we'll - - -

Mr Muir: We will come back to them. Yes. And Dr Baber?

Dr Baber: Sir, just with respect to 6, uplift for rehabilitation, we have Dr Robyn Simcock on-line - - -

Mr Muir: Oh I see, right.

Dr Baber: - - - who is leading, or the lead expert for the ecological rehabilitation programme.

Mr Muir: Item 6.

Dr Baber: So some questions may need – be best referred to Dr Simcock, in that regard.

Mr Muir: Dr Simcock. Well what I'm going to ask Dr Simcock is just that you interpose yourself, as necessary, in any issue before we get to item 6. Then of course, we will give you front of stage when we get to item 6. All right. Thank you. I think you're all familiar with the format. We're going to start with some brief statements issue by issue, from each of the panel, and then move into questions. From each of the experts then we're going to move into questions from the Panel, then cross-examination, and round back to the Panel. Right, species present and uncertainties in that respect. Dr Ussher do you want to lead off?

TOPIC 1: SPECIES PRESENT AND UNCERTAINTIES

Dr Ussher: Absolutely. Thank you. I'll just make a broad statement to introduce, and that is that we are confident on a number of matters to do with the species present on the site. The first statement is that there are a large number of native lizards that are present, and we're confident that there are three native species of lizard on the site, one gecko and two species of skinks.

Where the uncertainty arises, in terms of the lizard values of the site, is that not all areas of the 610 hectares and the wider 2,000 hectare surrounding area were assessed in detail for these species. So I consider that there was considerable survey effort in terms of persons hours, and methodologies and we've presented that in our reports. However there is still a level of uncertainty for some species.

The Panel may have seen one of the introductory statements in the joint witness statement for lizards, which provides the experts' opinions on the species present on the site. The [inaudible 2:00:08] species that we are very confident are not on the site, and the species that where we agree there is a low risk that they may be present. And those are those species that I'm referring to in terms of level of uncertainty.

Mr Muir: Dr Baber, is this your particular area, or it is Dr Ussher?

Dr Baber: Sir, Dr Ussher will lead this one.

Mr Muir: Lead on this one. Thank you. Well then could I come then to you Ms Teele?

Ms Teele: This is Trudy.

Mr Muir: Very good thank you. Then Ms Anderson.

Ms Anderson: I'm going to lead the lizard [inaudible 2:00:56] Regional Council.

Mr Muir: I see. Very good, thank you.

Ms Anderson: Yeah, so our view on this is that the survey methodology was not enough to confidently exclude the possibility that Nevus Skink, Jewelled Gecko and Lake Skink won't be present, albeit in a reasonably low likelihood of occurrence. We consider that there should've been more survey effort targeting the habitats that

they're likely to occupy. And rather than put time into the pros and cons of the methodology, I would like to propose some possible solutions - - -

Mr Muir: Yes.

Ms Anderson: - - - in order to overcome that gap that would not eliminate, but help with getting the information [over speaking]

Mr Muir: That's most constructive thank you.

Ms Anderson: Yes, so one of those proposals is to undertake an additional trapping effort prior to works being undertaken in habitats that are likely to be possible places for those skinks, in particular. And the other one will be doing EDNA survey using tracking tunnels, which is a relatively new methodology, but would - - -

Mr Muir: Can you explain that to me please?

Ms Anderson: Sure. There was a paper released last year by [inaudible 2:02:18] 2025, and I understand it's been utilised in other projects since. You put tracking tunnels out in places where they might exist. You bait them with things that are attractive to lizards. The idea is that you leave them out for some time. The lizards run backwards and forwards through the tunnels, and that's a way that the EDNA can be collected and then analysed to see the species that are present there. So there's an opportunity to use that method. So just gain a little bit more confidence in terms of the species that might be present at the site.

Mr Muir: Right, thank you very much. Mr Dale?

Mr Dale: I don't have anything of significance to add to what has already been said around the uncertainties. Certainly for around those rarer species with regards to the survey methodology, I support the solutions that Ms Anderson has suggested. And I'll also just add that there's also, I believe, significant uncertainty in the number of lizards involved, you know, within the direct – the DDF. So yes, as well as sort of location and composition, also I think abundance is still in question.

Mr Muir: Thank you. Dr Rogers?

Dr Rogers: I have no additional comment on this topic.

Mr Muir: Thank you very much. Questions from the Panel on this topic?

QUESTIONS FROM THE PANEL:

Mr MacGibbon: Yes, thank you. Perhaps to you, Ms Anderson on this. The applicant has proposed use of the Accidental Discovery Protocol to respond if additional species are found. Do you consider that's not adequate?

Ms Anderson: Yes, I do. I think it is missing some key functions at present. It hasn't got stop work triggers, in that it doesn't have the requirement to properly notify DoC if additional species are found. And I also think it would be appropriate to be clear about the process for species identification if there is a lizard found that is in doubt.

And also what would be done about it, to an extent, in terms of what it would mean for the project.

Mr MacGibbon: But in your mind, if those elements were added to that protocol and the approach, that would be satisfactory?

Ms Anderson: Yes, I think if we had the opportunity to work through that, then it is – yeah we could come to an agreement that would be workable.

Mr MacGibbon: Because I'd suggest perhaps that you could do that additional survey work that you proposed and still not find the risk – the potential for those species to be present, and low numbers would still remain. Would you agree with that?

Ms Anderson: There is the potential, yes.

Mr MacGibbon: Perhaps just to throw that back to you Dr Ussher too, do you have a response to that? Or Dr Baber?

Dr Baber: Yeah, Mr MacGibbon, sorry it's a bit confusing. I authored the Lizard Management Plan that relates to sorry.

Mr MacGibbon: No, that's fine.

Dr Baber: Yeah, long story short, very happy to provide more specificity around the Accidental Discovery Protocol. There's an obvious balance between being too prescriptive and round hole, square peg, depending on how the nature of the incidental discovery that occurs. What I mean by that is, in some instances a stop work across the whole project could very well seem like an overkill, and it might be a more nuanced approach, where its localised stop work in suitable habitat. And in many of those instances there's so many scenarios that could play out. There is a need for, to balance that specificity with some ability to operate or respond in accordance with the nature of the finding.

So short story, is yes we'll work, very keen, and it's appropriate to work harder on providing more certainty around what that discovery protocol looks like, in collaboration with lizard experts.

Mr MacGibbon: Ms Anderson, I guess in response to that, I assume you can collaboratively work together to develop a suitable protocol, would you agree?

Ms Anderson: Yes, I agree.

Mr MacGibbon: Right, thank you.

Mr Muir: Thank you. And I thank all the experts for the cooperation that they are bringing to that issue. Right, cross-examination out of that topic? No. Any counsel on-line? No. Thank you. Topic 2, significance of the impact. Who's leading off? Thank you, Dr Baber.

TOPIC 2: SIGNIFICANCE OF THE IMPACT

Dr Baber: Yes, sir. So in regards to this topic I will start at the end. So what I mean by that is, we have assessed the overall level of effects on lizards as significant. And in terms of each species we have two at risk declining species. And under the Ecological Impact Assessment Guidelines we have assessed the level of residual effects. That is to say the level of effects, after we've considered all measures to reduce the severity of effects. So that is avoidance, minimisation via salvaging, and rehabilitation. After we've considered and applied those measures, we consider there to be a residual effect of high on both the Kawarau Gecko which is at risk, declining, and on the Southern Grass Skink, which is also at risk, declining.

For McCann's which is listed as not threatened, we've assessed it as low, and I'll put a caveat on that. So, and I'm going into a little bit more detail here because this process is relevant and sits across a number of all our assessments really. So, when we do a level of effects assessment, it's basically – it's an interface between two key variables. So one is, for a species, one is the threat status, and that's interplayed with the magnitude of effects on that species. So those are the two key factors that dictate where we end up in terms of our level of residual effects that we assign.

Mr Muir: Magnitude of effects is covering both mortality and loss of habitat?

Dr Baber: Yes, sir. Certainly those things. So it's a function of the aerial extent or the scale of impact, the intensity of impact. So that is ultimately whether it's complete habitat clearance or it's a more less intense minor indirect effect. It might be further away. It is a function of the duration of effect, whether it's temporary or permanent, or somewhere in-between. And it's a function of the frequency. Sometimes, for example, noise, if it's something's happening more periodically it's generally has a higher impact than if it's a less frequent impact.

So a key aspect out of all that is the scale in the proportional, or the proportional effect. So we look at the size of the effect, per se, and then we look at the proportion of that effect relative to availability. And, in this wider landscape, that's where we might have a big effect, but in a proportional sense, based on the availability of the habitat type for a species outside the project footprint is expansive and extensive, it reduces the magnitude of effect.

Conversely, if you're impacting on a high proportion of the habitat that's available, you have a very, end up with a very high magnitude of effect.

So I'm saying that now, because that's ultimately how we do our assessments. Looking at the value of the threat status, and interplaying that with the magnitude of effect using several variables. And the assessment, where we end up with, in terms of level of residual effect, is path that we've considered avoid, minimise, and remedy. And that tells us what the level of residual effect is. That if that level is moderate or higher it precipitates the need for off-setting or compensation measures. That's

ultimately the ecological impact assessment methodology. But we will, I'm sure, revisit that under different umbrellas throughout this process.

So given all that, yeah, we've ended up with level of residual effects on lizards as significant overall, and we've got a level of residual effects of high for the two at risk declining species, and low for the – for the McCann's.

Mr Muir: Yes. Could I ask a very basic question?

Dr Baber: Yes sir.

Mr Muir: In relation to effects, one aspect of effects. Mortality as the mortality of existing population as heavy machinery moves into this area. How smart are lizards?

Dr Baber: Not very, unfortunately.

Mr Muir: They just sit around and wait to be sent to the crusher, do they?

Dr Baber: Yes, they do. Whereas, so that's a good point, whereas birds, apart from nesting birds, you know, they won't stick around, because they've got – they're mobile, they've got an ability to fly. But lizards and invertebrates, as well, it's almost a foregone conclusion, in a habit clearance heavy loss impact, yes sir.

Mr Muir: Thank you, very much. A very basic question. Right, thank you. Now, Dr Ussher you're not addressing this particular issue?

Dr Ussher: I won't at the moment.

Mr Muir: Right, we'll hold you in reserve.

Dr Ussher: Very good.

Mr Muir: Thank you. Shall I go to Ms Anderson?

Ms Anderson: Sure, I'm happy to talk to this one. In terms of the significance assessment, I just want to make the comment that the Impact Assessment Guidelines are just one way of assessing significance. There are other ways, and such as the Significance Criteria in the RBS and DoC has a document that describes the Significance Criteria. And those define any area that is the habitat of an at risk species as being significant. So in those – using those criteria, the site is significant because there is at risk species over much of the site, based on the information that we know at the moment.

The other point that I would make is that none of those Significance Criteria take into account possible microsites, within the site that might have more than one lizard species present. For example, if there's a lizard – if there are microsites that contain all three of the lizard species, for example, then that would, in my mind, add to the significance of that microsite.

And the absence of mapping [inaudible 2:14:52] species in the application, means that we're not able to identify where those sites are in relation to the disturbance footprint or elsewhere.

The other comment I'd like to make in terms of significance, you might see in the JWS there is commentary around the possible impact of up to 30 per cent of the national population for Kawarau Gecko, and there's obviously been quite a lot of discussion about that. Thirty per cent is a lot. But we don't have the information in front of us at the moment to discount that possibility. And I can talk further to where those numbers have come from, if that is what the Panel would like.

Mr Muir: Thank you. Mr Dale?

Mr Dale: Nothing further to add sir.

Mr Muir: Yes, thank you. Dr Rogers?

Dr Rogers: I've nothing to add, sir.

Mr Muir: Yes, thank you. Did you wish to add anything at this point, Dr Ussher?

Dr Ussher: I will, thank you. There are, through the joint witness statement, you'll see that there is quite a heavy discussion around the impact on Kawarau Gecko and the range of the species, and the proportion that this project will comprise. It's the overall species range. So, whereas some of the invited parties contend that up to, I think, 33 or 35 per cent of the range of Kawarau Gecko may be affected. I disagree. I think Dr Baber disagrees as well. We've undertaken a broader analysis of data that's available through DoC's database and publicly available records to try and show that the severity of habitat loss that may be caused by this project is a lot smaller than 33 per cent. It's in the order of one per cent, or less, is my opinion.

And in the joint witness statement, I believe the Panel may have received a supplementary document that provides some analysis.

Mr Muir: Yes.

Dr Ussher: That document hasn't been commented on. It hasn't had the chance to be commented on by invited parties, we realise that. But we've supplied that to reinforce our opinion that the level of effect on Kawarau Gecko will be quite small, on the site, and following successful rehabilitation, the permanent loss of habitat will be extremely small.

Mr Muir: Thank you, Commissioner MacGibbon.

QUESTIONS FROM THE PANEL:

Mr MacGibbon: Yes, look I just yeah would like some discussion about the Kawarau Gecko. There's a huge difference between 30 per cent and less than one per cent, and I'm reading joint witness statement, paragraph 25, where you refer to – sorry Kawarau Gecko being more vulnerable to extinction. The risks of extinction clearly at 30 per cent loss is considerable, at less than one per cent it's not. How do we resolve this? Because as a Panel, we've got to get a better understanding of what reality is there. Do you have, all parties, do you have suggestions as to how you might inform us more effectively?

Ms Anderson: Sure, I can talk to it a little bit. I guess that percentage comes about through two ways. One of which is what is the national extent of the population? And I think that relates to the paper that Dr Ussher has circulated. We haven't had a chance to fully review it yet. But my comment would be that I think – my view is that the national population in that maybe over-estimated, due to the fact that I think he has included habitat in that the Kawarau Gecko don't occupy, particularly in regards to places that above the altitudinal limit of around about 1,200 metres. So, I don't think it's appropriate for those places to be accounted for as possible habitat, when that's not somewhere that those species live.

And I guess the other side of that percentage statement is the actual area which is of Kawarau Gecko habitat that is impacted by the project. And the 32 per cent comes about through the consideration that over 3,000 hectares of the – is impacted by the application. And we have not seen adequate information from the applicant to show that it's going to be less than that. And the rhetoric around where that 3,000 hectares has come from is at the front of the JWS.

Mr Muir: Could you explain that a little bit better for me please, Ms Anderson? So why would there be negative effects on Kawarau Gecko outside the DDF?

Ms Anderson: That 3,000 hectares takes into account the covenant that's been revoked. So the rationale behind it is that - - -

Mr Muir: Thin edge of the wedge?

Ms Anderson: Sorry?

Mr Muir: The thin edge of the wedge, that something more is going to happen at some later time?

Ms Anderson: I don't think – that wasn't the nature of the conversation. The conversation was around at the moment the gecko that live within the covenant have a level of protection, and that protection's being removed. So therefore, that is an effect, regardless of whether it's direct or not.

Mr Muir: No matter what new arrangements are put in place in respect of the Ardgour area, that - - -

Ms Anderson: Yeah, which is why we know that, you know, at least the direct disturbance footprint should be taken into account in the percentage. The clarity that we need is how much of that other -- those other areas are appropriate to be taken into account, when we don't have certainty of how those are going to be managed, at this stage.

Mr Muir: I see. So it goes to the certainty and funding, and all of the associated issues around the wider area?

Ms Anderson: Correct.

Mr Muir: I see, thank you.

Mr MacGibbon: So perhaps Dr Ussher, or Baber, do you either, or both, want to reply, respond to that? And certainly my – the question that I raised at the beginning is this big disparity between 30 per cent and less than one per cent?

Dr Ussher: I think as Ms Anderson has pointed out, there's an interpretation difference between the parties on which – what the areas will be that are – that are impacted. Our contention is that it is the DDF, the 610 hectares, not 3,500 hectares or so. And then also a difference of opinion on whether rehabilitated landscape, so that's 480 hectares out of that 610 hectares post-mining, what that will offer for lizards, in particular, Kawarau Gecko. And our contention is, well my contention is that it's a species that will readily recolonise areas that are provided for it.

The other side of the equation is around where the range estimates for the geckos have come from. And I appreciate the analysis that's been put in front of you is an analysis that's been provided by one or two experts. And you will no doubt weigh that against the opinion of the DoC Lizard Recovery Group, which is an established body that goes through these issues with each species, every few years or so.

The point that I'd make from that is that the Recovery Group has a range of bands that they allocate species to, which is why there's a range band of possible range of 10,000 to 100,000 hectares. So it's a range band that species are allocated to. And the Department's expert has chosen a lower part of that range as 10,000 hectares, and emphasised that in her calculation for the possible impact. And my belief is that that's being excessively precautionary, possibly unrealistically precautionary.

Mr MacGibbon: I'm not sure that provides us with an answer, but in the way of a solution, but it's a – thank you.

Dr Baber: Am I able to just – so I think impact in this sense, in relation to the 30 per cent relates to both negative and positive impacts, in that some of the 30 per cent includes the pest exclusion fences, for example.

Another figure that you would've had bandied around to add to the confusion, was that relates to the categories, the threat classification categories that Dr Ussher was talking about, the 10,000 to 100,000. That was Dr Tocher's assumption that at 10,000 hectares, and at 700 hectares – and a 700 hectare DDF, that equates to seven per cent. And Dr Tocher considered that up to seven per cent was impacted on those numbers. I'm yet to understand where the 700 hectares come from. The DDF is 610. But there'll be more discussion on that in the future. But those, that was where the up to seven per cent came from, was the extreme in the category of 10,000 to 100,000 coupled with the assumption that there was 700 hectares of DDF footprint. And we're contending that the range is in order of magnitude greater than that. More in the 100,000 hectare or thereabouts, which obviously drops from up to seven per cent to up to .7 per cent, if that helps.

Dr Ussher: Possibly a last comment that I could make is the discussion here around impact on Kawarau Geckos is – it's important to separate out mortality, so death of

these geckos, and destruction – compared to destruction of their habitat. So and then the third aspect is rehabilitation and repair of that habitat.

Now the salvage that's been proposed is going to mean that much less than 100 per cent of the geckos within the footprint of this project are going to die. So we're conceding that we can't salvage all of them. But there will be a salvage effort, and those animals will be placed into appropriate habitat. Second aspect of it - - -

Mr Muir: Could I just ask a question there? I'm sorry about my ignorance about the life-cycles and the like. Are lizards highly territorial? Will the introduction of these lizards into new areas result in demarcation disputes between lizards?

Dr Ussher: Possibly if there wasn't additional management added. So by creating extra capacity, if you like.

Mr Muir: Yes, with the rocks, [inaudible 2:26:57] and things of that nature?

Dr Ussher: And by changing grazing regimes. So allow for more natural habitat to develop. So precisely.

Mr Muir: Sorry to interrupt.

Dr Ussher: The other aspect is, is that the larger numbers that the other parties are talking about beyond 610 hectares, there won't be a physical loss of habitat in those areas. That habitat will always be there. These are areas that are not being earth worked. So there will be geckos and there will be gecko habitat within these areas.

So where you're faced with a number of 35 per cent, we're not talking about killing all geckos and removing all habitats within a number of 35 per cent. The percentage is a lot, lot less. [2:27:52 audio/video freezes until 2:28:05] of the project, may be. Thank you.

Dr Baber: Sorry, one correction. I just realised there were a number of areas that were made up – make up that 30 per cent, and I said pest exclusion fences were included in that. I was incorrect.

Mr Muir: Yes, you're incorrect. Take that out?

Dr Baber: Sorry.

Mr Muir: That's all right. I'll just put a line through that.

Ms Anderson: May I respond to Dr Ussher's comments?

Mr Muir: Yes.

Ms Anderson: Yeah, he made the comment that there's going to be no disturbance in some of those areas. I would make the comment that there may be some disturbance in them. That's why we've got them on the list. Certainly in the area to be revoked in the covenant. We are aware that there is disturbance in those places currently. So I think ...

Mr Muir: In the nature of explorations?

Ms Anderson: Yes, correct. So the issue is that we don't have visibility of the size of that disturbance in order to put that in amongst the assessment.

Mr MacGibbon: But to add to that, if that could be defined, that would help?

Ms Anderson: Absolutely.

Mr Muir: Cross-examination of any parties?

CROSS-EXAMINATION BY MS GEPP:

Ms Gepp: Yes sir.

Mr Muir: Yes thank you Ms Gepp.

Ms Gepp: It's a similar question to that which I asked the invertebrate experts earlier. Does blasting have a potential effect on lizards and has that been considered in the assessment?

Dr Baber: That's over to me. I've had a lot of experience with blasting and the potential impacts on herpetofauna, with frogs and lizards, in my role for Hauraki District Council as a reviewer on the Waihi North Project, and there was in-depth discussion and analysis on the likely effects of blasting on herpetofauna. Noting, and as I've corollary or paralleled to that type of activity, we looked at vibration on roads immediately proximate, in lizards and herpetofauna immediately proximal to those roads where heavy trucks were going. Where the blasting profile was a lot higher than the blasting impacts expected at the mine too, depending on proximity to the blasting, of course.

The overall evidence around that was that blasting was not a major concern. Obviously the closer to the source the bigger the concern. But as we move out, there's a diminishing profile in terms of likely impact.

Ms Gepp: So it would be – presumably it would depend on the millimetres per second of vibration where you are on that curve or that mountain of [over speaking]

Dr Baber: Yes, it's frequency and intensity, and there's a number of dynamics.

Ms Gepp: So there is a level at which it does have an impact, and a level at which it probably doesn't, is that fair?

Dr Baber: It is fair, but in a general sense it, in the scheme of things, it's not like a major impact relative to complete habitat clearance - - -

Ms Gepp: Yes.

Dr Baber: - - - or, yes.

Ms Gepp: And has it been considered in the areal extent of impact that you have assessed?

Dr Baber: Yes, so and again this is another recurring theme in terms of how I dealt with indirect effects in my assessment. So, under the ECIG Guidelines, all effects

should be taken into account, and that includes direct habitat loss and it includes indirect effects associated with that habitat. Whether it's general disturbance, dust, light, noise, or it's more ecological edge effects, influx of weeds, indigenous [inaudible 2:32:29] a bunch of things, and my job in doing that assessment is to line item all those potential indirect effects and factor that into my offence assessment, which I did.

In terms of, and again because this theme will recur, I mean I can talk to it now, or I can talk to it from another question. Would you like me to?

Ms Gepp: Well I'd just like you to answer the question, which was - - -

Dr Baber: Sure.

Ms Gepp: - - - which was were those blasting effects factored into your list of indirect effects?

Dr Baber: Yes, as are set out in my assessment of effects. I line item and list all those effects, type of effects that I considered, and they are clear and present in that assessment of effects, that that was under consideration.

Ms Gepp: And at the time that you did that assessment, did you have the – did you have information about the vibrations from blasting specific to this project, such as the 3 March memo that the applicant produced?

Dr Baber: No, I didn't.

Ms Gepp: You didn't have specific - - -

Dr Baber: No I had blasting, I had – I had four or five times a week, and I had my understanding of blasting vibration profiles from a lot of the work that I reviewed. And in many ways I had to look at where the pit was going in terms of my assumptions around indirect effects, so that there were two key assumptions that I needed to make. What the effect might be, noting that there is a lack of evidence and quantitative information on the impact, indirect effect impacts. And that arises for several reasons. One, indirect effects are species specific, it's context specific, it's habitat specific, and I'm – I had to, in terms of the Management Plans, and how all those management plans mitigate those types of effects, until you've got certified management plans you're not exactly sure what the mitigation measures are proposed. I made the assumption that given the amount of scrutiny on this project and the need to mitigate a lot of these effects to a good standard, that that was my basis and benchmark for the indirect effects that I expected after a management protocol had been adhered to. If my assumptions around that are incorrect, then my assessment of indirect effects is incorrect.

Ms Gepp: Thank you.

Dr Ussher: Could I just add a little bit of numerical information for you? Sorry I haven't assessed vibration impacts. That's been Dr Baber. But I'm just drawing some knowledge from another project I was involved with. And that was again

ground dwelling frogs. So a similar sort of situation as this project with grown dwelling species. And on that project, vibration monitors in the Coromandel showed heavy vehicle transport would produce ground vibrations up to 1.5 millimetres per second, and Archey's frogs in that case an at risk species, were found within five metres of those roads, and were seemingly unaffected.

For our survey on this particular site we surveyed drill site, road margins that are traversed by vehicles and drill rigs, and we found geckos and skinks in rubble areas within one or two metres of both side margins. So, I appreciate that's different from blast generated noise, but my understanding of vehicle generated noise was that it could be up around 1 to 1.5 millimetres per second as well.

Ms Gepp: Thank you. That's helpful to have that number, because that's useful to being compared to the vibration may exceed 3 millimetres per second at up to 160 metres from the pits, which is the – which was the number stated in that 3 March memorandum. So that exceeds the vibrations from roads that you're talking about, doesn't it?

Dr Ussher: It does, and there's evidence from this Coromandel project for Waihi North that went into this issue in depth, it showed – it looked at past lines for frogs. But again ground dwelling under refuge objects and found that they were still present in underground mine blasting up to I believe it was up to five or six millimetres per second. It was a study undertaken by DoC back in the 1990s.

Ms Gepp: But that wasn't a lizard study, was it?

Dr Ussher: It wasn't a lizard study, no. It was different environment.

Ms Gepp: Thank you.

Ms Anderson: May I add a comment?

Mr Muir: Yes, of course.

Ms Anderson: Just a comment in regards to the way indirect effects have been assessed in the impact assessment, I remain unclear on that. There has been multiple conversations in the conferencing process about this matter. The 610 hectare area associated with the DDF has sometimes been referred to as a contingency area, and sometimes referred to as a buffer area. In my view, if the 610 hectares is a contingency area, then there has not been a buffer to account for the indirect effects on lizards. So I remain unclear about that.

Mr Muir: Yes, Mr van Mierlo?

CROSS-EXAMINATION BY MR VAN MIERLO:

Mr van Mierlo: Thank you sir. This is probably directed at you Dr Ussher in the first instance, at least, or the other ecologists may wish to comment. You've referred to the distinction between mortality and habitat loss, and indicated that not all lizards would die, the footprint of some would be salvaged. But, in terms of assessing the

impacts of salvage, there's no certain that salvaged lizards will survive. Would you agree with that?

Dr Ussher: There's no certainty. The one study that I've been involved with in North Canterbury, where we've been looking at the survival of translocated lizards, and they are two species that are completely analogous to this project. So one is a ground-dwelling gecko from the common gecko complex. It's a very close relative of the Kawarau Gecko and the Canterbury Grass Skink. So a very close cousin. Those translocations have been monitored extensively with DoC oversight, and have shown that we are still recapturing a small percentage of the released lizards a year and a half after their release. It's an ongoing project.

So based on that, it's the only quantitative study that I know of, I do have confidence that at least some lizards will survive a relocation effort.

Mr van Mierlo: So when you say a small percentage, can you clarify that?

Dr Ussher: I would have to go back to my reports. But it's – we've got issues that we're working through now with DoC and a statistician. It's not necessarily around mortality. It's around detectability, because in those areas the habitat has improved dramatically since stock have been removed and pest control has been introduced. So it's given lizards a lot more options for places to go other than be caught by us. So a small number that we've redetected, about 10 per cent, it's most likely going to be higher than that once we can resolve some of the sampling.

Mr van Mierlo: And there's also issues around potential impacts on the lizards that are present within the relocation sites, aren't there? So there could be adverse effects on those existing populations?

Dr Ussher: So that's an uncertainty and we acknowledge that. There's no detailed studies in New Zealand although that's through no lack of effort by DoC and regional councils and herpetological bodies to set up these studies to look at what the effects of relocation is on habitants. DoC's guidelines for relocation of lizards lay out a process by which risk can be managed in this regard and those aspects of managing risk are that locations in which lizards are relocated to should be enhanced, improved and protected. So enhanced through creating habitat, so that's for example in this project it's rubble pits, rock stacks, changing in regimes to improve grass ward thickness and so forth or by predator control, and for this project we're doing both.

CROSS-EXAMINATION BY MR LECKIE:

Mr Muir: Mr Leckie.

Mr Leckie: Thank you sir. Just a question for Ms Anderson. My questions on the concern you've raised about uncertainty over disturbance outside the direct disturbance footprint, and there's some discussion in the joint witness statement regarding the particular concern of exploration drilling relating to the [inaudible 02:42:09] underground shaft. You'd agree that to alleviate that concern, certainty

could be provided within the conditions around the extent of that disturbance associated with that exploration drilling?

Ms Anderson: Yes, I'd agree.

Mr Leckie: And would an additional certainty be to put controls around rehabilitation requirements with that exploration drilling?

Ms Anderson: Possibly. There is other – we have other comments about rehabilitation [inaudible 2:42:54].

Mr Leckie: Thank you. And with those controls in place, which I appreciate – I'm just putting that to you that they could be in place, and using the number for Mr Baber's paragraph 40 of the joint witness statement of up to three hectares of disturbance from that exploration drilling, when considered in the context of the total new covenant area, would you agree that that three hectare area rehabilitated is likely to be inconsequential in regards to your conclusions in relation to the lizards.

Ms Anderson: Well, the issue that I have is that we don't an assessment of environmental effects in order to make that assessment. I'd need to get all of the information that would ordinarily be in such a document in order to make that conclusion.

Mr Leckie: Thank you Ms Anderson.

Mr Muir: Is there any other cross-examination? I just had a thought that I might have omitted Mr Dale and Dr Rogers from this discussion, have I?

Dr Rogers: Yes, I'd appreciate a comment, Mr Chair.

Mr Muir: Yes, thank you.

Dr Rogers: In assessing sort of the overall significance of the impact, the equation has to be influenced by the feasibility of recreating from de novo lizard habitat within the 483 hectares of the DDF. I note in the joint witness statement – the lizard joint witness statement, paragraphs 42 to 44, that Mr Ussher relies on the recreation of the DDF to state that there'd be only temporary loss of lizard habitat and lizard carrying capacity on the 480-hectare DDF. I contend that that is a highly contentious view. I think a great uncertainty surrounds the feasibility of establishing lizard habitat across the DDF in the form of placement of rock, creation of rock stacks and the re-establishment of vegetation, albeit over 20 per cent of the area of original tussock land and shrub land. So this issue might also be considered – the feasibility of recreating lizard habitat in the next topic, that is the temporary and sort of permanent effects of the mine on lizards, but I've raised it here because it's a significant part of my evidence.

Mr Muir: Yes, indeed. And thank you very much for that Dr Rogers. I had anticipated that this would get greater exposure in our next topic so I'm not going to round back to the other experts on that observation. In no way does that deprecate from your observations. I'll just, if I may, deal with this more particularly under the next topic. Is that alright with you?

Dr Rogers: I concur, thank you.

Mr Muir: Thank you very much. Right, rather than inviting any additional cross-examination on that, we will deal with it in the context of the next topic. Arising out of the cross-examination, are there any additional questions from the Panel? No, right.

Ms Buxeda: Good morning Mr Chairman. Sorry, counsel Kā Rūnaka here. Just jumping in [inaudible 2:46:56] chance for Mr Dale to respond to your question there as well.

Mr Muir: Yes indeed. My apologies Mr Dale.

Ms Buxeda: Thank you very much.

Mr Dale: Thank you Mr Chair. Thank you Nicole. In my view, and this may be dealt with in subsequent topics, in my view one of the biggest issues is that there is insignificant – sorry, insufficient information to be able to assess [inaudible 2:47:26] impacts. As Ms Anderson mentioned, there has been no assessment in environmental effects around exploratory drilling in other small areas as well. And so it's difficult for us to – without that information, difficult for us to make that assessment. And there's a significant lack of information around a lot of the mitigation package that is proposed as well. A lot of uncertainty there, but I appreciate that that will be dealt with in other topics. Thank you.

Mr Muir: Yes, thank you very much Mr Dale. It's utterly inevitable that some of these topics bleed into others and no criticism of the experts that do so. We'll just make sure that by the time we close out our discussion of lizards, we have covered everything we need to. Right, I'm going to move then to the next topic. Overall effects. Would you like to lead Dr Ussher, or is it Dr Baber?

Mr Muir: Thank you very much.

Mr Muir: Well, what we're going to do is deal with salvage and uplift for rehabilitation as a combined topic if we may, and then we'll look at how we're going timewise. Thank you.

TOPICS 4 & 6: SALVAGE AND UPLIFT FOR REHABILITATION

Dr Baber: Thank you sir. So I'll start off with the salvage and then I'll hand over to Dr Ussher for rehabilitation. So first point I'd like to make in respect of salvaging is just circling back to a question from Mr Mierlo about the certainty around salvaging. And that is to say that that uncertainty around salvaging and the lack of evidence that when you pick up a lizard and you put it somewhere else, there is considerable uncertainty around whether they survive or not.

On that basis, and because the proposal was to only salvage 20 per cent – at the current proposal which is to salvage approximately 20 per cent or 102,000 lizards from the site, given both those, we have assumed that the salvaging relocation will

not reduce the severity of effects in any way, shape or form. So we have assumed that it won't reduce the severity of effects (a) because only 20 per cent are proposed for salvage and (b) there's no demonstrable evidence that those lizards will survive. We assume a lot of them will but we don't have the evidence, so in the interests of being conservative, we have assumed that none of them will survive. That's just the first point.

Mr Muir: Why is so much energy then devoted to this issue? Is it anticipated that this will be a balm for the conscience of someone?

Dr Baber: Yes. Good question. Yes. And we know that at least – we know that if we don't do anything, it's a foregone conclusion that none will survive, if we do do something, then at least they've got a chance. But it is above and beyond that from a legal standpoint – there's a requirement under the Wildlife Act in terms of protecting wildlife.

So in terms of salvaging, the thing we need to work through – there is best practice, good practice, salvaging and relocation protocol. Those protocols include a set of principles that dictate or we try to adhere to in any salvaging or relocation programme in the interests of meeting Wildlife Act requirements. In the sense that we've got a large project with a considerable number of lizards in the vicinity of 500,000 to 750,000 depending on who you talk to, we have a bit of an issue in that we're damned if we do and we're damned if we don't.

If we adhere to the salvaging best practice, which is pulling – a concerted effort to pull every single lizard out of the site and away from harm with, depending on the project, the expectation or the drive to demonstrably re-salvage around 80 per cent of the lizards and to determine that by repeat captures until your traps are no longer picking up lizards.

If we adhere to that principle and say we get the tick for that, then we move to the fact that we would have in the order of half a million lizards that we need to put somewhere. And so there's two issues with that. On the relocation side of the principles, we have to put them into a place where we can be confident that (a) they are in a safe place where they're likely to persist and establish in the long term, which what that generally looks like is habitat that's been enhanced, ideally in the form of the provision of additional habitat for them, and also habitat that is free or with reduced predation pressure so they're – so we're not likely to be putting them there and there's a whole bunch of mice and rats waiting for them when they're all discombobulated and they get eaten up. So we've got a bit of a challenge.

And on top of that, in addition to providing refuge and home for 500,000 lizards, we've also got to think about the resident lizards which was raised before about not putting so many lizards in a small area and inducing or intra-specific – inducing competition and stress because you've all got these lizards and they're very territorial and they get a bit stroppy and there's a food resource issue.

So we cannot comply with the salvage – and for a project of this scale we cannot comply with the salvaging principle and at the same time feasibly [inaudible 02:56:37 - coughing] principles which was putting them somewhere safe and making sure we're not affecting resident lizards because we can't do that with half a million lizards. We can't manage, for instance, the main predators at the scale that would be appropriate to spread those half a million lizards across.

So in the interests of trying to find a middle ground, and being uncertain what would land and knowing that no matter what we did we couldn't meet any of those principles or all of those principles, I put forward a starter for 10 which was we'll go for 20 per cent which is 100,000 lizards which to my knowledge is the largest scale effort by lizard that I know. I could be wrong, but if not the largest, it's close to, while balancing up the feasibility or being able to still put them across the 1,263 hectare Ardgour restoration area which 100,000 lizards across an area that large is about 100 lizards per hectare or one lizard by 10 by 10, which I felt comfortable that it wasn't too dense.

But then we're also subject to the constraint that we can't knock with certainty the mice numbers down to a level where we're no longer worried about mice predating on lizards, noting that we've broader pest control of larger predators at that scale, but there could be indirect effects where we're knocking down rats and we're knocking down stoats and in a grassland tussock environment there is a danger that in taking out those larger predators that also predate on mice, the mice numbers could go up. And for a lizard or an invertebrate, it's unclear which is the lesser evil. Lots of mice or a more balanced, broader suite of predators.

So we've got – the key point there is I don't know what to do to satisfy all the principles. I put a starter for 10 out and we haven't had a chance to work through a solution until very recently. We've got a proposed solution that we're all comfortable with but that will require confirmation. But we've thought of what most of us will be happy with, as set out in the joint witness statement.

So that broadly looks like a focus on Kawarau gecko and southern grass skink and putting them into – and anyone can correct me if I've missed a conversation – putting them into pest-exclusion fences where all predators will be eliminated and the remaining challenges that we can only follow that approach – to follow that approach, there's not many lizards that we can put into those areas because they're small and in fact for southern grass skink, there's no areas because our pest-exclusion fences do not provide suitable habitat for that species. So at the moment, with the pest-exclusion fence options we've got totalling 67 hectares, we can only put a relatively small number of Kawarau gecko in those. So we're a little bit stuck at the moment. Anything?

Ms Anderson: I mean I can just add that it's my view that the pest-exclusion fences don't come close to being anywhere near big enough and don't contain the habitat required

for the species that we're talking about. So there's still quite a bit of work to do on what that would look like.

Mr Muir: Fences not big enough, you mean the area is not large enough?

Ms Anderson: Correct.

Mr Muir: You're talking in order of magnitude larger area aren't you?

Ms Anderson: Well, there's a conversation to be had isn't there around what the suitable size is and what the purpose of the fence is in terms of, is it just to accommodate salvaged lizards or is it also to add to some sort of compensation package, etc and you actually need to have all of that information to determine what the appropriate size would be.

Mr Muir: Mr Dale or Dr Rogers?

Dr Rogers: Yes, I have a comment Mr Chair.

Mr Muir: Yes, thank you.

Dr Rogers: I wanted to build upon Mr Baber's contention that he has low confidence that any of the salvaged lizards can be confidently equated with survivorship wherever they're relocated. It's an impossibility. But that raises the issue of a significant conflict with their assessment that McCann's skink is going to have an overall low impact of effects from the mine. I can't see how they can equate the two without, in other words, not being able to confidently predict the success of a relocation with an assessment that McCann's skink is going to have a low overall impact upon it. It's numerically the most important species in the footprint. Are they relying on the self-introduction of the species to the DDF – the 483 hectares. I'll leave it there. There's a profound conflict.

Mr Muir: Is there such a profound conflict Dr Baber?

Dr Baber: No sir, not in my view, there's not. One aspect of the ecological impact assessment guidelines is it doesn't really value species that are not threatened in and of itself. But in terms of where we end up with low, it's a function of them not being threatened and the fact that while we're having a large impact in terms of the number of lizards, the proportional effect is very low because McCann's are widely distributed and where they are found can be found in very high abundances. But I do take the point – there's not no effect and that there are a large number of lizards that will be impacted. And that correlates back to our [inaudible 03:04:03] joint witness statement where we sign up there will be a considerable impact of McCann's skink.

Mr Muir: Mr Dale?

Mr Dale: Thank you Mr Chair. I think first of all I do concur with the view that there is no documented evidence of salvage at this scale and so that introduces significant uncertainty. How that uncertainty has been dealt with by the applicant I think is

appropriate in that they're not banking on the success of that as far as the mitigation framework and effects management.

It's my view that the proposed predator exclusion area is very much too small and just to pick up on some phrasing from earlier, in my view it would be – the increase needed in size would be likely – be closer to an order of magnitude greater than what it is now, without wanting to put a definitive number on that because there needs to be a robust process, both around size and location and coverage of habitat types to make a decision on that. And we haven't – that process has not occurred and we haven't had an opportunity to comment on that.

Furthermore, it is my view that the salvage of over 100,000 lizards is highly significant in scale and to my knowledge unprecedented. And that's going to take a significant amount of time to do. If I could draw on recent experience I've had in nearby areas where you're talking one and a half to three months to salvage 4,000 to 5,000 lizards and I appreciate significant resources could be thrown at it to try and get the numbers up in this case but we are, in my view, talking about multiple seasons, multiple years of lizard salvage required to hit those sort of numbers. And so I think it's going to be important if we're going to bank on this salvage at all, that the successful salvage of these lizards is linked quite strongly to stop-go clauses around mining activities.

Mr Muir: Thank you.

Mr Dale: And that is all I have on that topic, thank you.

Mr Muir: Thank you so much.

Dr Rogers: Mr Chair, I've got another comment please.

Mr Muir: Yes Dr Rogers.

Dr Rogers: Thank you. I contend that there have been no lessons or insights from Macraes mine in lizard salvaging and relocation or the husbandry – that is the husbandry of lizards, the storage and then relocation. There's been no insights from that science experience applied to the rationalisation around mediating impacts upon lizards at this project. There seems to be a complete absence in the applicant's evidence – the applicant's experts' evidence – about some of the grey literature that's reported on attempts for lizard salvaging, husbandry and then relocation at the Macraes mine. Thank you.

Mr Muir: Thank you. I'll just round back to Dr Baber.

Dr Baber: Yes, if I could just comment on that. I am serving as a peer reviewer on that project which is not that far from lodging for fast track, so I can talk to Macraes. And Macraes are undertaking a very comprehensive salvaging and relocation programme and will do so in the future if fast track application is considered and approved in due course. In terms of lessons learned, there's lots of lessons learned but Dr Rogers is correct – we still don't understand whether the salvage and

relocation operation is successful on that project and the key issue is constraints around – when you salvage a lizard and put it into a new area, and you monitor, there's no reliable technique at the moment to distinguish a resident lizards from a relocated lizard, so you don't know if picking up lizards, they're the resident ones that were already there or if they're the relocated ones and so you therefore can't determine if there's been success or failure.

Mr Muir: Because you have ethical concerns around toe clipping?

Dr Baber: Yes, I was just going to say. The only tried and true option which I'm not proud of saying I've done a lot of in America is toe clipping. But that is the best option.

Mr Muir: You can't put a spot of paint on their head or something of that nature?

Dr Baber: They've tried that and it doesn't work so great. But there is a new technique that's come out that looks promising that we would – are keen to use if this project is approved to understand success or otherwise of the project.

Mr Muir: Right. On this topic, questions from the Panel?

QUESTIONS FROM THE PANEL:

Mr MacGibbon: Yes, okay. I notice in the joint witness statement that Dr Tocher has suggested the idea of population monitoring – modelling – to determine what size a pest-exclusion fence may be required to serve as a salvage release location. It appears most of you agreed to that approach. I just wonder whether Ms Anderson and Dr Baber whether you have comments on that?

Ms Anderson: I'd just say that I support that approach. I'm not familiar with the population modelling side of things.

Dr Baber: Is this a trick, Mr MacGibbon. Is my name on there?

Mr MacGibbon: It is.

Dr Baber: Yes, I agree.

Mr MacGibbon: Well, unless someone else is MB.

Dr Ussher: Will I be able to make a comment? Population modelling, I'm not sure how valuable it would be as an outcome compared to evidence on the ground so if you were looking at what the capacity of a fence area might be for lizards, I think there's good evidence from the Mokomoko dryland sanctuary nearby that clearly shows that if you can successfully remove pests, then you can triple your headroom for uplift for some of these lizards. So I think population modelling has its place but evidence on the ground from another project is probably as valuable.

Mr MacGibbon: So do any of you have any comprehension of what size this fenced area may need to be to accommodate 100,000 salvaged animals for example.

Ms Anderson: I'd just make the comment that you could take the hectares that are being impacted and consider that in the context that a fence would create an environment where you could get three times as much lizards based on the hectares of the impact area.

Dr Rogers: Could I make a comment Mr Chair?

Mr Muir: I better keep some constraint this, but you've got me in a good mood.

Dr Rogers: Fences are just one aspect of habitat remediation for lizards but they can result in unpredictable effects excluding herbivores, in other words farm animals, lead to increased impacts upon lizards of pests on the Otago Peninsula, and in particular the green gecko. Sanctuaries really need to exclude not only herbivory but also all pests, in particular mice. And that's a really difficult proposition in dryland [inaudible 03:13:07] vegetation. Thank you

QUESTIONS FROM THE PANEL:

Mr Muir: Thank you very much.

Mr MacGibbon: Am I correct though that the intention for these sanctuaries is to exclude mice?

Dr Baber: Yes.

Ms Sweetman: This is an overarching question and I've heard reference that there haven't been these sorts of salvaging trials or rehab at this level. Have there been projects of this scale with these sorts of impacts on these particular species of lizards that you're familiar with, or is this reasonably novel?

Dr Baber: That's a very good question. On these particular species, there's – Oceana Gold cumulatively and collectively have had a very large impact because they've got a lot of lizards – it's Otago dryland. So that's it in terms of the scale of impact that's relevant.

Ms Anderson: Different gecko.

Dr Baber: But yes, different gecko. It's a Korero gecko as opposed to Kawarau gecko. But the southern grass skink is the same and McCann's are the same. And then there's another project that's had similar level of impacts on the West Coast. So it's not - - -

Mr Muir: What project is that?

Dr Baber: That would be Stockton Mine.

Mr Muir: Stockton Mine.

Dr Baber: Yes sir.

Ms Sweetman: How about salvage tents – this hasn't been?

Dr Baber: At this scale, not to my knowledge. Does anyone - - -

Ms Anderson: [Inaudible 03:14:55].

Dr Baber: Yes, I think this is currently proposed. This is the 102,000 [inaudible 03:15:01] currently in conditions is, I think that's the largest.

Dr Ussher: I'm not aware of anything that's larger. I mean a conversion of all the lowland areas adjacent to the site didn't do any lizard salvage or relocation. They were several decades ago.

Ms Sweetman: When did those occur Dr Ussher?

Dr Ussher: I beg your pardon?

Ms Sweetman: When did those occur though?

Dr Ussher: Post 2000 so a number of years ago. I'd just make the point that the techniques – so we do several dozen lizard salvages a year under DoC permits and so forth across the country and the methods that we use for salvage are – the toolbox is pretty small. It's similar methods that are used so for this project, it's a scaling up of those methods and as one of the other experts has mentioned, it's a scaling up in terms of person hours and then how that interacts with a development schedule and the ability to do this within a season or two of work. But the methods are the same. But I'm not aware of any project of this scale that has proposed to move this number of lizards to a new location.

Mr MacGibbon: Just for clarification, so standard salvage methodology for lizards at the moment is literally to release them into existing habitat with existing lizards and the assumption that some or none may survive. That's correct, isn't it under normal protocols?

Dr Baber: Yes, that's standard operating procedure on the smaller projects.

Ms Anderson: It's not quite that simple. You need to be able to prove that there is a gap in the habitat for them by creating habitat or controlling predators including mice to make a gap for them to fill.

Mr Muir: Commissioner Barry.

Mr Barry: Thank you. Two questions if I may. What is the expected cost of this salvage operation of this scale?

Mr Muir: Are you directing the question to any particular expert?

Mr Barry: I presume they all have some idea of that. We'll start with Mr Baber, Dr Baber.

Dr Ussher: I assume that I can't name numbers but I'm very aware of what's happened at Macraes mine so the salvage of 4,500 to 5,000 lizards over I think it was 11 hectares, the amount of effort that was required, I believe that DoC conceded that the – that Macraes would be able to meet the salvage threshold so allowed an out clause at the end of it because it was an exceeding amount of time. But based on those, you

would be looking at tens of millions of dollars of effort to salvage the lizards from this site and relocate them.

Mr Muir: Tens of millions of dollars?

Dr Ussher: Definitely tens of millions of dollars. And that doesn't include any enhancement work at the release site or post-monitoring. That's purely the salvage and release.

Dr Baber: Just to elaborate on that, the principle of the proposed solution that – where we're focused on a smaller number of geckos, focused on the at-risk declining ones and focused on releasing them to pest-exclusion fences, is an outcome-focused one where rather than salvaging at that scale where there's no guarantee of success, it seems smarter and better to focus on those more threatened species at lower numbers where there's a higher likelihood of success.

Mr Barry: Kawarau gecko?

Dr Baber: And the southern grass, yes sir.

Mr Barry: Just a follow up question. What do we know about diversity and density of population of lizards in the immediately surrounding areas of the land – terrain – and would they be likely to naturally repopulate the mine area after the mine is closed?

Dr Ussher: I can comment on – so for the lizard survey work we did survey a much broader area than just the mine footprint and our report contains information on the numbers that we found of each species of relative abundance. It's – so for some of those species the mine footprint is similar in terms of densities and abundance compared to the surrounding landscape. For others such as Kawarau gecko, the numbers within the mine footprint are slightly less and that's mainly a function because the surrounding landscape especially on other parts of Bendigo Station outside the mine area have got a far greater density of rock tor habitat. So within the mine footprint, there are relatively few rock stacks. There's still rock littered over the ground so it's there and abouts around about the same but for at least one of the species the mine area is slightly poorer habitat.

Mr Barry: And for the diversity though, the at-risk lizards, do you know anything about that?

Dr Ussher: It's the same.

Mr Barry: Thank you. And the follow-up question was would they naturally repopulate?

Dr Ussher: My contention is yes but that's a very large topic which I believe we're maybe about to get into which is around what happens with that 480 hectares of rehabilitated surface. My experience from other projects is that yes, they will naturally recolonise but it's been a large area of debate amongst the – within the conferencing.

Ms Anderson: Would you like me to comment?

Mr Barry: Please.

Ms Anderson: My observation would be that there's reasonable confidence that McCann's skinks will repopulate. Depending on the habitat will depend on whether the levels are going to be the same, similar, more, less than what is there now. There's little evidence to demonstrate that southern grass skink and Kawarau gecko occupy areas such as that with as much confidence. We have very low confidence that those species would recolonise the footprint.

Mr Muir: The DDF.

Ms Anderson: Correct.

Mr Dale: And if I may expand on that slightly Mr Chair?

Mr Muir: No, I'm sorry, I've just got to – I'm very conscious of the time and I haven't yet invited counsel to cross-examine. So we'll just come back to you at the end Dr Rogers [sic – it was Mr Dale who asked the question] if we can. It's now quarter to 12. Can I just move to cross-examination. We've concluded the Panel questions? And then Dr Rogers we'll come back to you at the end if I may. Is there any cross-examination on this topic? No.

CROSS EXAMINATION BY MS VELLA:

Ms Vella: I just have a very quick question or a couple. Dr Baber, just coming back to the comments that you made at the beginning around the uncertainty around the success of salvaging, etc and the need to essentially – the fact that you have not assumed that salvaging will reduce the severity of the effects in terms of the guidelines and the application of those. I just wanted to ask a question around the application of the guidelines. If you were – if you were taking into account the mitigation effectively of when you're assessing effects, at what stage in the guidelines process do you do that? Do you do that when you're assessing the magnitude of effects or does that come later?

Dr Baber: Yes, that's a very good question. So in the guidelines, it's important to assess the magnitude of effects - - -

Ms Vella: Sorry, we can't see each other.

Dr Baber: Yeah, sorry, it's important to assess the magnitude of effects after efforts to reduce the severity of effects have been considered so the magnitude of effects assessment is a magnitude of residual effects or effects remaining after efforts to avoid, minimise or rehabilitate effects have been taken into account. And why that's important is for two reasons. One, it sets up whether or not if the residual effects are moderate or higher, it induces or sets up the need to undertake offsetting or compensation. And another reason – so it's part of the effects management hierarchy of compensation principles to understand what your residual effects are so you know

what, where, and what instance, and for what values you need to undertake offset and compensation. And the second element why that's a key focus is because policy drives gateway 104 are for us to understand what the residual effects are. So another – there's – in brief, there's the ECIAG guidelines are 184-page document or thereabouts and there's a – it's a guideline and a framework to follow to provide some transparency and process to an effects assessment. It specifically states in there you don't have to do every single thing that's stated in there because a lot of the assessments can be case by case. So there are some instances where I've followed those guidelines to a tee and where I haven't. And I can discuss that – what those are now or at another point.

Ms Vella: Thank you. And when you say in this particular instance you have not assumed that the salvaging and relocation would be successful, that you have not assumed that that would reduce the severity of effects, you're also really saying that the Panel can't make that assumption. The Panel cannot assume that any of these lizards will in fact survive, is that what you're saying too?

Dr Baber: That's what I'm saying, yes. Actually, can I just correct that. It's not up to me to assert whether the Panel can or cannot do something, but technically I'm letting the Panel know that I haven't. Thank you.

Mr Muir: That's understood, thank you. Any other cross-examination? No. So I'm just going to round back to you Dr Rogers.

Dr Rogers: Can I just correct you Mr Chair, it was Mr Dale speaking.

Mr Muir: It was Mr Dale, I'm sorry. I'm sorry. My apologies about that. Mr Dale.

Mr Dale: Thank you Mr Chair. I just wanted to touch on the topic before around whether or not southern grass skink would – could effectively be uplifted back into the – or recolonise the mine area following rehabilitation. It is something that the experts didn't really touch on but whether or not there is a possibility to deliberately create southern grass skink habitat within that area.

Mr Muir: I just missed a word Mr Dale. You said "deliberately something" in that area?

Mr Dale: Deliberately create southern grass skink habitat. The habitat requirements are reasonably well known. I couldn't comment now on the likely success of that. But it is certainly something that could be investigated further as we move forward into management plans, etc.

Mr Muir: Thank you, that's a very helpful observation, thank you. Right, now we've got relatively limited time now. We're running a little over. Dr Baber and Dr Ussher, how – if we were to close out this discussion in 10 minutes because we do actually need a comfort stop some of us. How would we best use the 10 minutes that is available, given the fact that we are moving into effects management of course – an extended session this afternoon. So would that – could issues in relation to

rehabilitation that have not yet been traversed be grouped into that discussion this afternoon? [No audible answer.] Right, so really sort of floating holistically over the top of all of this – the overall effects, who would like to address the Panel on that?

Ms Anderson: You can go first.

Dr Baber: So it is a little bit redundant with some of the other ones, but I just really reiterate – at the moment, we've got significant adverse effects on lizards. We've got a potential solution and agreed way forward to – I'm not going to say end up with a net gain or net positive outcome for lizards but certainly get a long way towards that, that we don't currently have and that's where we're at in terms of level of effects for lizards.

Mr Muir: Is there a closing out comment there Ms Anderson?

Ms Anderson: Yeah, sure. I guess my closing comment would be that we're not in disagreement that the effects on lizards are significant. I think where we are in disagreement is what the level of that loss is going to be, given that we have disagreement about the effectiveness of the rehabilitation and the certainty of that, which makes it difficult to determine how close we are to a net gain. My view is that we're some way off that.

Dr Ussher: Could I just add that we're – I'm in agreement with Ms Anderson on those points as well. There are lots of good things proposed. Some are uncertain but at the end of the day there will still be significant residual effects on at least two of the species.

Mr Muir: Mr Dale, a closing out comment?

Mr Dale: Yes, I'd just concur with the statements of the previous experts. It's my view that residual effects would be high. The degree to which that gap can be narrowed will depend on the effects management which we can discuss later in the day and I don't need to expand on further today at this point. Thank you.

Mr Muir: Thank you. Dr Rogers?

Dr Rogers: Yes, I concur with the previous comments – the summary comments. But I wanted to add that I think the equation around overall effects has got a great degree of uncertainty a la the restoration or creating – the feasibility of creating lizard habitat on the DDF. I think there's great uncertainty around that. It's leaving a big unknown in the equations that we develop for overall effects.

Mr Muir: Thank you. Here's an opportunity for the Panel really at a – at quite a high level just for closing out comment. Is there anything further Commissioner MacGibbon?

Mr MacGibbon: No.

Mr Muir: Any other questions from the Panel? And is there any cross-examination?

CROSS EXAMINATION BY MS GEPP:

Ms Gepp: Sir, I know we all need a comfort stop but I just have that question about a covenant again that we haven't heard anything about the covenant, this is the existing conservation covenant. Have you – have each of you considered criteria for assessment of an application for revocation of the covenant?

Dr Ussher: No.

Dr Baber: No.

Ms Anderson: No.

Ms Gepp: Mr Dale?

Mr Dale: No.

Ms Gepp: No, okay. So one of them is whether the amendment or revocation will compromise values of regional, national or international significance. Do you have a view on whether the revocation – or do you have the information to enable you to say whether the revocation will have that – will compromise values of regional, national or international significance?

Dr Ussher: I can't comment on that because I don't know what the revocation is going to mean in the future.

Dr Baber: We've got a broad understanding of the values there but we don't have a cookie cut assessment confined and focused on that area because it wasn't – our core focus was the DDF but in undertaking less intensive quantitative surveys in that ecological study area within which part of the covenant occurs, we've got some information. In terms of directly assessing that, David Norton was asked to – I can't remember the scope of the assessment but there was – there should be something from David Norton in that regard.

Ms Gepp: As lizard experts, did you feed into David Norton's evidence, RFI response on that?

Dr Ussher: No we didn't.

Dr Baber: No.

Ms Gepp: Right, thank you. Those are my questions.

CROSS EXAMINATION BY MR RANDAL:

Mr Randal: Sir, thank you. And we can park this to the extent necessary and I come back to it. But I just wanted to frame a question – it's not all strictly about effects management – for Dr Baber and Dr Ussher. In the lizard joint witness statement at paragraph 53, there's an offer there to update a summary effects table in respect of lizards. I think this is the equivalent of the table in the AEE report, 8.4, and then, Dr Baber, in your section 53 response to comments evidence, I think there's a further update there. I'm just trying to get clear on what you intend to – what's the new

information or the outstanding steps that will be factored into that update of the table, in terms of a snapshot of what is missing or what's been picked up along the way since April when your evidence was prepared, Dr Baber. Reading the joint witness statement, I'm trying to piece it together but I think there's something there about the conservation covenant revocation area and drilling there. There might be something about more defined habitat mapping for the different lizard species perhaps.

Dr Baber: Yeah, so I think signing up to that joint witness statement was done at 2.31 pm and what I recall from that discussion was that other parties were keen to see a more definitive description of how each step along the effects management hierarchy contributed to the point that we get to. So we start off before any efforts to avoid or minimise or rehabilitate and we're at a certain point. Then we look at salvage relocation and where we get to after that. Do we get five per cent towards the journey, towards no net loss, or two per cent. It's zero because we haven't counted salvage relocation, and how far along the journey we get from our rehabilitation and the expectations around that. And in terms of – and then as part of that story I think there was also, as you pointed out, a need to further delineate as we discussed the maps and the distribution and the hotspot areas or the best habitats within the DDF. But do – can I – am I allowed to invite – if I've got that wrong - - -

Mr Randal: But you'll understand, it's sort of a process question, a bit like what Mr MacGibbon was asking before. How is the Panel going to crunch this? What happens next. I understand the management plans are being updated and conditions and things. Where does all this work slot into that and your updated effects rating table?

Dr Ussher: Are you referring to paragraphs 53 and 54?

Mr Randal: Yes.

Dr Ussher: So it's not about an update to the rating table. It's about dissecting the overall net loss position that has come out of the offset models. So the request from the invited parties was to say there is a number that we have provided that says this is the amount of net loss for these lizards that is going to occur. The invited parties have said could you please now separate that number out and to look at the contribution from the TSF rehab, the contribution from the sanctuaries and the contribution of the pest management areas. And that's what we've undertaken. So it's not new information. It's using the information that is in the offset summary technical report which is appended to Dr Baber's assessment of ecological effects and drawing out those numbers into a summary table so that it's more clearly identified for the invited parties to understand the contributions.

Mr MacGibbon: Have you done that Dr Ussher, or not yet?

Dr Ussher: We haven't done that yet, no.

Mr Muir: What's the anticipated time frame for that?

Dr Ussher: I guess when we are directed we will provide that. Up until two days ago, the joint witness statement was unsigned so no other parties apart from the experts have been aware of this statement, including our client.

Mr Muir: Right.

Dr Ussher: So in terms of delivery, it can – it's a small amount of remodelling work over a day or two and it can be delivered quite quickly if the Panel request that information.

Mr Muir: Mr Leckie, from the applicant's perspective, is there any issue with provision of that material?

Mr Leckie: I don't have instructions either sir. I can indicatively signal, subject to getting those, it doesn't sound like something that would take a long period of time and I – so if I could confirm shortly. But I don't see it being an issue and it sounds like something - - -

Mr Muir: Just take a note and before we close out the day, if we could have a steer on that, that would be appreciated. Thank you very much. That concludes the session on lizards. I want to thank any of the experts that we don't see later in the day – I know we'll be seeing many of you – for your very professional presentation in respect of that topic and we're going to take a break now until quarter past 12 when we will resume with avifauna.

Hearing adjourned at [time]
Hearing resumed at [time]

AVIFAUNA:

Mr Muir: Yes, Avifauna, and welcome back, Dr Baber and Ms Teele. Thank you. And we're now joined by Mr Lurling, is that correct, and Mr Colbourne remotely. Good afternoon Mr Colbourne.

Mr Colbourne: Good afternoon.

Mr Muir: Right, thank you. Right, the usual process. We assume that the experts have conferred and can identify for us an agenda for this aspect of the hearing, up to four or five points. Do we have any spokesperson in that respect, and then we can, if there are any additional issues that don't have overall buy in, we'll consider those at the end. Dr Baber?

Dr Baber: Sir, I'll pass over to Mr Lurling.

Mr Muir: Right, Mr Lurling. Very good. Thank you Mr Lurling.

Mr Lurling: Okay, we've consolidated into four topics which are:

Mr Muir: Could I just ask especially from our stenographers, who are obviously off-site, to try and get as close to the microphone as possible and just for the benefit of the record we're introducing now Mr Lurling.

Mr Lurling: Thank you. Okay. Our proposed topics are: Adequacy of avifauna surveys; then Indirect effects;

Mr Muir: Just hang on a moment please?

Mr Lurling: Typically lighting and ecotoxicology, and their level of [inaudible 58:10]. And then, so number 3, Adequacy of the compensation package, including management plans and monitoring. Number 4, Overall net outcome for avifauna.

Mr Muir: Very good.

Mr Lurling: So a number of these topics do stray into - - -

Mr Muir: Can we just change the order of that slightly, and take topic number 3 as our final topic? If we were to run out of time it, of course, will inform effects management this afternoon. Is that acceptable to you? Right okay. Let's focus then first on the adequacy of the surveys. Would you like to lead off please Mr Lurling?

TOPIC 1: ADEQUACY OF AVIFAUNA SURVEYS

Mr Lurling: Okay. The principle disagreement regarding survey adequacy relates to whether additional survey effort was required to characterise the values and potential effects, particularly in regards to the use of automatic recording devices. I consider the survey programme was adequate and fit for purpose and sufficient to characterise the values and potential effects.

We undertook significant survey effort across multiple seasons and habitat types, including comprehensive terrestrial bird surveys and targeted surveys of wetland and associated birds, and acknowledged that while additional methods, such as ARDs, or automatic recording devices, and nocturnal surveys may have increased confidence regarding occasional presence of cryptic species, or nocturnal over flights, I do not consider them necessary to identify the [inaudible 4:00:20] ecological values, or assess their likely effects.

Mr Muir: And why, briefly why?

Mr Lurling: Basically because I acknowledge there may be potential intermittent presence of these species and that cannot be ruled out, but due to lack of suitable habitat, limited food sources, the resident – the likelihood of these species being resident is extremely low, I'd say now.

Mr Muir: Right.

Mr Lurling: And the overall level of effect would not be materially affected due to the – if there's any potential use, it would be intermittent.

Mr Muir: Isn't there always the problem if you don't know what you don't know, and you don't know that it is intermittent until you've established that it is?

Mr Lurling: Granted. But we do know that during surveys at key times of year for surveying for these species, they were not present, and targeted surveys in the primary habitats, and at critical times of year.

Mr Muir: Dr Baber, I take it you're not contributing directly on this at this point, is that right?

Dr Baber: Not on this point, sir.

Mr Muir: Thank you. Ms Teele?

Ms Teele: Yeah. Thank you. When you're dealing with cryptic wetland species an approach that is generally used is to use ARDs or automatic recording devices, because these species are cryptic and hard to find. So, I would consider that would be a – I consider the survey is adequate except for the lack of ARD devices, given the presence of wetlands, and the potential presence of those wetland cryptic bird species.

I appreciate that the wetlands are considered to be degraded. However, a lot of our wetlands are degraded now, and could well be used for foraging, if not breeding. And we have sightings of some of these species in degraded wetlands where you wouldn't necessarily find them within neighbouring ecological districts or regions.

I can take that through into the – I will, but stop me if I stray into effects management. The – I appreciate the likelihood might not be high. But they are present. But you reduce the certainty of that, the probability that they're not using the audio recording devices, and that coupled with not then including them in the AEE in any form, further increases that uncertainty. And given these are species of very high, or high ecological value, particularly for very high, it only takes a low to moderate magnitude of effect to then have a moderate level of effect.

So I think when you take that all the way through, there is an effect there that may not have been taken into account. Yeah.

Mr Muir: Thank you. Mr Colbourne:

Mr Colbourne: Good afternoon. I was quite happy within the authority used, particularly around the five minute bird counts surveys for waterfowl. However, I do agree that nocturnal species weren't taken into account, such as morepork and perhaps little owl. And perhaps some of those things like crakes. I didn't think the habitat was that great to harbour crakes. But you never know unless you look. But the probability would be pretty low. But there is a possibility.

I [inaudible 4:05:25] survey outside the area just as a comparison, but given the commonness of [inaudible 4:05:42] of the distribution of many of the species, they're quite common throughout Otago. They did identify three species that were of interest, falcon, pipits and a black shag, and that's to do with the threatened classification system. But these rank higher than perhaps things like blackbirds or – not blackbirds but rather silvereyes and perhaps other more common species.

Mr Muir: We've just lost Mr Colbourne. Is he there?

Mr Colbourne: Sorry, it cut out. I'm reasonably happy with the methodology.

Mr Muir: Right. Thank you.

QUESTIONS FROM THE PANEL:

Mr Muir: Thank you, questions from the Panel in relation to methodology?

Mr MacGibbon: Yes, I just have one for Ms Teele. Of the wetland species that could have been there, that weren't obviously detected because ARDs weren't used, what would you suggest could – could – may be present?

Ms Teele: Fernbird – sorry fernbird would be probably at the top of my list if I was to prioritise them, followed by the crakes and to a lesser extent bittern.

Mr MacGibbon: And are any of those species present within the wider region?

Ms Teele: Within the wider geographical area, so neighbouring ecological districts?

Mr MacGibbon: Mm-hm.

Ms Teele: Yes.

Mr MacGibbon: Okay. Which ones are bittern present, for example?

Ms Teele: Marsh crake, fernbird and bittern. Not within the ecological district we're talking about, but in the surrounding landscape outside of the ecological district. Not to be confused with the surrounding landscape referred to in the application.

Mr Muir: So could you just delineate that for me?

Ms Teele: Yes, with the locations?

Mr Muir: Yes please?

Ms Teele: So there was fernbirds in the wetlands in the Matukituki Valley which is near Wanaka.

Mr Muir: Yes.

Ms Teele: Crake in the Lake Hayes, which is towards Queenstown.

Mr Muir: Yes.

Ms Teele: But also just on the other side of the Dunstan Mountain Range. And bittern to the north of the Dunstan Range, in the Maniototo area.

Mr Muir: Right.

Ms Teele: These are - - -

Mr Muir: Quite a considerable distance from the subject site?

Ms Teele: Yes. Birds can fly though, so it's less of a problem. But no but I – but to be fair yeah not all New Zealand birds, fair point – fair point. These ones can, and bittern are known to have very wide ranging territories. And fernbird and crake and

bittern are popping up in our region down there in more and more places where we – you would, at first instant think – first instance think these are degraded wetlands, the chances are slim. But bittern are actually quite happy. Not for breeding. I'm purely talking foraging here. They're quite happy in some pretty degraded places, culverts, in some cases, which is for foraging not for breeding. I make that distinction.

Mr Muir: Yes.

Ms Teele: And the observation, the fernbird observation in the Matuki was – isn't actually published. So I'd just like to acknowledge that. It was a colleague of mine who saw that. The other records that I'm referring to are available on iNaturalist and eBird.

Mr Muir: Thank you. Any cross-examination on the subject of the adequacy of the surveys? No, thank you. We'll move on then to the indirect effects. The subjects of lighting and ecotoxicity. Are you going to address it, Dr Baber?

TOPIC 2: INDIRECT EFFECTS, TYPICALLY LIGHTING AND ECOTOXICITY

Dr Baber: Yes sir. I'll introduce that. So, this is a common theme, so I will provide a little overview first and then get into a bit more detail.

In terms of the magnitude of effects on birds, I was looking at the assumed complete loss of the 610 hectares of the direct disturbance footprint and the associate – and the indirect effects associated with that. That was the key driver to how I assessed the magnitude of effects.

What I also relied on, in the overall assessment, was the likelihood that the adverse effects within the DDF, so I assumed total loss, but I also assumed there was likely to be some contingency in there because not every square inch of that 610 hectares of the direct disturbed footprint would be lost. And that's for several reasons.

So firstly, the actual footprint as it stands now, within that 610 hectares is 483 hectares, and there's a zero to a hundred metre buffer around different types of project activities, ranging from zero to a hundred metres around the pits.

Secondly, when we assessed the habitat, we cookie cut out any roads or existing disturbance and assumed they were habitat, as opposed to not habitat, and that amounted to quite a few hectares.

Thirdly, we assumed that the Come in Time pit was going to be lost, but the conditions in there, that's a very high bar that it needs to achieve for the Come in Time pit to actually be lost, based on the Spring annual criteria around that Come in Time pit.

On the other side of the ledger, there working with the project team, there were several reasons why we assumed there would be some encroachment into the area between the 483 hectare footprint and the rest of the 610 hectares. But on balance, it

was likely to be on the smaller side than the greater side. And that was for several reasons. So, firstly earthworks is expensive, so you don't want to dig up a whole lot of earth when you don't need to. Secondly, there's a bond that makes it quite challenging and expensive to do more earthworks and leave more earth exposed than you need. And thirdly, rehabilitation is also expensive. So if you don't dig stuff up, you don't have to rehabilitate. Rehabilitate per hectare is a very expensive business engineered landforms, rock stacks, et cetera.

So I relied on the assumption that not every single square inch of that 610 hectares would be lost and that provided some contingency around my magnitude of effects assessment.

When that comes to the type of effects that I considered, again I mentioned that I assumed that for the relevant management plans that related to potential indirect effects, so that was the dust management plan, the lighting management plan, the noise, essentially those ones, they were – I made the assumption they'd end up being good practise given the scrutiny and the fact that it does require certification and, should use standard techniques. That was the assumption that I worked on around the type, quantum of mitigation to reduce the severity of indirect effects.

And then I looked at the types of effects on birds, and we know that lighting is a potential effect. But I looked at what that – considered what that might look like, and above and beyond, and extending beyond the 610 hectares and I considered there to be an effect, but that that effect would diminish quite rapidly the further away from the light. And the reason for that, the main reason for that, is birds, roosting birds at night, or so non-nocturnal birds at the least, they tend to roost inside in areas of shelter. Shelter from wind, shelter from rain, and so they're usually in vegetation, and therefore there's – they don't, in that environment, there's definitely a reduction of line of sight, or reduction in the amount of light that they are subject to.

Secondly, a lot of the braided river birds, which is a – there's a – there's a wetland area about 8.5 clicks – sorry 8.5 kilometres from the site. Most of them are on the ground. So on balance, there will be shelter belts, there'll be other aspects that generally protect them from light. So if I'm wrong on that, then I've underplayed the effects. If I'm right on that, based on my professional judgement, then I'm comfortable and I assume on balance that I'm generally more right than wrong on that.

Mr Muir: One would think so.

Dr Baber: I hope so. So that's at least that's the logic for how I incorporated indirect effects and my general perception that it's the key impacts, habitat clearance, that are a lion's share of the impacts and indirect effects, relatively speaking, are smaller. Obviously that doesn't apply to birds that potentially could fly over. But again under normal practice it's directional downward lighting that's 3,000K, which is a less intense lighting and less likely to bounce off.

So that was my overall logic, and if I've erred in my assumptions, then I've underplayed effects, but I am comfortable in that assessment and where I landed.

Mr Muir: What about ecotoxicity?

Dr Baber: Yes, good question. So, I'm glad you mentioned that because that's an assumption that – I held the assumption that the pit lakes would have some toxicity, but that would be managed. From recent information that we've just received, it seems evident that the level of toxicity in the pit lakes exceed human health and livestock requirements. So, if that exceedance is at a level that has lethal, or some lethal effects on birds, then my assumption doesn't hold and indirect effects are greater.

If, by the time the management plan is certified, the water is treated and that reduces, significantly reduces the likelihood of lethal, or sublethal effects, then I'm back to being on point with my current assumption, or my, sorry not my current assumption, my assumption at the time I wrote the assessment of effects, that ecotoxicity would be a negligible to no effect situation for the birds.

So, for my assumption to hold around that, we would need to find a way to treat the water, to provide confidence or assurance that there are not ecotoxic effects on birds. And I think that's the ball's up in the air, and I don't know what the answer is to that.

Mr Muir: What about the ecotoxicity of the, at least, in the operational phase of the mine, the tailings containment facility?

Dr Baber: Again, I've relied on engineers and those involved to – that have given me assurance that that is not an issue and/or can be managed. If relying on that proves to be incorrect, then my assumptions on effects are incorrect.

Mr Muir: Thank you. Ms Teele.

Ms Teele: I'll start with ecotoxicity, just because that's where you've finished. So my brain's in that space. I'm in the same position as Dr Baber, in that the information has only sort of just been coalesced and we've detailed it in the joint witness statement from the effects management whereby the levels that have been modelled for contaminants in the water bodies that will be within the DDF, so the pit lakes, the TSF, decant pond and other water bodies appear to be higher than the Australia New Zealand Draft Guidelines for livestock, which include poultry. However, you'll notice in the joint witness statement, within my area of expertise, those factors indicate further investigation is needed to bring in other experts, specifically in ecotoxicity.

So just taking a look at the arsenic levels in some of those water bodies, and the Australia New Zealand Draft Water Guidelines for Livestock, including poultry, there appear to be exceedances above that. But the detail as to what the lethal or sublethal effects may or may not be, requires greater expert input to further that. And I believe that's what you'll find in our joint witness statement from yesterday.

I think, in particular, it's the avifauna experts and the hydrologists, water quality experts, as well as very specifically ecotoxicity, because different birds, different weights, bioaccumulation for particularly the New Zealand falcon/kārearea which is at the site, they eat lots of passerines . They'll probably be the ones that bioaccumulate if this is a risk. But I think we're all - - -

Mr Muir: Because they're higher up the food chain?

Ms Teele: Yes. Yeah, yeah, they're at the top in our view, yes. It's a potential issue from my perspective that has not been included in the impact assessment to this point.

Mr Muir: And is there an acknowledgment then, on the part of all of the experts, that there is more work to be done here? That of course, includes you Mr Colbourne?

Mr Colbourne: That's right. There's all this uncertainty now that are the levels safe or not safe, and we've talked about the bioaccumulation, but also ducks could land on there, start eating some of the vegetation, or some of the – and if that gets into their bodies, then it could actually get into the human chain, given duck hunters eat the ducks. So it might just be a storm in a teacup, but if there were these uncertainties and the levels of cyanide and arsenic were unacceptable, then there's a real health issue.

But that's to the humans, but also as was mentioned, going further up the food chain, it could be invertebrates such as mosquito larvae getting eaten by small beetles, getting eaten by swallows gleaning over the pond, just eating those invertebrates and then getting eaten by falcon, so it's all going up the food chain. So we really want to be certain that water quality is well within the guidelines of safety.

Mr Muir: Could someone please tell me what is required to run these issues to ground, and what time is required to do so?

Mr Colbourne: It might be quite difficult because there's a timeline of the first year versus the 10th year, how much mining minerals are being put into the pits, and even over 35 years, 50 years, is there seepage getting into it? So we could at least start by having water quality tests monitored very closely and maybe some – and just see what is happening. But, certainly we need stringent monitoring in place.

Mr Muir: Well I don't like my prospects of being here if I adjourn it for 50 years. There's a slightly smaller timeframe on this.

Ms Teele: May I speak?

Mr Muir: Yes.

Ms Teele: So part of the uncertainty is I've compared to guidelines that are for livestock and those guideline values, for clarity, assume primary water source. And that – so there are a lot of factors still to play into this. I've used the guidelines that I am aware of. There could be – we need to talk to someone who specialises in wildlife ecotoxicity. They may be able to provide – shed much more light on this, and actually have models that account for some of these unknown factors that we're talking about.

Mr Muir: And the only reason you really engaged with the guidelines for – the guidelines that you did, was because they included poultry?

Ms Teele: It was the closest I could get that – if, yeah,

Mr Muir: Okay. Well we'll have to – the Panel will perhaps have to confer about how we deal with this issue. It's one of several. Yes, Mr Lurling.

Mr Lurling: Yeah, I agree there's definitely further assessment required and that does need to be made by an ecotoxicologist, because there's the presence of a hazard, like high levels above drinking water standards of arsenic in particular. But potentially other contaminants. But then there's the – how that relates to a level of effect depends on exposure pathways, and that may be different for terrestrial birds, and then for waterfowl, and potential bioaccumulation. It's quite complex and I think it needs a relevant expert to assess it.

Mr Muir: Well Rome wasn't built in a day, and we'll just have to see where that settles after we've had a discussion on that. Yes, thank you.

QUESTIONS FROM THE PANEL:

Ms Sweetman: I just wanted to come off the lighting, ecotoxicity and probably circumventing a question Mr Gepp would want to ask, is have you considered the effects of blasting on avifauna? You have, so that's part of the noise and vibration assessment you've done?

Dr Baber: Yes, that's part of the assessment, yes.

Mr Muir: Now I've lost my place to where I am. Perhaps I'll just go back to the Panel. Are there any further questions from the Panel on this issue?

Mr Kensington: If I may?

Mr Muir: Yes.

Mr Kensington: Just if I may a quick one on the lighting. You're aware that we've requested further information on vehicle lighting effects, and would you need to update your advice to us based on the outcome of that study?

Dr Baber: Yes I would.

Mr Kensington: Okay, so we can put that into the same basket as - - -

Dr Baber: Yes.

Mr Kensington: - - - yeah, the ecotoxicity? Thank you.

Mr Muir: Cross-examination, Ms Gepp. Yes, your thunder was stolen.

CROSS-EXAMINATION BY MS GEPP:

Ms Gepp: Well just to follow up on Commissioner Sweetman's question, and it's the same – bit of the same point that I asked you before in relation to lizards. So your assessment wasn't based on the specific blasting modelling that's been done since for

this project was it? It was based on your general understanding of what the blasting might be?

Dr Baber: General understanding of blasting and the noise profile and the response to birds to that noise profile, whether it's blasting or helicopters, or machinery, et cetera.

Ms Gepp: Yeah. And then in terms of the ecotoxicity issue, you will be aware, Mr Lurling, that that was an issue raised in comments by Fish and Game, and I think you provided some reply evidence on that. And did you recommend at that stage, that an ecotoxicologist was brought in to assist on replying on those issues?

Mr Lurling: No I did not. I only became aware of ecotoxicity figures after the joint witness statement which recently became available from the water quality and fresh water conferencing.

Ms Gepp: So it was raised in comments as an issue, and you reply – you provided reply evidence on it without having that water quality information?

Mr Lurling: I replied – I made those comments after reading evidence of some submitters for the parties which raised it as a concern.

Ms Gepp: Do you think in hindsight it would've been appropriate to ask for some water quality information at that stage to understand how it compared to toxicity guidelines, given it had been raised as an issue?

Mr Lurling: Perhaps in hindsight. I was not aware it was relevant.

Mr Muir: Closer to the microphone if you wouldn't mind please Mr Lurling.

Ms Gepp: Sorry sir, what was the answer?

Mr Lurling: It may – it may have been good in hindsight, yes. I was not aware it was available at that stage.

Ms Gepp: Okay. And just this might be a question for you, or for Mr Colbourne, but just to confirm that because some of these species, and Mr Colbourne mentioned ducks, which is a particular issue for Fish and Game, because they travel this – the footprint of this indirect impact could be quite large, couldn't it, in terms of where, if there is a bioaccumulation issue, that could be something that is – that is experienced outside the site, such as in the Bendigo Wildlife Reserve?

Mr Lurling: Do you mean from contaminant travelling to the Bendigo Wildlife Reserve, or waterfowl travelling there?

Ms Gepp: I mean from ducks travelling there.

Mr Lurling: Okay. Yes that is possible. I can't rule that out. I can't make any comment as to the scale of that potential impact, because I'm not an ecotoxicologist.

Ms Gepp: Okay, thank you.

Mr Muir: Thank you. Mr van Mierlo?

Mr van Mierlo: All my questions have been covered sir, thank you.

Mr Muir: Mr Randal? No, thank you. Ms Vela or – thank you. And Mr Leckie?

Mr Leckie: No questions.

Mr Muir: Thank you. Is there any issue that has emerged out of Ms Gepp's questions that the Panel wish to revisit? No. Thank you. The adequacy of the compensation package. Who intends to address that?

Dr Baber: Yes sir.

Mr Muir: Thank you Dr Baber.

TOPIC 3: ADEQUACY OF THE COMPENSATION PACKAGE, INCLUDING MANAGEMENT PLANS AND MONITORING

Dr Baber: Sir, so we designed an off-set compensation package that, for those values that we could demonstrably get good outcomes for, we were likely to achieve. One great tool in the arsenal of conservation management is mammalian pest control. And when it comes to birds, there's a lot of evidence to indicate that reducing predation pressure on birds via control or elimination of feral cats, ferrets, a number of other mammalian pest does -- facilitates recovery for those birds. So when we're thinking about off-setting or compensation effects on avifauna, that was in the front of our minds.

So we have across the 2,219 hectares of land surrounding the direct disturbance footprint, we have a large scale mammalian pest control programme. Noting that it doesn't – it doesn't control for the smaller predators such as rats and mice. I'm not the overall pest control expert. If further questions are directed, but I'm just giving you an overview.

The other element, and a key element to the overall off-set compensation programme surrounding the direct disturbance footprint is also facilitating the recovery in diversity and quality of woody native shrub land. At the moment woody native shrub land in and around the direct disturbance footprint is quite depauperate or limited in the number of species present. That ultimately a small relative number of species, mainly matagouri and pepikwa due to livestock, browse from livestock and other mammalian pests. So a key part of the offset compensation package is to facilitate the recovery in the diversity and quality of that woody shrub land habitat.

That woody shrub land habitat is also conducive to bird recovery. There's a number of birds that like that habitat and will do well in that habitat. So we've got essentially a two-pronged approach for birds in the form of improving the quality of habitat overall and reducing predation pressure from those key predators.

And at the scale that we're proposing, and balancing that up against the effects we're having, we're generally expecting good outcomes for birds.

Mr Muir: I take it that mice are not a significant predator even if checks, or do they eat bird eggs?

Dr Baber: They can be an issue especially on off-shore islands. There's reports of mice wolf-packing on big sea bird chicks. So they can be a threat, which is one thing to – one option to mitigate that, which is currently not on the table. But just looking at an option, is to monitor for instances of mice numbers elevating, and which enable an adaptive response to that as required.

So what that would look like is following, if it was proffered, is following standard practice monitoring protocol, and if elevation in mice is detected, then initiating a response. And so that would be done in those habitats that are more vulnerable to that type of thing happening. Like the tussock lands.

Mr MacGibbon: Just a clarification there Dr Baber. You said that the control, pest control did not include rats as well, is that correct?

Dr Baber: I'd have to confirm. Not heavy intensive rat control, but there will be some form of rat control. But I'm not the expert and that would need to be confirmed. That's my understanding and it is entirely possible I've got my wires crossed on that. But it's not an intensive rat control programme.

Ms Sweetman: Who is the expert in that [inaudible – coughing]

Dr Baber: That is Keith Barber. Please take his word over mine. And apologies if I have misdirected.

Mr Lurling: Yeah there is rat control proposed over 2,600 hectares. But I'm not aware of the intensity of that control. But there is a wide area of rat control proposed.

Dr Baber: Yes I don't – sorry. Is it an option to get Keith – would it be helpful to get Keith Barber to comment, who's in the room?

Mr Muir: Yes, it would be.

Mr MacGibbon: So perhaps just to frame that so Mr Barber, so you can respond. So, yeah we're interested to know if rat control is part of that programme and also interested to know whether there's a seasonal approach? So, for example, is there going to be focused control in the approach to bird breeding season with avifauna in mind?

Mr Muir: For the purposes of the record Mr Barber now is addressing the Panel.

Mr Barber: So there isn't a rodent control part of the programme off the bat. There is a component of rodent monitoring which extends to rat monitoring. Yes you will get mice monitoring from the same tunnels. However, the intention is that in the areas of the Ardgour Restoration Area, which are intended to be developed into forest, once that forest is established the rodent monitoring will commence and will – will lead to a threshold based control in that area.

Now the intention was that, and this is from the Ardgour Restoration Plan, from the ARA, is that the intention of controlling rodents in those areas is to develop a defence against predation of birds in that forest once it establishes, also of the seeds, and other aspects. And so yes it is seasonal, in terms of it's a cyclical standard rodent monitoring programme. However, that is limited to several parts of the Ardgour Restoration Area at present.

Mr MacGibbon: Just to clarify, what's the purpose of the monitoring to do?

Mr Barber: Is, so the monitoring is to monitor the levels of rats to keep them down to low levels. And if they have cyclical explosion, or they get above threshold levels, then it would commence control, and that would be a response to high levels of the rodents, therefore intending to reduce the predation on seeds, birds, invertebrates and other aspects of that forest environment once the forest is established.

Mr Muir: Does the same apply to mice?

Mr Barber: No. So currently, there's no proposal to control mice, and that is something that could be incorporated into the management plan. At the moment it hasn't been because all actions under the mammalian pest management plan at the moment are actions to deliver outcomes that have been determined, or required by other experts, i.e. if the bird expert was to say, "We need to have this outcome" then we can develop a programme to achieve it.

At that moment there hasn't been a directive that we need to protect birds from mice, so therefore we haven't developed that programme under the pest control guise. If that was the case, I do believe that is something that could be achieved, and that is part of the process of wrapping up all these discussion, of where have we got to? We started the process. We developed a pest control programme around that. If that progresses and there are other aspects that need to be included in that, then these are known techniques. There are things that can happen.

The one caveat I would put on that is when we get to talking about mouse control, and mouse monitoring. Mouse monitoring is relatively simple. There's standard protocols. While the control of mice itself is a known thing, we get to the discussion of scale. And so developing a programme, in my mind, all those need to be practical and achievable. And so with mice there's a lot of literature, and we've had a lot of discussion through expert caucusing and my perspective, and that is there becomes a point at which your scale of mouse control becomes impractical or unachievable. And that's well supported in literature.

However, there are, just to wrap it up, there are examples in literature giving suggested levels of mice that you would target to get responses in various other animals, and there are suggestions of where the scale becomes not acceptable. So if that helps.

Mr MacGibbon: Mr Barber, you'd agree though wouldn't you that rats are recognised predators of birds in shrub lands, particularly?

Mr Barber: Yes.

Mr MacGibbon: So is there as reason why rat control is not automatically part of that management programme?

Mr Barber: I would defer to the experts. That would require the benefits, i.e. for the bird expert, for Jeroen in this case, and Dr Baber to require an outcome. So, and I make a very big point of that, because when we're reviewing the mammalian pest management plan, the plan in and of itself doesn't direct that any actions happen. They are – it's the methodology to achieve the outcomes that have been stated in other places. It's the management document that you would give to people to do the work. It sets out a little bit of the why. But it sets out the what, the how, how that's monitored and what outcome must be achieved. It's not in and of itself as the animal pest expert, to dictate what we are trying to achieve, other than the need to control predators that can be done in this way, and this is how it's going to be managed, and monitored.

Mr Colbourne: Yes I believe that 1080 was in the mix every three years, in which case if it could target mice and rats and also would target stoats as well. Trapping alone will not be effective over time. We need toxins because rats and stoats become trap shy. So, the effectiveness of trapping declines rapidly after about three to five years. So we need bouts of toxins.

A build up of rats, sorry built of mice will also have competition with invertebrates that birds need, as well as mice preying on small birds themselves. And so I think there has to be a really integrated, right at the front, exactly what you're going to be doing. So we want to have toxins that can have secondary effects that we can target the mice and rats. When the stoats eat them they'll die. Cats will eat poisoned rats with 1080. They'll die. So it's – I think we need to sort out right at the start that recipe for integrated predator control.

Mr Barber: Just to respond to that, I agree. And I don't believe there's a one solution for any of this. It's a combination and it's sustained. And you've got a combination of techniques and a combination of triggers and timings.

Mr Muir: Yes. At this stage, and subject to what emerges in about 10 days time, we're not expecting the management plan to identify that at this percentage of increase in the rat population specific targeted responses will automatically follow. Rats are a predator. To the extent that predators attack aviculture it is going to be very relevant to our assessment of impacts. To the extent that management of predators can occur, so the – some part in the equation – the impacts assessment will go down. How are we going to deal with this issue?

Dr Baber: So referring to your question, so we have stated net positive outcomes for avifauna for the species that where impacting and we need to achieve those net positive outcomes for. By net positive I'm meaning where the benefits outweigh the

impacts. And the key mechanisms for that are habitat restoration and pest control across the 2,219 hectares.

In terms of – and so to verify those stated outcomes we have proposed a biodiversity outcome monitoring programme with currently the stated objective of net positive outcomes. But acknowledging that we need to put targets around that. We fully agree that we need to know, because net positive can be a point one per cent outcome. We need a set target. Fully agree with everybody, and we will set that target, and we will monitor, and in the unlikely event that where the monitoring indicates we're tracking below that target, so that target won't be achieved by year 35, we will need to look at adaptively managing that situation, i.e. by turning on more tap in terms of pest control, or some other means, so that by year 35 we're back on track, and we've achieved that target.

That is the intent, and then there's still some work to do on consent conditions, but that is a compliance issue if we fail our targets. So we've got outcomes, intended outcomes, stated outcomes and we need to undertake management to ensure those outcomes are achieved, to avoid non-compliance. But again acknowledging further work is needed on targets and on some more specificity around what adaptive management or contingency measures will be undertaken in the event that we're tracking below expectations.

Mr Muir: Yes, always an importance to us.

Dr Baber: Yes, and rightly so.

Mr Muir: I think I've got to you Ms Teele at this point, don't I?

Ms Teele: If you don't mind. Thank you. In principle, yes predator control and habitat restoration can increase avifauna populations and allow them to increase their carrying capacity around the site. I guess I have two avenues of concern at this point. And that is the management plans for predator control and habitat restoration are still up for debate. In terms of predator control, we've traversed some of those, which is there is no mice control, and there is limited rat control. The potential solution that we have put forward, is you monitor for mice and rats, and when you hit a threshold, 10 per cent is often taken for tracking tunnels as your threshold, you then need to instigate your control.

Mr Muir: Yes.

Ms Teele: Noting that you would, for – to have confidence that that would occur, you would want to know in advance what that control will look like. So when it comes time to activate it, you're not scrambling for what you're actually going to do.

And I think there's further work around the management plans, particularly for feral cats and mustelids, as has been said, are the main predators of a number of the birds at site, and there's still work, I think, to be done on the predator control management

plan around the detections. The detections that are considered success criteria for feral cats and mustelids, in particular.

And so I guess bringing it back to the item, I think, as it stands there is greater net loss of avifauna as the application currently stands, than what is stated, due to those concerns. I won't go into the habitat restoration, because I think that will be traversed in the vegetation session coming up.

And I will note predator control and habitat restoration addresses, helped to address ecological effects. However, they don't necessarily address noise, and light, and dust, and vibrations. They still exist. So you may well still cap your population, carrying capacity below what it could be, because you decrease the predators, they, depending on how you do that, they should increase, and you increase the habit they should increase. But you still can have noise, light, and dust, and vibration alongside habitat restoration and predator control.

So I wouldn't say, by any means, you're going to reach carrying capacity, or that you potentially would not reach carrying capacity.

Mr Muir: Thank you. Mr Colbourne:

Mr Colbourne: Yes certainly carrying capacity through predator control is, in my mind, one of the most important aspects. It's well known that most of the extinctions or local extinctions have happened through, particularly rodents and stoats. It really depends on the different species of birds.

As far as noise, in some ways noise could be quite beneficial, in that it keeps birds away from the mining site. But you don't want that to be a long-term thing. It's just birds will never come back. But just from the point of killing birds through machinery et cetera, maybe it's a bit like what they use around orchards to keep birds away, is scaring them with loud noise.

So there might be some benefits from loud noise, that birds will go elsewhere, but we certainly want them to come back. But that's where the – when we start rehabilitating the mine site, pest control, in my mind, will be the biggest factor.

Mr Muir: Right. Any other comment there from you, Dr Baber, having listened to those other comments?

Dr Baber: Sir we agree that further work needs to be undertaken to ensure that we've got targets aimed to achieve net positive outcomes and that they are likely to be met based on the management regime we propose and put forward, and need to comply with.

Mr Muir: Thank you. Questions from the Panel. No. Cross-examination. No. Right. Dr Baber, our last topic there, we could deal with it very briefly, or do you think that we will - - -

Ms Sweetman: Or have we already?

Mr Muir: Or have we already?

Dr Baber: We have already sir.

Ms Sweetman: We have already, yeah.

Mr Muir: Right, that was probably my sense. Very good. Does everyone agree with that? Excellent. We'll take a brief - - -

Ms Sweetman: I think Ms Gepp has a question?

Ms Gepp: Are we ending the avifauna sessions then, at this point?

Mr Muir: I will conclude the avifauna session, but of course, Ms Gepp if you had any additional cross-examination.

CROSS-EXAMINATION BY MS GEPP:

Ms Gepp: Only the question about covenant, again whether the avifauna values of the covenant have been specifically considered in terms of the criteria for revocation?

Dr Baber: So David Norton addressed that and he would – you'd have to, sorry not you'd have to speak to him, but he would know to what degree he looked at our reports and used those reports to inform his assessment.

Ms Gepp: Right, so you didn't specifically feed into them separately to what he might have [over speaking]?

Dr Baber: No. No.

Ms Gepp: And you reports don't include a specific - - -

Dr Baber: No.

Ms Gepp: - - - covenant specific assessment? Okay, thank you. Those are my questions.

Mr Muir: That concludes the avifauna section of the hearing and we will take a break for – until 1.45.

Hearing adjourned at [time]
Hearing resumed at [time]

TERRESTRIAL VEGETATION:

Mr Muir: Very full house now for terrestrial vegetation. Could I just, for those who haven't previously appeared this morning, could I just ask you to introduce yourselves. So we've got three very familiar faces here, and a new one.

Mr Milner: Yes my name is Zac Milner. Ecologist for the applicant.

Mr Muir: Yes, thank you Mr Milner. Right.

Prof Norton: My name is David Norton. I'm an ecologist for the applicant.

Mr Head: Nicolas Head for EDS.

Mr Muir: Yes, thank you Mr Head.

Mr Harding: Mike Harding for Central Otago District Council.

Mr Muir: Yes, thank you.

Mr Crowe: Max Crowe for Department of Conservation.

Mr Muir: Do I have anyone on-line as well? Yes is Dr Simcock on-line?

Dr Simcock: Yes, Robyn Simcock, Restoration Ecology.

Mr Muir: Thank you. Good afternoon Dr Simcock. And, Dr Rogers, we have you back again. Good afternoon again, Dr Rogers. Thank you. A very large team. It was probably quite an undertaking to confer and see if you could identify the five or six topics that we would focus on this afternoon. Could I ask one of the representatives of the applicant, whether there was any success in doing that, and if so we will get those identified now.

Mr Milner: Yes there was success.

Mr Muir: Excellent. I've got to the point of not expecting anything less from the experts who are appearing before us. Thank you. Would you like to be the dictator and Ms Sweetman the scribe? Thank you.

Mr Milner: Yes. Number 1, information gaps in survey data, and implications for effects assessment. Number 2 is determination of ecological value and magnitude of effect, Number 3, Biodiversity baseline trends and relevance; Number 4, Avoidance and vulnerable and irreplaceable values; and Number 5, Significance of effects.

Mr Muir: Would you like to lead off Mr Milner on Number 1?

Mr Milner: Sure.

TOPIC 1: INFORMATION GAPS IN SURVEY DATA AND IMPLICATIONS FOR EFFECTS ASSESSMENT

Mr Milner: In general, I consider that the vascular plant survey of plants species and vegetation communities was appropriate, with some limitations. The methodologies included terrestrial vegetation plots, wetland plots, targeted surveys for rare species, drone photography and GIS analysis over 176 person days.

The limitations or information gaps include, and which have implications for effects assessment, include less than ideal survey effort in the conservation covenant.

Mr Muir: Is that the allegation or is that your assessment that it was less than ideal?

Mr Milner: That's my assessment.

Mr Muir: Yes.

Mr Milner: The non-vascular plants, which were not included in the substantive application and therefore not the assessment of environmental effects. There were

limitations around spring annuals. And finally, there was also limitations around the detail of vegetation mapping outside of the DDF.

I would also note that taoka or taonga vascular plant species were not specifically targeted, but the survey encompassed all vascular plant species, and so they were not limited.

I will just leave it at that for now.

Mr Muir: So should I be touch – touching with any of the other experts for the applicant, or will you have summarised the applicant's position you think sufficiently?

Mr Milner: I think so. I'll leave that to - - -

Mr Muir: Well then why I don't then go to Ms Teele, we'll start with her.

Ms Teele: As per the joint witness statement, the baseline surveys are adequate for assessing overall ecological significance, but not for a full assessment of effects of all vegetation and flora values. And further, insufficient survey effort to determine the type and extent of values for which protection will be lost from the covenant area, as as result.

Mr Muir: Right. Ms Anderson?

Ms Anderson: I'm happy. That – is that working?

Mr Muir: Mr Head?

Mr Head: I'm very satisfied that the survey was adequate, but I do know that those – there are those gaps, which means potential for level of effects are unable to be assessed.

Mr Muir: Mr Crowe?

Mr Crowe: Thank you. Yes, I agree with the items raised by Mr Milner. Additionally, the aggregation of survey data in the ecological survey area makes it very difficult, in addition to determining the values in the conservation covenant revocation area, also the areas within the Conservation land where activities have been proposed. It's difficult to determine the precise effect [inaudible 5:32:35].

Mr Muir: Mr Harding?

Mr Harding: Thank you. I think Mr Milner's summary is a good summary. I would add though that the gap in the spring annual survey is significant. So, a significant part of the DDF was not actually surveyed for spring annuals.

Mr Muir: Yes, he mentioned limitations, "limitations around spring annuals".

Mr Harding: Yes, I was just clarifying that.

Mr Muir: Yes, you could expand on that?

Mr Harding: Well the reason that's important is because the species, the spring annual species are values that are considered irreplaceable and vulnerable, and therefore it has quite an important effect on assessing effects, and therefore the effects management hierarchy. So I think it's a very important limitation, acknowledging that spring annuals are hard to survey.

And the other comment I would like to make in addition to what's been made so far, is that the non-vascular flora is a very important part of dryland ecosystems, and especially disturbed dryland ecosystems. And the absence of those data is a very important limitation in the assessment of effects.

Mr Muir: In a sentence or two how would you describe the limitations of the spring annual survey?

Mr Harding: Well the limitation is critical.

Mr Muir: Yes, I understand the criticality of it.

Mr Harding: I'm not quite sure - - -

Mr Muir: Identify the deficiency?

Mr Harding: You mean - - -

Mr Muir: What should have been done, in your view?

Mr Harding: Well firstly the spring annual flora survey should've covered the whole area. And so there was – it didn't, the geographic extent of it was limited. And secondly which is – secondly spring annuals, as you probably understand already, are difficult to survey. They occur briefly and their presence is often seasonal. And so it normally requires more than one season's survey work to accurately identify the extent. And I acknowledge that's difficult in a situation where you've got limited time to prepare an application. But that remains a limitation.

Mr Muir: Dr Rogers, did you have a comment to make on this? Dr Rogers you're on mute at the moment. Shall we try again?

Dr Rogers: Finally go there. Thank you Mr Chairman. Probably a sticky fingerprint, or sweaty fingerprint. Yeah, I want to reinforce and note the inadequacy of the non-vascular plant work. It as an add-on quite late in the juncture. There are likely to be endemic species that have adapted, lichen species, endemic lichen species, at least in the footprint of the Come in Time proposed pit.

I recognise that non-vascular flora surveys require highly specialised, and often lab-based assessment, but they are a critical function in terms of ecosystem processes. They're the primary colonisers. They kick start the nitrogen cycle; they kick start the carbon cycle on primary successions, which is what the DDF constitutes.

So yes, I think they're very inadequate in terms of the assessment and their values, particular in the endemism rarity values.

I also want to speak on spring annual survey. I note that the DDF contains probably the strongest national species, of a nationally critical species, that's Ceratocephala. And yes I recognise that there were limitations in both timing and spatial extent of the surveys, because of lambing. But the significance of the population would suggest that there should've been a much greater effort put into the whole of the Ardgour Station, an assessment of those highly rare species as a component of spring annuals.

Thank you.

Mr Muir: Why was survey on the Ardgour Station, to the extent that it is outside the DDF, necessary? I mean in the way in which the application is framed, a significant part of the application has to be parked, is effectively parked until such time as further work is done, and more accurate assessment is made of the extent to which the population of spring annuals, which will undoubtedly be lost on the application as framed, represents vis-á-vis total spring annual populations, as we all understand. But why beyond that was it necessary, at this stage, to consider populations of spring annuals in the Ardgour Station, outside the DDF?

Dr Rogers: Sir, if the question is directed to me, yes I note that there was incomplete survey of the DDF and with the discovery of that significant population of nationally critical species, to really evaluate its significance, you do need to look at the status of the population beyond the DDF. At least in the immediate vicinity that is of the ecological study area, which includes a substantial part of Ardgour Station.

Mr Muir: Should one be as critical of the applicant, however, in circumstances where they acknowledge that work has to be done in the future if they are to develop one part of their proposed works, the Come in Time pit beyond quite confined and reasonably superficial works? Isn't there a natural control system in there?

Dr Rogers: I'm not quite following your question by a natural control system?

Mr Muir: Well a natural control in the sense that there is a strong economic case for ensuring that at some stage the applicant will undertake the work that you say is necessary, because without doing so they don't access what they have already established is a rich seam of gold in the Come and Time pit, in the prospective Come and Time Pit?

Dr Rogers: Yes. I will re-couch my comment and say, look it wasn't a direct criticism. I recognised the financial and time constraints on spring annual survey. No one knows it better than I do, as a scientist studying them. And so yes, I'll just reiterate, it's not a direct criticism, but I think actually for a full assessment of the values, that the survey should've been much more spread over multiple years, and should've had better timing for the theological expression of the species. They only occur for six weeks of the year.

Mr Muir: Thank you very much, Dr Rogers. Questions from the Panel.

QUESTIONS FROM THE PANEL:

Mr McGibbon: Probably just one to you Mr Milner. It sounds to me like you're in general agreement with the comments made by the other experts, is that correct?

Mr Milner: Correct.

Mr McGibbon: So there's no dispute here? Okay. Thank you.

Mr Muir: Well then there's unlikely to be a lot of cross-examination other than from Ms Gepp.

Ms Gepp: [inaudible 5:41:10] I have no cross-examination on this so far, especially not now.

Mr Muir: Any other cross-examination on this topic?

CROSS-EXAMINATION BY MS VELLA:

Ms Vella: I have one question sir, if you please? Ms Vella for EDS. Mr Milner, I noticed in the third JWS that came out last night, that some of the experts, including Mr Harding – I can't remember the others – noted that there was a 2025 survey report addressing spring annuals that the raw data has been provided, and they've asked for the actual report. It hasn't been provided by the applicant, and I'm just wondering why that's the case?

Mr Milner: My understanding is that that report contains information from private land for which that private land owner has not provided permission to distribute that report.

Ms Vella: Have you seen the report?

Mr Milner: I have seen a version of the report, yes.

Ms Vella: In your view, does it contain information that would assist the Panel?

Mr Milner: Yes.

Ms Vella: Thank you.

TOPIC 2: DETERMINATION OF ECOLOGICAL VALUE AND MAGNITUDE OF EFFECT

Mr Muir: Topic 2. Who is leading off the applicant on topic 2? Mr Milner?

Mr Milner: Yes. So in this section I'll cover off the determination of ecological value and pass over to Mr Baber for magnitude of effect.

For the determination of ecological values, I used a bespoke method for determining those, based predominantly on the EIANZ Guidelines, but with modification, which, using commonly used criteria for significance in value assessment. In assessing ecological value it's useful to look at a wide context. And so I made a evaluation of the ecosystem within the ESA. That ecosystem comprised the [inaudible 5:44:01]

components, uncultivated components of the ESA, and I determined that it was of very high ecological value.

I also assessed the disaggregated vegetation communities, and for six of seven of those, concluded that they were of high or very high ecological value. For individual species, once again I used a modified version of the EIANZ Guidelines, in which the conservation status of each species is directly associated with the ecological value. So a threatened species would be very high, et cetera. The modification was in that there is a regional conservation status document also, and for species where the regional conservation status was higher than the national conservation status we used, we defaulted to the higher status and classified the ecological value accordingly. I'll pass over to Dr Baber for the magnitude of effects.

Dr Baber: So sir, so I took Mr Milner's assessment, and which was focused on vegetation values, and his assessment was focused on vegetation values across the ecological study area, which captured the direct disturbance footprint, plus the surrounding landscape.

I then ran that values assessment or picked up elements of that values assessment and pumped it through an assessment under the Ecological Impact Assessment Guidelines. The difference between – and there were some differences between his assessment and my assessment which was probably related to three factors. In essence, for the seven terrestrial habitats, I assessed two as very high, one just high, three as moderate, and one as low.

That differs from Mr Milner's assessment for three primary reasons. One is, we're all independent ecologists with slightly different views on the world. Two is, my assessment was focused on the direct disturbance footprint, rather than the broader ecological study area. And in my view there were some habitats within – in the ecological study area but not in the DDF that were of higher value outside. So that was where you had deeper gullies and more indigenous and more diverse and rich woody scrub. Or you had an area that had been fenced for a while. So was not – no longer being browsed by predators. So I just generally felt in some instances the quality of the same habitat type was lower in DDF than in the surrounding area. And the third thing was, Mr Milner's assessment was vegetation specific. My assessment under the EIANZ included vegetation and fauna values as well. So, my assessments of ecological value included both vegetation flora and fauna, as opposed to just vegetation, per se. So those three reasons are potentially why we differed in our assessment. When it comes to – so that was the values.

Then when it comes to magnitude of effects, I, yeah I've mentioned before, and I mention in my evidence, and I mention in the report, the things that I considered in that assessment, following the guidelines, and I'm comfortable with my approach. But it's certainly a bone of contention, or an area of disagreement among others. And I think I'm best to stop here and let everyone have a chance to respond to that.

Mr Muir: Before we do so, is there any other expert called for the applicant that considers it appropriate to contribute to this? No. Thank you. Then could I go to Ms Teele?

Ms Teele: Yes, thank you. As Dr Baber's alluded to, I disagree with the ecological value rating that's been assigned to the mixed tussock shrubland and exotic grassland vegetation community, along with the mixed shrubland community, specifically in relation to the representative criteria and diversity and pattern for the mixed tussock shrubland and exotic grassland vegetation community. And again for mixed shrubland representativeness and ecological context. I align with the high value that was assigned in the vegetation values report that Mr Milner has put together, and the same applies to the mixed scrubland high value in the values report, not the lower moderate value that's been assigned to both those vegetation communities in the AEE.

Mr Muir: Thank you.

Ms Teele: And I think as you follow that through that would change most likely the level of effect for those community – two communities as well.

Mr Muir: Ms Anderson?

Ms Anderson: I would just add one comment in regards to Mr Baber saying that he has considered both flora and fauna in his assessment. My comment would be that if he's added fauna into his assessment, then that should, if anything, increase the significance, not decrease it.

Mr Muir: Mr Head.

Mr Head: I think, at first, Mr Milner's talking about his significance assessment, which is different to the values assessment that Dr Baber's talking about. My view is that the values assessment understates the actual full extent of values present. There is a number of reasons for that. Both the way the assessment's been undertaken, and the scale it used. It used the scale which was based on vegetation types, as opposed to the ecosystem, which it should've done. And then it also used different criteria. That they should've used, consistent with the MPS, or the Regional Council and that had, in particular, the representative criteria and a different definition, which is inconsistent and resulted in a far lower score, which I do not agree with.

In my experience assessing dryland systems at the site scale, which is what it should be assessed at, I would not have scored low representativeness for a number of the vegetation types that Dr Baber assessed. And that has knock on effects. Even though one – because then they aggregate them into an overall value and that tends to result in diluting the overall value of certainly some of the higher attributes. And you'll see that that has occurred. And that has knock on effects, because it adds to the magnitude of effect.

So anyway, in terms of the values assessment, in my view is it understates the extent of values. Certainly it's inconsistent with the high significance assessment that Mr Milner undertook.

When it comes to magnitude, well again I have some concerns about the magnitude and the true level of effect. If you look at the – the EIANZ Guidelines to determine magnitude, the four attributes you should consider is the extent, the intensity, duration and the replaceability and that's how you should assess the scale of the magnitude. Well if we look at that, the extent well virtually all of it goes, so that's a high effect there on that one. The intensity, well so it's across the whole extent. It's across the whole site. The intensity, well all of it goes, it's high and high. And duration, it's long lasting, and it's replaceability is very questionable. So my assessment of magnitude clearly meets all the – all the assessment criteria that the Guidelines say follow, being of very, very high effect.

It's probably going to be introduced later, but in terms of also the magnitude of effect, the residual effects are then also downgraded because they rely on rehabilitation which is high uncertain, and uncertainty in the way we should consider things there's a risk. So we shouldn't be – when there's high uncertainty we shouldn't be crediting that as a tangible gain to downplay the scale of effects, and that has been done for most of the values that have been identified. So that one may regard the residual magnitude of effect in my view is downplayed for many of the values that are present within the DDF.

Mr Muir: And is your position, I note this no doubt, but the level of uncertainty about rehabilitation is such that it's impossible to back any, well any offset in terms of effects?

Mr Head: Certainly there is, in terms of dryland restoration, there are very few examples, none in fact that I know, that have managed to rehabilitate in a manner that replicates the values that were lost. And that's an important distinction because it comes back to equivalence of like for like. It's possible, I'm sure, to grow a few tussocks and the like, and from what understand in terms of the rehabilitation plan, there's only about 20 per cent of it is proposed to be planted in native, whether or not that's successful.

Mr Muir: It might even include a lot fewer weeds and a lot less briar?

Mr Head: Well that's right. I mean if you look at old tailings from mining done in dryland ecosystems from over a hundred years ago, and they're tailings yeah with briar. They certainly haven't recovered to anything like a natural dryland ecosystem. I do put a lot of work into dryland ecosystems. I am not exactly the same as well those in the Dunstan Ranges, but they are similarly arid and difficult, and they are extremely challenging environments. And as I said, I know of no actual examples where they've managed to come close to replicating the values lost, within any reasonable timeframes. So on that, yes there's high uncertainty, and high uncertainty, you know, requires a precautionary approach. And in saying, in addition to high

uncertainty, and even if it's successful it is highly unlikely they're going to replace anything that is of true worth to credit it as a reduction to the magnitude of effect.

Mr Muir: Mr Harding?

Mr Harding: Thank you. I'm probably going to have difficulty, as others have, of trying to confine to the question, because it ranges into effects.

Mr Muir: Yes, or course, they all lead into the others.

Mr Harding: Yes, but I'll attempt to limit my comment to the values. So the – what the applicant has used, as has been explained, is the INC Guidelines to make an assessment of ecological value, and magnitude of effects. Those guidelines are widely used because they are a practical way of looking at the effects on components of sites. They are not statutory or endorsed in any way by the ecological community, and they're not regarded as best practise by many of us in the ecological community. And the reason for – one of the reasons for that, is that the way they're used, or the way – the way they have been used, and commonly used, and have been used in this case, is that components of the site, they are selected and values are placed on those components. And in this case, it's been the species and the vegetation types.

So what's – what doesn't get assessed, as part of that process, is other factors which affect the ecological value and functioning of the site, and that's important because we have an obligation to consider ecological integrity under the National Policy Statement for Indigenous Biodiversity. And so while the assessment the applicant has done has been thorough with regard to those components, it can't be considered a full assessment of the value of the site.

And I acknowledge that in this case, because the value of those components are so high, it may not affect the ultimate outcome. But it's important to understand that limitation, that those effects have not been fully assess – the values have not been fully assessed and therefore that limitation continues through the effects management process.

Just to be – to use a specific example too of another problem with the guidelines is that they require, or propose, an assessment against a historical 1840 bench line, and that also is inconsistent with their obligations under the MPSIB, which where the aim or the objective of the MPSIB is present day values, not some historic situation. And that's particularly important for this site, because this is a modified, degraded site, as is typical for these inland dryland ecosystems, and the values, the indigenous biodiversity values are what is there now, not what was there perhaps in 1840, or whatever. So that's another, I guess, concern I have about the use of the guidelines to assess value.

I'll just make a brief comment without trying to stray into the effects management issues, about the assessment of magnitude of effect, which is another component of the application of the guidelines. And that is what has been done is the magnitude of the effect has been assessed after minimisation and remediation or rehabilitation

actions, which while I can understand why it has been done, because it provides you an indication of the magnitude of the residual effects, what it has the effect of doing is lowering the magnitude of effect value, or rather potentially lowering it, because the – there's no certainty that the rehabilitation that's being used will actually be effect – so I've not phrased it – I will try to rephrase that more clearly sorry.

So to assume that -- the magnitude of effect values that have been provided by the applicant include rehabilitation for which the outcomes are uncertain. And there's wide agreement about that, especially in these difficult environments. So I'll leave it there. They're my main concerns or comments on the value, thank you.

Mr Muir: Mr Crowe.

Mr Crowe: Yes, thank you. I'd like to agree with my colleagues' points that have been raised. And I don't think I have much more to add on those particular points. But there are a couple of other points that haven't been raised yet, that I think are also relevant in terms of this question, particularly around the magnitude of effects. And again I'll be careful not to stray too far into the effects assessment side of things.

But the question of indirect effects has been raised in conferencing, and there remains, to my mind, a degree of uncertainty about how indirect effects, particularly fragmentation, impacts of dust deposition, for example, have been accounted for in terms of assessing the magnitude of effects on those values.

There has been to my mind a conflation between this concept of a contingency zone, and a buffer zone, surrounding the disturbance footprint. And from what I have – from what I can tell there is no explicit area where disturbance will be prohibited, but used as in a manner to account for indirect effects on adjacent habitats.

The other point that I would like to raise, with respect to impacts on species, is that the estimates of population size as to each of the species that have had those assessments done, which are, as Mr Milner's pointed out, are for those threatened and "at risk" species, or those species that have a threatened or at risk classification, are based on the minimum number of species that have been observed during field observations. So, they're not an estimate of the total population size, and there's no confidence intervals placed around that estimate. So the true population of these species impacted could be much larger, and therefore the residual effect could be much larger as well.

Mr Muir: Dr Rogers.

Dr Rogers: The only reinforcing point I would like to make is the need to have a wider context around the value and magnitude of effects upon spring annuals. The cushion field community in which they occur in has been, probably quite accurately mapped, at least remotely, but the spring annual component of that ecosystem has not, and therefore I think has got compromised ecological value assessment and magnitude of effects.

And without straying too much further into significance of effects, because of the great uncertainty around attempting to rehabilitate noted vegetation on the DDF, I think there's enormous uncertainty around, yeah, assessing magnitude of effects on that DDF component of the equation.

Mr Muir: Thank you. To the Panel. Any questions from the Panel?

QUESTIONS FROM THE PANEL:

Mr McGibbon: Probably just one to everybody. I'm just trying to decipher what the implications are in terms of overall level of effect. Mr Harding, I think you probably said it. You've criticised some aspects of the way it's been done, but did make the comment that suggests that maybe it wouldn't change your overall assessment of effects, compared to what the applicant has presented. Is that the case?

Mr Harding: Not quite. I guess what I meant by that was because the values of those components are so high, that you would then, if you worked through the effects management hierarchy, you would avoid the site, because there's values there that are irreplaceable or vulnerable. And I guess what I'm saying there is that if you found, for example, that if you looked at, if you assessed in a different way, it would make no difference to that avoidance outcome.

Mr McGibbon: Thank you.

Mr Muir: Any cross-examination on this topic?

CROSS EXAMINATION BY MS VELLA:

Ms Vella: Just one quick question, thank you sir.

Mr Muir: Ms Vella.

Ms Vella: Thank you. Mr Harding I just wanted to be clear around some of the comments that you've made, particularly in relation to the lack of assessment of ecological integrity. All experts have accepted that that's the case with this assessment of effects, is that correct? And I just wanted to be clear that what you mean by that is ecological integrity is defined in the RPS, which means the extent to which an ecosystem is able to support and maintain its composition being its natural diversity of indigenous species, habitats and communities, structure, being it's biotic and abiotic physical features, and functions being it's ecological and physical processes? And is it your – sorry your – Mr Harding's nodding. I'm not giving you a chance to respond. Is that correct?

Mr Harding: I'm just agreeing with your interpretation of what ecological integrity means. And I am also conscious of the definition in the MPISB which that sounds consistent with, from my memory.

Ms Vella: And from your experience with dryland ecosystems and rehabilitation of them, are they some of the key features that are inherently difficult to replicate in those ecosystems?

Mr Harding: Yes, and perhaps by way of explanation, the site is a degraded site. It's been – there's lots of things going on at that site. There's been former disturbance. There's been a long history of pastoral use and historic burning, and these sites are quite dynamic. They're not as stable or sort of set state. There's a lot going on and it's very hard, and so I guess what I'm trying to say is that you may survey the site and find spring annuals at one part of that site, this year, but you don't know that in five years they may actually have migrated or just occupied habitat just adjacent, because the whole site's quite dynamic with respect to the changes that have occurred and the inferences that are occurring now.

And for that reason, just taking, selecting components of the site and valuing those, misses the functioning of the site, which is actually very important in this case. It's not like a patch of old growth forest, which is quite uniform and over time won't change dramatically. There'll be a lot of changes going on in this environment and it's one of the reasons why the non-vascular flora, and the spring annual flora are there, because they're comfortable in those, or favour those habitats. So that's, yes, that's where the integrity of the site, the sort of functioning of the site, becomes very important. I hope that's helped to explain it.

Mr Muir: Mr Milner, just rounding back on you, at those issues, any comment?

Mr Milner: Yes, just in terms of the population size estimates, I agree with Mr Crowe that it was a minimum estimate for populations of species within the DDF. But I would also say that I made a similarly – a similar assessment for the surrounding landscape in terms of the minimum estimate and I put it – and there was a proportionally less effort per hectare put into the surrounding landscape compared to the DDF. And so that has – means there's a conservative kind of aspect to what Dr Baber would've used in his magnitude of effect assessment, if that makes sense.

And then secondly, Mr Head noted that in my introductory spiel I was talking about ecological significance. But I was actually talking about ecological value. In Table 11 of the vegetation values report I make a ecological value assessment of the entire hilly landscape unit, as I called it, which comprised most of the ESA.

Mr Muir: Thank you. Dr Rogers I haven't left you out, have I, of this – on this subject, no?

Dr Rogers: No I made a contribution.

Mr Muir: Yes.

Dr Rogers: Yes, you have invited comment from me.

Mr Muir: Yes, thank you. Right. Was there any further cross-examination? No. Any issues arising out of that the Panel wanted to revisit? No. I move then to topic number 3.

TOPIC 3: BIODIVERSITY BASELINE, TRENDS AND RELEVANCE

Mr Muir: Who's leading off the applicant on this issue:

Mr Milner: I'll start that.

Mr Muir: And then Emeritus Professor will follow.

Mr Milner: In terms of biodiversity trends, for myself there are only a few species or communities for which I have confidence in the decline or improvement of those values. There is an obvious positive trend for woody vegetation cover, and there are several species for which there appears to be a decline. But I do not make a determination that there is overall decline or improvement at the site.

Prof Norton: Shall I carry on from that?

Mr Muir: Yes.

Prof Norton: Yes, so my role, I assisted Mr Milner and wrote a first draft of the section on the sort of the history of the vegetation at the site. And in the conferencing there's been some debate about what are the recent trends. I won't bother going over the historical trends. They're well known and accepted. But the sort of changes that have occurred in recent decades. And there's been some debate about tipping with regard to shrubland.

So the suggestion that's been made, in the joint witness statement it's quite clearly articulated there, that some of the experts feel that shrubland has continued to expand and it will continue to expand into the future. So I want to comment on that for a couple of moments.

Mr Muir: Yes.

Prof Norton: So I agree the shrubland has expanded over recent decades, and it's expanded for a number of reasons. And we're talking about the last 30, 40, 50 years. It's expanded where farming has been removed from the area. So, for example, through tenure review, the dry creek conservation area, which is adjacent to Ardgour, was taken out of Cloudy Peak Station in a tenure review, and shrubland has expanded there. There's been changes in farm management practises, particularly less clearance, less spraying, less burning, or different grazing regimes, which does lead to an expansion of woody vegetation. And then, at the same time, you know there's been 50 or 60 years of aerial fertiliser application, which has increased fertility and matagouri in particular responds very positively to that, and that's certainly contributed to the expansion of matagouri in these systems.

But I think it's important to note that the shrublands that have expanded and are quite widespread in the landscape are dominated by a small set of species, Matagouri in particular, Mingimingi, sedentary daisy, and they lack diversity and structural complexity. They're very simple systems. They're also systems that are subject to on-going herbivory from both domestic livestock and from [inaudible-coughing]

animals, deer and pigs in particular, which limit the ability of any palatable species to establish and for succession to progress.

I think it's important to also recognise that cyclical clearance of regenerating native shrubland is very common in hill and high country Central Otago, and it's a routine farm management tool. And I've been involved with a number of high country farmers around that issue over the years. What that periodic clearance, which is burning or spraying, does is it resets the system back to basically exotic grassland and then because of the fertility in the system, it again redevelops.

I think it's important to acknowledge that the Central Otago District Plan is quite permissive with regards to vegetation clearance, and Matagouri, in particular, is exempt from the vegetation clearance rules. And I don't think many farmers would go much beyond saying these are Matagouri shrublands. They wouldn't necessarily look at the other species there.

Because of this, many of these woody communities have no guarantee of permanence, if pastoral farming was to continue. And that's why I disagree with the assertion that's been made in the joint witness statement by some of the experts, that the biodiversity outcomes that we are proposing for the Ardgour Restoration Area, in particular, are not likely to be additional. I think they are additional, because I don't think there's any permanence in that shrubland vegetation. Thank you. I should have added that I made a lot of these points in my statement of evidence.

Dr Simcock: David, I might add to that, or would you like to pick up on the weeds?

Prof Norton: Go for it, Robyn.

Mr Muir: So just for the purposes of the record, this is Dr Robyn Simcock now, addressing the Panel. Thank you.

Dr Simcock: Yes, good afternoon. So the Ardgour Restoration Area and the what we'd call the MRZ, the mine regeneration zones are being managed in similar ways for similar reasons. So I won't cover the expected response for woody vegetation, but I would note that the vegetation survey has identified a reasonably wide range of plants that are known to either suppress cushion form, for example, sedum and thyme. Briar is considered to be facultative. By which I mean if a briar establishes on the edge of a cushionfield, other plants can then establish in that area. So it's another agent of conversion.

And then in small areas there's also gorse. There is a nasty clematis outside the site and variety of bird dispersed plants. Only gorse and broom are generally controlled by farmers, with some good control of willow occurring on some wetlands. So the implication of that, is that we are at the beginning of weeds that can come in and degrade this landscape. They will only expand because they're not being controlled.

Mr Muir: Thank you Dr Simcock. I'm now going to round back to Ms Teele.

Ms Teele: Thank you. As per the joint witness statement, I have not seen any evidence that shows there is an overall biodiversity decline at the site, and that does have implications for the proposed benefits, as to whether or not you see the site as being in decline or not. It's an incredibly dynamic system. Some parts will be increasing, and some parts may well be declining. But I haven't seen a break down of all those parts and where you land at the bottom, and that would be a very difficult thing to try and do, in my opinion.

Mr Muir: Ms Anderson?

Ms Anderson: I've got nothing further.

Mr Muir: Mr Head.

Mr Head: The evidence I've seen which seems reliable is that shrublands have expanded. It's quite obvious that recolonised land from which they must have been cleared decades ago, and that trend seems to be on the increase. Otherwise, in terms of the covenant area I think I'll assume – I can probably safely assume the trend has improved within the covenant, because they're required to do weed and pest control within that covenant, and that's over 800 hectares. And you see noticeably the lack of briar rose comparatively to other aspects, other places on the range, which I would attribute to the requirement to control those weeks in their covenant. That's an assumption. But it is written in the covenant and called an effect, lack of weeds there.

In terms of the – I mean the [inaudible] systems meant people have noted there's a high diversity often with small herbaceous species and sub-shrubs, and grasses that occur with them. They're really hard to document and determine what trajectory they're going to take. But we're subject to different management techniques and management regime such as grazing. You know, you're in trouble if you do, you're in trouble if you don't when it comes to grazing. But to determine all those trends would require a considerable monitoring effort over many, many years, at a scale which is fully representative of the diversity within the system. And that data is not available, as far as I'm aware.

Mr Muir: Mr Harding.

Mr Harding: Thank you. I could just tie it back to I think the reason we gave this so much attention in the conferencing was because in the application, great weight is placed on the contention that the values at the site are declining. And the outcome of that conferencing, as stated at para 34 of the vegetation joint witness statement, is that all expects consider that, with the notable exception of the recent clearance of shrubland at Ardgour Station, there is no reliable evidence of baseline biodiversity decline in recent decades.

And in my observation, I've worked in dryland systems for quite some time, at least in the South Island, often these degraded sites aren't declining. They're quite stable, and they're often recovering. And so it's very hard to just make it just a – to do a

survey without any sort of historic data, or accurate historic data, and to draw – and then to, well and then to state that there's a decline.

So I guess the key point here is that those are assumptions, they're not evidence. And the – it's a complex ecosystem, or complex set of communities, some of which will be perhaps stable, some of which will be declining, and some of which will be perhaps increasing. Now the only example of all the evidence that's been presented, the only evidence we have of an increase, as has been discussed, is shrubland. And David's articulated that very well. But I just want to make a couple of comments in response to that.

Firstly, and because it's straying into the effects management or the restoration, and that is that increasing the diversity of the shrubland is not necessarily an ecological benefit. At site, that's a pretty typical shrubland. But the components that are missing, may or may not naturally occur now. There's a lot of reference back to what was there and it's highly debatable whether introducing some of those species back into that system is actually appropriate, in the present day environment. So there's a level of uncertainty there as well.

And then the second comment I would like to make is, it's really with respect to the permitted baseline, and David makes the point that Matagouri clearance may be permitted under the Plan, but vegetation, woody vegetation clearance is not. So I don't know, I'm not a planner, but I think it's important to point out, that even if that clearance is occurring, it's not necessarily permitted. I think I'll leave it there, thank you.

Mr Muir: Mr Crowe.

Mr Crowe: Thank you. I agree with many of the points that have already been raised, and I don't think I have anything to add.

Mr Muir: Dr Rogers.

Dr Rogers: At the potential risk of losing time in rhetoric but I want to reiterate that assessing trend, and the value of trend, is complicated by the dynamics of these systems as Mr Harding has pointed out. An assessment of deterioration, or loss of values of an open community with pastoral farming can actually benefit the rare, non-woody flora.

So these systems are dynamic in relation to the amount of burning and pastoralism, extraction, that goes on. But for some of the open vegetation communities, their value increases through deterioration in their integrity, because they host a greater diversity of often rare and threatened, sometimes endemic species. So, it's very difficult to make any assertions on the overall biodiversity trends.

I agree that shrublands generically, in dryland systems, can increase in both their cover and their biomass and richness extent through removal of herbivory, spraying and burning, but I've not seen, in my 27 years in the upper Clutha, any convincing

trends in the amount of woody cover on Thompsons Gorge, in the Thompsons Gorge landscape. Yes, they will – the shrubland has always been confined to the damp shaded south-east aspects, yes it's been increasing in its biomass content, but I'm not convinced it's spatially increasing. Thank you.

Mr Muir: Thank you.

Mr Crowe: Sir, I know I've passed over my opportunity, but if I may, something has come back to me? And that is just perhaps in danger of labouring the point regarding the relevance of the increase in woody vegetation, the biodiversity models, as I understand, assume a stable state. If it is the case there is back line increase in the vegetation cover, irrespective of the proposed management, those biodiversity outcomes relating to shrubland cover may over-estimate the effectiveness, or the effect of the management activities. I just wanted to make that clear.

Mr Muir: Mr Milner, or Emeritus Profession Norton, was there any repost to any of that, that you'd like to bring to our attention?

Mr Milner: Well for myself, most of the section, [inaudible] parties agreed with me. So I'll leave it to Dr Baber or Professor Norton.

Mr Muir: Thank you. Professor Norton?

Prof Norton: I'll just make a brief comment. Yeah my comments were with regard to shrubland and we'll come back to that. I speak in the next session, we talk about the gains in Ardgour. Certainly, in other systems, like cushionfields, I think we're all pretty much in agreement in the joint witness statement about the values there. So, definitely it's a very dynamic landscape for sure.

Mr Muir: Yes, thank you. Now to the Panel?

QUESTIONS FROM THE PANEL:

Mr McGibbon: Yes look I have one question for you Professor Norton. Just picking up on the comment from Mr Harding where he questioned the appropriateness of reintroducing past woody species in there, what's your view on that?

Prof Norton: I've got a slightly different view. I mean I think we should be trying to bring back some of those elements that were in the landscape, and I'm thinking about things like – this is from a vegetation point of view – thinks like kowhai, thin bark totara, but in appropriate sites. I think they were in this landscape, and I don't believe there is any reason why they couldn't grow on this landscape. I'm a great believer in restoration and the power of restoration, and I think if we can get more of those elements back we'll create an environment that is then favourable for birds. Bring more native bird life back into those areas. I think Ardgour does present a really good opportunity. It's a large areas with a lot of good south facing slopes where we can do that.

Mr McGibbon: Thank you.

Mr Muir: Cross-examination?

CROSS-EXAMINATION BY MR VAN MIERLO:

Mr van Mierlo: Thank you sir. A question directed to Professor Norton. You referred to cyclical clearance rates, burning, spraying, and said it resets the system and then it redevelops, and you referred to quite permissive rules in the Central Otago District Plan and concluded no permanence in the shrubland communities. Would you agree though that the conservation covenant places another restrictive regulatory overlay of activities that can occur on the site, in terms of those farming practises, and the ability to reset the communities, if you like, in that context?

Prof Norton: Yes, I do. As far as I understand the covenant doesn't have a provision that allowance clearance, woody vegetation clearance.

Mr van Mierlo: Yes, thank you.

Mr Muir: Thank you Mr van Mierlo. Any other cross-examination? Thank you. That rounds out that topic. Now Avoidance, vulnerable and irreplaceable values.

TOPIC 4: AVOIDANCE, VULNERABLE AND IRREPLACEABLE VALUES

Mr Muir: Who's leading off the applicant on this issue?

Dr Baber: Technically that should be me. But I might pass over to others to just – is there an option to pass over to others to flesh out what they would like to discuss and then I just close?

Mr Muir: You close, very good.

Dr Baber: If that's okay?

Mr Muir: Very good, we can do it that way then. Shall we start then with you Ms Teele?

Ms Teele: I shouldn't have chosen this seat should I?

Mr Muir: You're always the first cab off the rank.

Ms Teele: As per the joint witness statement, all experts agreed that some ecological values that will be affected by the proposed project, are irreplaceable and/or valuable and we have listed some of those, noting vegetation. They're all plant species. It was also noted by some of the experts, myself included, that the dryland ecosystems and wetland vegetation systems could also be considered irreplaceable and vulnerable. And from my perspective, what this speaks to, pleads into effects management, with impact assessment, if you like, and it speaks to the high ecological, very high ecological value and the high magnitude of effect of these species and systems, that in some cases they are irreplaceable and/or vulnerable. And I'll leave it there for other experts to take that where they may like to go.

Mr Muir: Ms Anderson.

Ms Anderson: I've got nothing further.

Mr Muir: Thank you. Well then let's then raise this issue with Mr Head and then Mr Harding.

Mr Head: Certainly the applicant identifies the cushionfields and the spring annuals as irreplaceable.

Mr Muir: Could you just keep the microphone nice and close there Mr Head. Thank you.

Mr Head: The applicant has rightfully identified the cushionfields and the spring annuals as irreplaceable value. My view is though the extent of irreplaceable value should be greater, and that comes back to the earlier concerns I raised about the under-valuing of some of those key attributes. And then in combination with the downgraded magnitude of effect that I think merely feeds into a table, essentially there are not it's offset or whether or not it should be avoided, and it's [inaudible] that the effects management, but certainly there's, in my view, far more values for their rarity, for their contribution to ecological context, such as connectivity, and ecological sequences, are really important attributes which haven't been adequately assessed. And other values which, you know, assessed objectively score highly, and then which will be permanently lost within the DDF should, in my view, score a very high overall effect. And if it's a very high overall effect, the response is avoidance.

Mr Muir: With pen poised, could you give me four or five?

Mr Head: Well yes I can. Well the way the applicant has assessed it is through what they call – well vegetation types, like EMUs. So, for example, the mixed shrubland EMU which has, I think, 20 something rare and threatened species in it, contributes to an in-tact ecological sequence across altitude and across geological gradients, hence the mine. And other high values means that it should – and which will be permanently lost – in my view should be – should score very high, as should the mixed shrub and scrub – sorry I haven't got the exact names of them here, that is likewise very high. And they actually did score it very high, but then they downgraded the residual effect based on the fact that they think they can re-establish it in the DDF, which I've said I don't agree is an accurate appraisal of that.

That is a sensitive ecosystem with many rare species and other aspects of rarity again, it's an inherent part of the ecological sequence, and which will be severely affected in terms of it will all go. That should also be – should be classified as an overall very high value and avoided in my view. I can keep going.

I mean the most part, in my view, most the what they call EMU or vegetation types that comprise the DDF, which are ecologically significant, and support multiple attributes of significance, you know rare species, is in a large part replaceable when you consider that the ability to recreate that ecosystem is very, very unlikely and that, and the time for it to occur, effectively means that, you know, it's gone for such a period of time that we can only consider it to be irreplaceable. It's a bit like cutting

off your arm but saving your freckles. Because planting tussocks in the wider area and shrubs within areas which are already significant, does not address the inherent values of the ecosystem which is permanently lost.

Mr Muir: Would there be a certainty irony in the fact that everyone talks about this being a heavily degraded system, and I am no ecologist. I visited the site and I think it is a fair description. For the unformed eye, I'll give you that, it looks a heavily degraded system. And yet now it is assuming a certain reverence on account of its heavy degradation. Can you understand my point?

Mr Head: Oh yeah, that's right. The context is everything and, you know, in the lowlands of New Zealand there's virtually no in-tact ecosystems remaining. For example, if you drive across the country of Canterbury, you drive across the Canterbury Plains you won't even see a native plant between Christchurch and Timaru. And I mean degraded is probably the wrong word. It's modified, you know, like most of them are. But it still retains all those inherent aspects of the dryland ecosystem, and part of that is a high level of rarity, and that's reflected in Mr Milner's assessment. He's assessed it as significant. The whole, more or less the whole of the DDF, which is the area I'm referring to too, is significant, for those reasons I've talked about.

Mr Muir: Mr Harding?

Mr Harding: Thank you. I mean I haven't got much to add to what's been said, but I just will refer back I guess for clarity to the vegetation joint witness statement, para 44 and there's – we all agreed there are seven species in one community that should be considered irreplaceable, within the DDF. I've also noted that you could probably assess other components as irreplaceable. We didn't go down that path, but that's just an acknowledgment that what's been assessed is based on species and communities.

I'd just also like to point out that since then, and this in the effects management joint witness statement, we went further, Mr Milner did a further assessment of the species, and which raised the – he raised the magnitude of effect on the species from what his former assessment was, which means there's probably two more species, if you were to just directly look at species that would be regarded as irreplaceable.

Ms Sweetman: Is that paragraph 115?

Mr Harding: That's 115, yes, thank you. Yeah. So there's two other species that are already there, Myosotis brevis and Ceratocephala pungens are in the para 44 of the earlier statement as being irreplaceable because of their high value. But there's also now Myosotis antarctica and Myosurus minimus would also now fit in that category under the same criteria. So just for clarity. Thank you.

Mr Muir: Mr Crowe?

Mr Crowe: Thank you. I think – I mean I'd like to agree with my colleagues' comments, and perhaps also just to draw back to why it is considered inappropriate to off-set or compensate for, through biodiversity offsetting and compensation for the loss of these vulnerable and irreplaceable values. And it comes back to the objective of the National Policy Statement for Indigenous Biodiversity which is to maintain indigenous biodiversity across New Zealand. So there is, at least, no overall loss of indigenous biodiversity. And what a loss of irreplaceable and vulnerable species means, is a net loss in the indigenous biodiversity in New Zealand.

Mr Muir: Dr Rogers?

Dr Rogers: Thank you. I note the absence of non-vascular plant values in the assessment of vulnerable and irreplaceable species. Our present science knowledge is that there are endemic lichens, but I cannot speak for mosses and liverworts. But there are certainly more than one species, likely two to three, taxa that are lichens, that are crustose lichens that are presently known only from the broad Come in Time proposed pit footprint, and they've been completely overlooked in the assessment of irreplaceable and vulnerable values, other way round.

And just finally, I just want to reinforce Mr Head's clarification or use of a better term and therefore a better concept and the value of dryland ecosystems. I believe that we should be using and viewing them as modified. There's no natural or pre-human component of dryland ecosystems, at least in Otago, remaining in the landscape. They've all had high degrees of modification and commensurate improvements in their rarity values, because they host rare species that have been liberated from the very rare non-forest ecosystems that occurred in pre-human times. Thank you.

Mr Muir: Questions from the Panel?

Dr Simcock: Can I make one more comment if that's all right?

Mr Muir: Yes, of course, Dr Simcock?

Dr Simcock: So yeah Robyn Simcock speaking again. I just, in terms of the spring annuals, so I was one of the people walking around the landscape and co-authors of the 2025 Spring Annual Report that has not been released, and I just thought you might find it useful to consider some of the numbers.

So, while Zac has raised the importance, the threat ranking of these four species, in those 10 days – those 60 person days we spent there, between September and November, our minimum estimates for the Ceratocephala were 11,000; for the [inaudible] it was 59,000; the mouse tail it's 130,000. These are not – these are relatively large numbers. When we first went in there and did the first survey, I think Zac decided from the literature there might be maybe hundreds of those most rare plant. And last year may have been an extremely wet and extremely good year for them. But we're not talking about plants which we've got 10 or 20 or a 100, or a 1000 left.

My second comment would be around the extent to which avoidance has been actioned through the constraint to the DDF to date. We've done some intensive work, using particularly the location of the cushionfields, trying to maximise avoidance. And I don't think that's been fully appreciated. So that's been through relocating and relocating haul roads, moving soil stockpiles and reducing footprints of what can be reduced. Those contingency zones that have been discussed have been narrowed right back to what the applicant thinks is workable to still give them flexibility, and parts of the plant and stockpile have been relocated out to Ardgour Terrace. So they were all things that have been done initially to try and reduce, and avoid impacts.

I'm sorry if that's not relevant to our discussions, but I sort of thought that that work may be useful to highlight.

Mr Muir: Yes, thank you Dr Simcock, and of course you reminded me that we did this in reverse order, and I needed to round back to Mr Milner, and Emeritus Professor Norton, to see whether there was anything that they wanted to respond to.

Mr Milner: Well yeah on the top of them, avoidance. There is the qualified form of avoidance that's proposed for the Come in Time Pit that you'll be familiar with. As of the 2024 work that we did, that was – that would have avoided a very large proportion of the Ceratocephala pungens based on the more up-to-date data from 2025. It would avoid 19 per cent of the known population of Ceratocephala pungens. Twenty-one per cent would remain in the rest of the DDF.

Mr Muir: Yes, Mr Harding.

Mr Harding: Thank you. Can I just briefly respond to a comment that was made by Dr Simcock. She mentioned the numbers of the species, of the individuals of these species. And I just want to make the point, when the threat status of those species is assessed, it's on a number of factors including its national distribution, the threats, the population trends, and so just the fact that there might be good high numbers at the site, does not mean in any way that it's less threatened. It's not how you assess threat. And in fact, it reinforces the value of the site, with respect to what we know of these species, that there are very high numbers here, and they are not – we don't know of high numbers elsewhere. So just wanted to put it in context, thank you.

QUESTIONS FROM THE PANEL:

Ms Sweetman: Thank you for that Mr Head, that was going to be my question, is what was the distribution of these particular species, and what do we know about where else they are?

Mr Milner: I'm happy to add to that, as I'm sure a few others will be able to. For Ceratocephala, as Mr Harding noted, this is the world hotspot for Ceratocephala pungens. There are a few other places in Central Otago for which there are very small populations potentially of several plants, that might pop up in some years. As far as I understand there was another population in the McKenzie Basin which has not been detected for a number of years now. And so what we're looking at, at the

site, in the ESA and the area surrounding the ESA, is the hotspot and now has 98 per cent, as far as I can tell, of the world population.

Dr Rogers: Mr Chairman could I comment please?

Mr Muir: Just one moment please until we conclude this topic and what Ms Sweetman wants to ask.

Ms Sweetman: So if that's the case, this is 98 per cent of the world's population of the species, does that mean that it's loss would have international significance?

Mr Milner: Sorry, I should clarify, 98 per cent is within the – in the ESA and wider area, 40 per cent is within the DDF. Yes, I would say that an effect on 40 per cent of a population like this would materially move it closer to extinction, and yeah sure would be of international significance.

Ms Sweetman: The area you're talking about, is that all within the conservation covenant area, or outside as well?

Mr Milner: In and out.

Mr Crowe: If I may add some further clarification. As far as I'm aware the populations that have been found within that conservation covenant, are only within the area proposed to be revoked.

Mr Muir: Sorry?

Mr Crowe: The populations of this critically threatened species that occur within the Bendigo Conservation Covenant are entirely contained within the area proposed to be revoked.

Ms Sweetman: Dr Rogers did you want to comment?

Dr Rogers: Thank you. Yeah, thank you for the opportunity. The witnesses have dealing in their evaluation of the significance of these nationally critical species in particular Ceratocephala and Myosotis brevis. They're referring to my science. I want to correct them somewhat. There are three perhaps viable, and significant populations of Ceratocephala. One is on the DDF. There's one next door on the Mt Koinga component of the Bendigo Historic Reserve, and there's another significant, probably sustainable population, at the Bannock Burn Historic Reserve.

And I just want to also reinforce, I think it was what Mr Head said, when we come to – I think it's a red-herring, and a somewhat shallow evaluation of the value of these things based on the numerical number of the species that have been recorded. Far more important is the ecological integrity of the population when it comes to evaluating their significance. And that is populations, the sustainability of the habitat, security of tenure of the land, and all sorts of other factors go into evaluating the replaceability of these highly critical species on the DDF. Thank you.

Mr Muir: Sorry could I come back please again to Mr Milner then and we have established that 98 per cent of the world's population was within the wider area,

40 per cent within the DDF, and then, of course, we have an application recognising the importance of this, and premising a significant component of the application on identification of further populations.

And so could I ask whether you had made any analysis, if the Come in Time pit development did not extend beyond what is initially proposed, the first and approximately I think about a thousand square metres only area, I might be wrong on that, but there was a proposed initial works in that area, and then no further works until such time as the relativities of that population to a wider population had fallen below critical levels. If we took out the balance of what is proposed there, and for the purposes of argument assumed that this Panel were to grant the application, other than in that respect, and to say there was no Come in Time development, what are we down to then?

Mr Milner: For Ceratocephala pungens that would be 21 per cent of the DDF without the Come in Time pit.

Mr Muir: So it will be 21 per cent of the DDF would be affected without the Come in Time pit, but that includes the initial Come in Time works does it? Because the initial works appeared to be in an area rich in cushionfields and presumably spring annuals.

Mr Milner: Yeah, no sorry I haven't ruled out that initial works area when making that assessment.

Mr Muir: Right. So even if the initial works were to come out, we may be down well under 20 per cent in the balance of the DDF?

Mr Milner: No it would be at least 21 per cent.

Mr Muir: At least 21 per cent?

Mr Milner: Yeah. But also noting that there's portions of the DDF that have not been surveyed.

Mr Muir: Thank you.

Ms Sweetman: Did you have anything further to say Dr Baber?

Dr Baber: Oh that's uncanny.

Ms Sweetman: I don't know what made me think that you might have something to say.

Dr Baber: Neither do I. No, thank you. Thank you for the opportunity. So, I'm going to be be brief. So the first thing I would like to say, sir, this – so we're sort of half way through and have a covered a lot of that last section, the significance of the effects and the implications. So, I think we're on that now, and I'd just like to sum up my position.

My position is that a lot of – there's been some good comments and some perspectives from invited parties, and I'm not going to rebut or respond to those here,

but I do ask that my response, a lot of what's raised I have rebutted or responded to in my evidence, and I'm just – there's some – I have - - -

Mr Muir: Rest assured we'll be going back to - - -

Dr Baber: Thank you. All right. Now for context, like if I listen to that, I'd be like "right that guy must've basically assessed the site as having no significance and all the values were low, and there were no effects". That's sort of the impression that I get from that chat over there, which is fine. What I'll do is I'll provide some context to that.

So the first thing, I assessed the entire site as ecologically significant. Of the seven terrestrial habitats and looking at the values and the effects on those values, I assessed those – two of them as very high level of residual effects, which is the highest category; one of them I assessed as high residual level of residual effects, which is the second highest category; and three as moderate, and only one as low.

In terms of the species of 88 notable species that we assessed, 13 of them were assessed as having our effects being very high level of residual effects, which is again the highest category; and 14 of them I assessed as having high levels of residual effects.

When it comes to the limits to offsetting compensation, which ultimately in my view is where you have significant adverse effect on irreplaceable or vulnerable species, that cannot be demonstrably offset, we've got about six or seven instances of those, including all the spring annuals that we talked about.

So just for some context, that was my assessment and I am comfortable with that assessment, acknowledging that a lot of others think I've underplayed pretty much everything. So I'd just like to say that. Thank you.

Mr Muir: Well that's effectively introduced our last topic, and so we'll just run straight into that.

Ms Vella: Sorry sir, will there be an opportunity for cross-examination on those points?

Mr Muir: Sorry?

Ms Vella: Is there an opportunity for cross-examination on those – that topic?

Mr Muir: Yes, there's always an opportunity for cross-examination. It's a question of whether you want me to break and allow cross-examination now, or whether we just round out the significance of effects and then have an overall opportunity to cross-examine at the end of that.

Ms Vella: That's fine with me, sir, yes.

Mr Muir: Is that all right with you, Ms Vela?

Ms Vella: Yes, of course.

Mr Muir: Thank you. Thank you so much. Have you finished on that point, Dr Baber?

Dr Baber: Yes sir.

Mr Muir: I thought that you had. Right. Okay. Is there any other member of the applicant's team who speaks to that issue? Would like to? Right, okay. Ms Teele.

Ms Teele: Thank you. In some ways Dr Baber has hit the nail on the head, and I'll only speak for myself here. But I do believe that ecological values have been valued too low, and the magnitude of effect is higher than what it stands. And I think sitting in this room is a lot of expertise in inland dryland ecosystems, probably most of the country to be honest. And I appreciate that terming it degraded isn't the right term. There's a lot of value there, avifauna value, lizard value, vegetation value. And, I think, in terms of significance of effect, the significant of effects are large, larger than what has been stated, and I'm not going to delve into the effects management because we're going to get there. At this stage the management plans do not outweigh that at all. So I think, from my perspective, I'd just like to make clear to the Panel that the overall loss, and the significance of value is much higher than what is currently stated.

Mr Muir: Ms Anderson.

Ms Anderson: I concur with Ms Teele.

Mr Muir: Mr Head.

Mr Head: My view is that the effects are certainly more than minor, an in many cases severe, and as it currently is, results in the enduring loss of significant indigenous biodiversity in ecosystems.

Mr Muir: Mr Harding.

Mr Harding: Thank you. I'll start with a sort of retraction if you like. I do concur that they've been modified is a better way to describe the site than degraded. And, I think the residual effects are significant, and I'll just briefly explain one of the reasons I say that. Is that I work quite extensively in dryland systems and also have worked quite extensively at assessing the rate of change in those systems, over the years, through, particularly through the conversion of land, and have recently done some work for Otago Regional Council on that very matter.

And what the evidence shows is an on-going incremental loss of dryland systems in inland parts of the country. The McKenzie Basin and Central Otago, are two very good examples, and in Central Otago even though there's between 1996 and 2018, and I've got some evidence presented in para 37 of my main evidence, more than 9,000 hectares of loss of those dryland type ecosystems. Not all of it in Central, but most of the change in the Otago region has occurred in Central, and even, I mean it's evident if you drive through, you can see the subdivision development, the vineyard development.

And so I guess I'm just saying that for context, because even though the site's modified it is one of the few remaining sort of in-tact dryland systems in the sense that it's not been converted to pasture or residential subdivision, or vineyard, or mine.

Mr Muir: Or orchard.

Mr Harding: Or orchard. So I just – I guess that's by way of explanation of why I think, or one of the reasons I think the residual effects would be significant. Thank you.

Mr Muir: Mr Crowe.

Mr Crowe: Thank you Mr Chair. One of the points that I'm going to broadly lump into the significance of effects is with respect to the proposed revocation of the conservation covenant. And having had the discussion that we've had regarding the nine values within that area, I think it should be clear to the Panel that the values within that area are very high. And currently, as the application stands, there is no clear, or direct, compensation provided for that removal of the conservation covenant. There has been several mentions of covenanting in the future, but it's unclear, and there doesn't appear to be any direct link in terms of compensation for that loss of protection, particularly of those very high values. That's the point that I wanted to raise.

And with regards to the significance of the effects, something that Mr Harding has already raised, but to labour the point, and having spent several calories trying to get my head around these documents, it has taken quite some time for me to appreciate that the calculated residual effects are including what is assumed to occur post-rehabilitation. And so to my mind, that makes some large assumptions about success of a very experimental process.

Mr Muir: Assumptions about the ultimate outcome of a process which involves experimentation. There might be many failures along the way, but which assumes that ultimately, by one means or another, provided it's sufficiently well-funded, and supervised, that it can produce something in due course. Presumably at some stage it used to grow things before farmers came along and it was burnt, and overgrazed. So apart from issues of climate change, that might have affected certain of the micro-environments there, it is capable one way or another, of some form of revegetation, given enough energy, time and money. Correct?

Mr Crowe: I absolutely acknowledge that. But the concern that I have is that there is very little transparency about the amount of weight that has been placed on the rehabilitation success. And should that not be successful, what would be an appropriate commensurate offset to account for that success. So as currently calculated, those components of the mitigation, including rehabilitation, if they're amalgamated together, and in the absence of that rehabilitation portion being extracted, and being able to be interrogated in isolation, is unclear. Is it half? Is it 20 per cent? To me that's an area for concern.

Mr Muir: Are those considerations that we have got to have in mind in the context of proposed bonding? Is that what you're talking about?

Mr Crowe: It is a matter that could be addressed through bonding. It is also a matter that could be addressed in other ways.

Mr Muir: What about the recently proposed – we're seeking some further information on it at the moment – the recently proposed fund capitalised to up to $50 million for this purpose?

Mr Crowe: I would suggest that a more precautionary approach would be to provide credit for rehabilitation once it has been achieved, rather than to provide that credit in advance, in terms of calculating the residual effects.

Mr Muir: That's a chicken and egg isn't it, because one never ever gets to that point unless there's been an approval and we never get an approval while we're saying that this is a, you know, seriously adverse effect that's not – that is out of proportion to a regional or national benefit, and in order to make our assessment of how serious the effect or impact is, we are obliged to take into account the condition. So we go around in a circle. It's a problem for us.

Mr Crowe: My sympathy, sir.

Mr Muir: Mr Rogers.

Dr Rogers: The point, I just note that an evaluation of significance of effects it has to be predicated on the surety of restoring the 480 hectares of the DDF. I believe there's great uncertainty around that. It's going to be entirely experimental. From what I've heard, the protocols around attempting to reintroduce 230 hectares of shrubland, and 220 hectares of grass, of short tussock land, give me no confidence that there's going to be any measurable measure of success.

Now many of these species that will be attempted to be introduced occur in the landscape. However, on earthworks engineered surfaces, we have lost all integrity of the soil component of the ecosystem. You're dealing with a complete unknown trying to plant native plants in this extremely exposed drought prone, dryland ecosystem. There is no protocol around it. It's going to be entirely experimental.

Yes we have protocols for restoring engineered, or earthworks engineered surfaces in the lowlands, and what we've learnt from that is that every plant needs to be micro-managed and protected with surrounds, with mulching, with weeding, for a minimum of three to five years. So finally, I'll just say that the great degree of uncertainty we have around whether the mine footprint can be rehabilitated leads us to having a poor understanding, I think, of the significance of effects of this mine. Thank you.

Mr Muir: Don't you think that you might just be being just a tad too pessimistic? Have you turned your mind to any of the international instances of mine rehabilitation, even at altitude and in arid environments, where, with in the old saying, where's there's a will there's a way, but it's usually qualified by the fact where

there's a large pot of money there's a way. But you can get some satisfactory rehabilitative outcomes.

Dr Rogers: Yes. In response, there have been attempts to rehabilitate similarly large footprints of cleared land in Otago. But that is an inequitably moist micro-environment, which is quite different.

Mr Muir: Sorry, I was referring to international examples in arid environments, if you had any experience with them?

Dr Rogers: None at all, sir.

Mr Muir: Right thank you.

Mr McGibbon: I just wonder, Mr Chairman, whether Dr Simcock might want to respond to that?

Dr Simcock: Yes, I do have some experience with international arid environments through going over to Australia during their Australian Mine workshops that they have – used to have every couple of years. So, I went through from one in Australia, but particularly Western Australia, and then in parts of – yeah anyway.

There is a variety of techniques, and what I think has been under-appreciated is the role that occurs when you are doing mine rehabilitation versus a community planting into pasture, and the differences between this site and what we – what is in Macraes

So the key difference between community planting locally and Macraes is that here you have surfaces that are treated to create those microsites. So they're not flat. They're dimpled. There's rock added. So and that helps with forming the microsites. The dimpling means that you have low points and high points. You put plants where they're protected a bit lower, and the rocks again provide some shelter, some anchoring, some degree of redistribution of water.

Unlike a community situation, we're not talking about planting into pasture, where you have high competing biomass. At Macraes they do an extremely good job of rehabilitating pasture for grazing stock production, because that's what they've been requested to do. So what they do is they put 50 kilograms/hectares of seed with three to four hundred kgs of super-phosphate and nitrogen to kick start that system. It's not what's been proposed here.

Here we're proposing putting two to three kilograms of pasture with probably no fertilisation to get simply a stabilising cover that's very sparse but holds the space, just does enough to keep the site from eroding. And the two other things that are different about this sort of project compared to a community planting, is that as you said, you've got a 10 or 15 year plant supply contracts that are guaranteed, that enable you to have targeted production for a wider species range for things that you can't normally do if you're just trying to get root trainers in the ground. You have your contracts in place. It's not being done by volunteers, and that maintenance and

monitoring is being driven by reporting, and it's got some very clear goals for success.

So, I'm annoyed with myself that I haven't made it clear enough obviously in the documentation for the LERMP. The reason that only 20 per cent of the site is proposed to be planted is because this is a dryland environment, and I think it's best done through a lot of natural revegetation which is the reason for the massive investment in that mine regeneration zone that wraps right around the site. So that's been enhanced with native seed sources and controls. So you've got a seed, a proper [inaudible] flow coming through this landscape.

The mine itself is not that wide, and the MRZ connects with Department of Conservation land at the top of the range right through to the Ardgour Terraces at the bottom. So it's basically wrapped around by what is aimed to be a [inaudible] source of flows going in for these drought tolerant, tough old things, that may only seed one year, may only have good seed supply for spring every five years. But there's the time, and as you say the willing, in the requirements to develop a cover over the 35 year project.

What I haven't done, is in the LERMP it's been clear in the talking with the experts that we've been able to do, that we need to do some improvements to increase the certainty, or reduce the risk, and I think part of that, there's sort of like three things that I think need to be done before the next version of the management plan.

Add intermediate success targets. So at the moment we've just got the year three to five, and the closure, but having that year 10 target so we can have – so there is a measurable – yeah very clear measurable intermediate timeframes to get things back on track if they're not. All the experts agreed, in terms of having five yearly reporting and requiring the LERMP to be revised every five years based on monitoring and independently reviewed, and I think that's a fantastic – a really important thing to do.

And the last one is to add more detail on the corrective actions if plant survival is inadequate. And so that will go into the next version of the LERMP as well, so it's very clear that if things go wrong, because there's with the initial planting what then gets put into place, the options.

Does that help?

Mr Muir: Yes. Thank you, very much, Dr Simcock, it does.

Ms Teele: Can I reply to her? I appreciate we're on a time constraint?

Mr Muir: Yes, do add any comment that you think is appropriate Ms Teele.

Ms Teele: So when I speak to the management plans that doesn't come from community restoration planting experience alone. Have I been involved in that? Yes. I also have experience project managing and being involved in large-scale landscape restoration projects of between 20,000 to 100,000 plus native plants. This is within the Queenstown-Lakes District, so the neighbouring district, and I will say it is a

slightly easier environment. We're slightly more west, which makes a difference. However, we do have the similarity – there are similarities. They're extenuated though as you go into Central Otago. And having read the LERMP a number of times now, and tried to get my head around what will that DDF area look like when the rehabilitation is put in place?

There is proposed to be hydroseeding of brown top and sweet vernal which is an exotic green grass. I understand that is for erosion control measures, dust control. I fully appreciate that. The proposed native planting is of less than 20 per cent. There is, in some areas, it's as low as 15 per cent. In one area the TSF, I appreciate the planting rate is 7,500 per hectare. That is, in my view, reasonably high. But overall what I envision, in lieu of a landscape plan, is large areas of exotic green grass with pockets, or nodes of native plants that will – might survive. I don't at this point think it will necessarily thrive. The planting measures that we employ in the Queenstown-Lakes District is to plant it one metre centres to achieve that. One of our biggest problems is exotic green grass. They're one of the biggest competitors to native plants expansion. I appreciate what Dr Simcock has said in terms of – oh goodness I've lost my train of though.

Mr Muir: That's quite all right. Why don't I just invite the cross-examination that we have deferred and then we can come back to you if - - -

Ms Teele: Thank you.

Mr Muir: - - - there's something additional you want to add. Ms Vela you had some cross-examination on one or other of topics four and five?

CROSS-EXAMINATION BY MS VELLA:

Ms Vella: Thank you, sir, and I'll say that your judgement was good because some of my questions have been answered. So I just have a couple.

Perhaps if I could come back to the questions that Ms Sweetman was asking around the – Commissioner Sweetman sorry – around the Come in Time pit. Mr Milner, at the time that – well I should probably start with saying that all the experts have agreed in the JWS, haven't they, that the most appropriate approach to spring annuals in the Come in Time pit is avoidance?

Mr Milner: I believe so yes.

Ms Vella: Including yourself?

Mr Milner: Yes.

Ms Vella: That's at paragraph 38 of JWS 1. And that the condition for the Come in Time pit is the only circumstance in which it should be mined, as in the population of seed pungens and Myosotis brevis is found to be equal to or less than one per cent of the population in the Dunstan ecological district?

Mr Milner: Sorry, could you repeat that question?

Ms Vella: Sorry, the Come in Time pit condition and your acceptance that avoidance is the most appropriate response, leads to the Come in Time pit condition which says that the only circumstance in which the Come in Time should be mined – sorry I'm having trouble with my microphone – is if it can be demonstrated that the population of C-pungens and Myosotis brevis is equal to or less than one percent of the population in the Dunstan ecological district?

Mr Milner: Yes, although the avoidance statement was kind of separate. It was saying the most appropriate approach is to avoid and if that's not possible, then using this threshold system would be the next most appropriate approach.

Ms Vella: Okay.

Mr Milner: And also further clarification, not just finding plants within the rest of the ED, but also potentially establishing plants.

Ms Vella: Yes. At the time that proposed condition was developed, our understanding of the population of C-pungens in the Come and Time pit was that it was 17 per cent of the national population, is that right, or the world's population?

Mr Milner: Correct.

Ms Vella: Yes, and at the time the understanding was that the population in the rest of the DDF was only three per cent?

Mr Milner: Correct.

Ms Vella: And now, based on current information, there's 19 per cent of C-pungens in the CIT pit.

Mr Milner: Correct.

Ms Vella: And 21 per cent in the remainder of the DDF outside the CIT pit?

Mr Milner: Correct.

Ms Vella: And so wouldn't you also accept that the most appropriate approach in the DDF as a whole, is to avoid?

Mr Milner: For those species?

Ms Vella: For those species?

Mr Milner: Absolutely.

Ms Vella: Yes. And the second most appropriate approach would be to adopt a similar condition, as per the Come in Time pit?

Mr Milner: Yes.

Ms Vella: Thank you. Dr Simcock, you made some comments about wanting to be clear about the extent to which measures have been employed to avoid effects on spring annuals. Do you recall that?

Dr Simcock: Yes, I can't see who's speaking sorry.

Ms Vella: Sorry, Ms Vella for EDS. Do you recall that?

Dr Simcock: I did, yes.

Ms Vella: My question for you is, at any time have you been asked to advise the applicant on the extent to which underground mining in this location would avoid adverse effects on these species?

Dr Simcock: Sorry, have I been asked the extent which underground mining would avoid extent?

Ms Vella: To advise the applicant of the extent to which underground mining would avoid adverse effects on these species?

Dr Simcock: No, but underground mining's been – where they are considering doing underground mining has been discussed.

Ms Vella: But you haven't been asked to advise on the extent to which that approach would avoid adverse effects on these species?

Dr Simcock: Not generally, no in any one specific circumstance.

Ms Vella: I'm not sure if that's answering my question. Have you been asked to advise on that point?

Dr Simcock: Well we've discussed it for one of the ore bodies, but not others no.

Ms Vella: Would underground mining avoid adverse effects on some of these species that we're talking about, in terms of spring annuals at this location?

Dr Simcock: Yes, if you don't disturb the surface you generally can avoid effects on these sorts of species that have shallow roots.

Ms Vella: Thank you. And sir my last point, rather than cross-examine one of the witnesses on this, I wonder if I may simply point out to you, and make a request, that in terms of the Environment Court Practice Note and Expert Witness Code of Conduct, expert witnesses are required to identify the data, information, facts and assumptions considered in forming their opinions, and specify literature or other material used or relied on by them in support of any expert opinion expressed. But as you've heard there's a 2025 report on the survey of this area that has not been released, and I understand that there may be some information within it, that it's not entirely clear what that information is, but relates to private land. And EDS requests that that report be provided, even if privacy information, as it should be, is appropriately redacted. Because otherwise the other experts haven't had the benefit of seeing that and understanding that report.

Mr Muir: This is the report that's referred to in paragraphs 115 to 117 of the joint witness statement, correct?

Ms Vella: That's my understanding sir. 116, is the relevant paragraph where some of the experts have noted that the report that outlines the method and data analysis was not made available, despite repeated requests to the applicant.

Mr Muir: Yes, 116.

Ms Vella: And, of course, Mr Milner in response to my question earlier considers that it has information that would assist you.

Mr Muir: Right. Well what I will ask EDS to do, is to make their application in writing and the Panel will consider it, and the implications of any grant of your application in terms of whether the experts have to, in any way, reconvene to consider it.

Ms Vella: Thank you sir.

Mr Muir: Thank you. Right, that concludes - - -

Ms Gepp: Sir I have some questions as well.

Mr Muir: Sorry. Ms Gepp thank you.

CROSS-EXAMINATION BY MS GEPP:

Ms Gepp: Thank you. First of all to Dr Simcock. You were asked a question by Ms Vella about whether you had been asked to advise on the extent to which underground mining could avoid effects on these species and ecosystems. And I have a similar question. Were you asked to advise on tailings management options and the extent to which adopting a different tailings management option could avoid effects on these species and ecosystems?

Dr Simcock: No, that would be part of the whole ecological group sitting together with our maps.

Ms Gepp: Was the whole ecological group asked to advise on that?

Dr Simcock: Matt, Zac, when we sat, when we started to do outlines and alternatives, can you remember back to then?

Dr Baber: We were asked to characterise and assess the values of the project as proposed when put in front of us.

Dr Simcock: Right, so the answer therefore must be no.

Ms Gepp: Thank you. And then also following up on an issue around the 2025 report and it's probably a question – I'll start with you Mr Milner, it might be – you might be the one to answer it. The latest version of the conditions that the applicant has put forward refers to in condition 107, and this is this condition around spring annuals within the Come in Time pit, it now refers to the population of the spring annuals within the Come in Time open pit footprint, and the words "recorded in 2025" have been added. So it's the population from the 2025 survey. Is that the population recorded in this report that the other experts don't have?

Mr Milner: Yes, I think that's what it's referring to, but I will note that the data from that survey has been shared. And, secondly, in one of the JWSs we proposed new wording for that condition.

Ms Gepp: All right. And then on the earlier topic about irreplaceability and vulnerability, perhaps Dr Baber it might best if you answer these questions. So those words have been used quite a lot.

Dr Baber: Yes.

Ms Gepp: When the experts are using those words, they are using them – they are using those particular words because they are in the National Policy Statement for Indigenous Biodiversity aren't they?

Dr Baber: Yes.

Ms Gepp: So they appear in both the biodiversity offsetting principles and the biodiversity compensation principles - - -

Dr Baber: Yes, they do.

Ms Gepp: - - - in that National Police Statement?

Dr Baber: Yes.

Ms Gepp: And that the – in both offsetting and compensation principles say that if you have values that are irreplaceable or vulnerable, then that's essentially a limit to offsetting or compensation, where you shouldn't be using those. It wouldn't be appropriate to offset or compensate. That's right isn't it?

Dr Baber: That is what they say. That, in my view, has some flaws in it, that statement, because that's irrespective of the scale of magnitude on those and/or the ability to offset or compensate. So you could have, if there was a simple avoidance on any species that were deemed irreplaceable or valuable – ah vulnerable, and in an extreme situation that was a one square metre impact, then it would just seem unusual for that to constitute a limits to offsetting. The intent of the limits to offsetting, hitting that mark is at the worst case you are causing the global extinction of a species, and then down from that it's more into the exacerbating the risk on a local population.

So it doesn't seem – so I can't see how that is a stand-alone avoid scenario, relates to something like a very small impact on those irreplaceable, vulnerable species. Or equally where you have impact on those species and it's a decent one, but there's demonstrable ways in which you can achieve tangible biodiversity gains that might exceed the impacts. So that, I think that's the full context of, and so just that statement in and of itself, doesn't align or match with the intent of what the limits to offsetting and compensation principles are, in my view.

Ms Gepp: Okay, if I just take you back to the words of the National Policy Statement though - - -

Dr Baber: Yes, then you are correct.

Ms Gepp: - - - that that's what it says - - -

Dr Baber: Yes, hundred per cent that's what it says.

Ms Gepp: - - - isn't it, so that's an issue you'd have to take up with [over speaking]

Dr Baber: Yes. Yes, whoever wrote it because I don't know who that was.

Ms Gepp: Okay. So then just working through what the means. So if biodiversity offsetting is not appropriate, coming back into the body of the National Policy Statement and thinking about the policy relating to effects management, the effects management hierarchy, which starts with avoiding where practicable, and then minimising, remediating, offsetting or compensating. But if those things aren't available then the Policy Statement says the impact itself should be avoided doesn't it?

Dr Baber: It does, and so when working within and under that policy then anything that hits or is likely to hit the limits to offsetting or compensation principle, the appropriate approach under that policy is to avoid, yes.

Ms Gepp: So to the extent that the project doesn't avoid those impacts, it is contrary to the National Policy Statement?

Dr Baber: It is contrary to the National Policy Statement and as we have set out, there are six values that we consider are likely to not meet that principle, and one that may not meet that principle, as set out. So under that Policy, it's stand-alone, that is the appropriate course of action, yes.

Ms Gepp: And if this was going through an application under the Resource Management Act directly, that would be a very significant issue for [inaudible-coughing] for consenting wouldn't it?

Dr Baber: To my understanding, but again I'm not a planner or a lawyer, so I don't have that full expertise.

Ms Gepp: No, but you've been involved in heaps of these haven't you?

Dr Baber: Yes, I have and it's my [inaudible coughing] quite a few, and that is my understanding, yes.

Ms Gepp: Thank you. Okay, and my last question is for Professor Norton, the last topic, and this relates to the covenant and revocation of part of the covenant. You give some evidence on this in a response to a request for information and it looks as though you've been given the lucky task of responding to that request for information and that you have reviewed and drawn on the other experts' reports, but that they haven't been directly involved in answering that question. Is that accurate?

Prof Norton: No, that's actually incorrect. The question from the Panel related specifically to the PNAP report and a LINZ report and the request was framed in the context of those two reports.

Ms Gepp: So to the extent you have an opinion on – to the extent you give an opinion on the proposed revocation, you're limiting it to an assessment against particular

reports? You're not providing an assessment of the revocation criteria, is that the distinction you're making?

Prof Norton: Yes, the request for information related specifically to the PNAP report and the LINZ report, which is associated with the 10 year review.

Ms Gepp: Okay. All right. So in that case, I'll widen my question out to all of the applicant's witnesses then. There hasn't been an assessment of the vegetation values within the covenant – the revocation area specifically has there?

Dr Baber: No there hasn't.

Ms Gepp: So okay, that's probably, that's fine. And then in terms of the criteria for assessing a covenant revocation, one of those is whether the revocation will compromise values of regional, national or international significance. Mr Milner, with what you were saying about the percentage of certain spring annuals that are affected, that sounds as though you'd agree that that would compromise the values of regional, national or international significance?

Mr Milner: I haven't made the assessment against the covenant revocation area, sorry, so I wouldn't be able to comment on that specifically.

Ms Gepp: Okay, so we don't have specific evidence on that point?

Mr Milner: No.

Ms Gepp: Okay. All right, does any of the other applicant's witnesses want to comment on that? No. Do any of the other witnesses want to comment on the covenant revocation?

Mr Muir: Well I'll control the cross-examination. Are there any of the other applicant's witnesses that wish to contribute to this? Within very strict limits, given that we are now running one hour behind schedule, is there any other witness that wished to comment on that?

Mr Crowe: If I may?

Mr Muir: Yes.

Mr Crowe: So as I alluded to earlier, if I was to be asked what the impact of the revocation is in terms of the impact on the covenant's values, or the implications on the values generally, based on the current information it would be a very difficult task. Notwithstanding the limited information that we have got on the spring annual distributions, which alone would be a national – a matter of national significance.

Mr Muir: Thank you.

Ms Teele: Would you like me to round up from my point I was making before in 30 seconds.

Mr Muir: Well you did make the point very articulately.

Ms Teele: Okay, that's fine. If there's nothing further, it's all good.

Mr Muir: Very good, Mr Leckie was there anything here?

Mr Leckie: No, nothing further from me.

Mr Muir: Right, thank you. Thank you very much. That closes our group's topic and we are going to just take a five minute comfort stop before we start on the last topic of the day.

Court adjourned at [time]
Court resumed at [time]

EFFECTS MANAGEMENT:

Mr Muir: On the subject of effects management we have a very, very large team here, and I'm just going to make sure that I identify the new additions that we've got coming in. Mr Colbourne, you're back with us remotely, correct?

Mr Colbourne: That's right, yes.

Mr Muir: That's right, yes, and we've still got Dr Simcock on the line. Yes, Mr Dale, you're back with us too remotely, correct?

Mr Dale: Yes.

Mr Muir: Right, okay. And some new faces. Yes, could you introduce yourself please?

Dr Giejsztowt: Kia ora. I'm Dr Justyna Giejsztowt. If that's mispronounced I won't be offended, just in advance.

Mr Muir: Give me one more turn at trying to get it right.

Dr Giejsztowt: Giejsztowt.

Mr Muir: Thank you. Thank you very much, Dr Giejsztowt. Right any other new faces? No. No that's the only one. Right, okay. We're going to be on first name terms shortly. Okay. Now who is leading off effects management for the applicant?

Ms Sweetman: [inaudible]

Mr Muir: Oh yes I know but I just wanted to know whether they had reached a point of – after discussion – identification of the topics that we're going to put up there. Who's the spokesperson for topics?

Dr Ussher: We're all pointing the finger at each other at the moment. We do have a list. Zac would you like to, since you've got it on your computer?

Mr Muir: Right, okay. We've got a list. I don't care who dictates it, thank you.

Mr Milner: Okay. Well there's five topics. Number 1: Scale and significance of residual effects; and in the same topic and overall expected outcomes; Number 2: implementation of effects and effects management hierarchy. Number 3: Scope of offset and compensation package. Number 4: Level of uncertainty and residual effect. And number 5: Long-term outcomes.

Mr Muir: Right, so the way to handle it is, I'm going to just invite whoever it is, and if more than one, the several representatives of the applicant to address first, and then I'm just going to proceed around this way, around the room and then to those who are on-line. And could I get you again, because it's such a large number, just if you would, when we get to you, just reintroduce yourselves for the purpose of our stenographers just in case they don't recognise the voices as the day has gone on.

So topic 1, thank you Dr Baber.

TOPIC 1: SCALE AND SIGNIFICANCE OF RESIDUAL EFFECTS, AND OVERALL EXPECTED OUTCOMES:

Dr Baber: Thank you sir. So there's two part to that topic. So one relates to the scale and significance of residual effects, which I think we have pretty much gone over. But anyone's welcome to revisit that if they would like.

And then we've got the second part to that, which is the overall expected outcomes. So for clarity, we end up with the scale of – well we end up with residual effects and then we look at what those residual effects are, and we engage offsetting and compensation to, and in an attempt to achieve ideally net gain or net positive outcomes.

So, in that regard, I have, in my appendix, of my evidence, a sort of a nature accounting table where, for each value, it line items what the value is, the assessed level of residual effects and then once offsetting and compensation is considered, the expected outcome. And that outcome ranges from net positive, where for that value the gain – sorry the benefits are expected to exceed the impacts, we have net gain where we use an offsetting accounting model to demonstrate predicted net gain.

Then we have some outcomes where, after we employ offsetting or compensation, we're uncertain about the outcome. Maybe it's good. Maybe it's not. We're not sure. Although there's only a few of those. And for a number of them we get a net loss outcome. And this table is an advance on the table in the main report, in that there's also an assessment of the magnitude of net loss. So whether the net loss we think is a pretty minor one, or we think it's a very high net loss.

And then above and beyond that, for some values where we think that degree of net loss, given the values the magnitude and the inability to offset and compensate, triggers the limits to offsetting, or is unlikely to achieve the limits to offsetting.

So that's sort of the master table and where we end up. That is a little bit outdated on the back of the new spring annual information. So there's a joint witness statement which needs to update this fully, needs to be incorporated in this table in my appendix.

Ms Sweetman: So that's Table 2 - - -

Dr Baber: Yes.

Ms Sweetman: - - - from your response to comments?

Dr Baber: Yes.

Ms Sweetman: Okay.

Dr Baber: Yes, that's Table 2. So that's the latest version but we need to add in the spring annual, where we end up after this last spring annual 2025 surveys.

So and I won't go over the species, because there's 88 assessments of those. But we think for exotic pasture per field we end up with a net gain for native elements. We think for the cushionfield we end up, we've assessed this after we try everything around offsetting and compensation, we don't get very far or we still end up with a very high level of residual effect, at a very high magnitude and we think there's a limits to offsetting breach on that one. We think we end up with net gains for the other values, with the exception of – we've got a net loss, moderate magnitude for seepage wetlands, and a net loss magnitude for gully.

Anyway that's all there, so I won't keep running down the list. And that's all I had to say. But are there are any other comments from any other applicant?

Dr Ussher: I suppose the second part of the question was around overall expected outcomes and I - - -

Mr Muir: Just introduce yourself for the purposes of the record.

Dr Ussher: I beg your pardon, Dr Ussher speaking. The second part of the first question was overall expected outcomes. And it would be good to have, to continue on the discussion around – reach a conclusion around the rehabilitative landform as well as the benefits for the Ardgour Station Restoration Area and the MRZ zones.

Mr Muir: Thank you. Then we come to Ms Teele.

Ms Teele: So I think it's very important, at this point, in terms of effects management to note that my understanding from this, is that for indigenous lizards, once you take everything, including offset, after offset and compensation, what are we left with? We're left with an overall net loss for indigenous lizards; an overall net loss for indigenous invertebrates. In terms of avifauna there are net loss with some proposed net positives, and for vegetation and vegetation communities, net loss with some potential positives.

Overall that is a net loss in indigenous values, and the overall effects management package does not balance, or closely balance the ecological impacts. And I would go further to say that there is greater net loss and less a net positive than is stated due to three main reasons, but not limited to these. One, being the experimental nature of many of the management plans that are proposed. Two, the management plans, as they stand, we've had a chance to conference on some aspects of these management plans, but there is still a lot to do to get them to the point where I think they'll achieve what is hoped they will achieve. And the impact of indirect effects, such as lighting, and ecotoxicity have not either been addressed or not sufficiently in the impact assessment. And that is where I will leave it for now.

Mr Muir: Thank you. Ms Anderson.

Ms Anderson: Yes hello, Trudy Anderson for ORC. I just wanted to add to that in regards to lizards, following on from our conversation this morning. I just wanted to draw the Panel's attention to item 36 of the JWS, where myself , and Ms Tocher, comment that we think there's a possibility that the Kawarau Gecko triggers the limits to offsetting and compensation, subject to clarification of a lot of the matters that were discussed this morning.

Mr Muir: Yes, Mr Head.

Mr Head: A lot of my views were known in the last session, in terms of this scale of significance and residual effects, and that my view is they've downgraded both the values and the magnitude of effect being downgraded, so materially understates the true level of residual effects, which in my view a lot of them are irreplaceable.

There's clearly some issues that haven't been addressed, which is the requirement of the applicant to assess the ecological values as a whole. That's a principle they're meant to adhere to. I don't believe they've done that. That means they need to account for the extent of ecosystem loss, and that is a permanent, pretty much permanent loss. A big gap has been created, and with that the loss of ecological connectivity and sequences in functioning, they're core high level ecological attributes that the applicant is required to assess. Based on its [inaudible] I don't believe they've done, and with that is the disaggregated or the attributes of significance and treated them individually. That is also inconsistent with the requirement to assess these values as a whole, as a ecosystem, as ecological values, not individual species values, et cetera.

For those reasons, and as I have said, it adds to the understatement of those and the seriousness of the effects, and on top of that, as we heard from Dr Simcock, the irreplaceability of that gap created, we heard from Dr Simcock, that primarily got to plant it with, if they can plant in vegetation it's primarily an exotic grassland, with a relatively small portion of native species that do not replicate the values lost. So in that regard we have to discount, largely discount what is offered there, and that has knock on effects, clearly in terms of how they've used the rehabilitation of the DDF to downgrade effects, and to come to a conclusion that they do not have to offset – sorry to come to a conclusion that they do not need to avoid. They can offset all those residual effects. I'll leave it at that.

Mr Muir: Mr Harding.

Mr Harding: [inaudible] I think I've already provided advice on most of this. But just with respect to – seeing as the question includes expected outcomes – and there was a lot of discussion at conferencing about the uncertainties associated with restoration. We've already had some discussion about that. But I just, by way of rounding it out, just would like to refer you to para 22 of the second Terrestrial Vegetation JWS, and I'll read it out: "All experts consider that much of the proposed offsetting restoration

and habitat enhancement is experimental. Management plans and AEE rely on restoration/enhancement in a difficult dryland environment where restoration methods have not been well established and also rely on natural regeneration that is not as given and will require intensive management".

And I'm just saying that to just I guess restate the uncertainties that are shown with outcomes. Thank you.

Mr Muir: Mr Crowe.

Mr Crowe: Thank you. I think I've already addressed my concerns.

Mr Muir: Thank you. Dr Giejsztowt.

Dr Giejsztowt: Yeah hi. I wanted to broadly support Ms Teele's comments on the subject. But I had a couple of additions. I just wanted to say that despite the extensive area, and the complexity of all of these proposed effects management actions, I think that overall loss of biodiversity for this project is inevitable. Following expert conferencing, it appears apparent to me that this view is shared by all, if not – well maybe most, if not all the ecologists.

My opinion differs somewhat from the ecologists for the applicant, because I consider the magnitude of this loss has been systematically under-estimated and that there is substantial uncertainty in many parts of the effects management package which greatly elevates the risk to ecology.

I am of the opinion that the proposed effects management is insufficient to address losses by a substantial margin. I know that Dr Baber has provided some summary of how – of the losses and the gains that we might expect across this package, but I just really wanted to highlight some of the losses that we might expect.

So we expect, so everybody, including the applicant's ecologists, expect losses for deplete herb fields and grasslands, which has got a very high ecological value. For seepage wetlands, which are an endangered, naturally uncommon ecosystem, for gully [inaudible], for 23 nationally and regionally threatened, or at risk plant species, and three lizard species, two of which are nationally or regionally threatened, or at risk.

I consider that this list is incomplete because there are many omissions, many of which you have heard about today, and this includes complex ecological attributes, such as integrity, which have not been accounted for, as well as impacts in the long term. I consider that this effects management has also incorrectly incorporated the principle of additionality, and I have major concerns about the level of uncertainty. Which you've heard that word "uncertainty" throughout all of these proceedings, and I think that it should continue to come up, and this has a huge bearing on my assessment of the expected residual effects [inaudible] management, but I'll cover that in further detail in the later point, which is to that subject.

Mr Muir: Thank you. Mr Chinn.

Mr Chinn: Kia ora, it's Warren Chinn, DoC. Yes, we've heard a lot about all sorts of things here. So from the invertebrate point of view, this is a large fragmentation effect on distribution of the inter-genus invertebrate fauna. In fact the disturbance area represents an ecological splice, an insertion of a totally different sort of ecosystem, and it's expecting the invertebrate fauna to comply with the splice, in a way that we want it to be thus. And it may not be.

So some of the effects, lighting has not been resolved. Monitoring of invertebrates populations once they've been shifted around the landscape, has not been fully resolved. And yeah so it represents, not entirely a net loss, but a net reduction in indigenous biomass, and an elevation probably of exotic invertebrate biomass. And so an erosion of the signal of the natural history of the Dunstan Mountains. Thank you.

Mr Muir: Thank you. So Mr Colbourne. Quite a lot has been said by DoC expects. Do you have any additional comment.

Mr Colbourne: I can only talk about the avifauna.

Mr Muir: Yes.

Mr Colbourne: Initially there's going to be quite a lot of disturbance and birds moving out, because birds are quite mobile. But given time, with rehabilitation, the birds should come back, particularly if there's really good pest control methods, which we were a little bit unsure of exactly what that would entail. Whether we're targeting mice or targeting rats, or not. But no matter what the outcome of revegetation is going to be, birds will come back, but we don't know what species will benefit. Some will benefit more than others. So there's a lot of unknowns still.

An example might be Pipits. If you just fill in everything with rock, and a bit of grasses, it might actually suit Pipit habitat. And likewise if it's just all rock, we know at MacRae's that Dotterels have turned up, because it looks like riverbed. But that's not going to be any good for Tomtits and all the other things. So it's really got to monitor what sort of richness, species richness is going to be in the long term.

So yes there's going to be net loss to start with, but hopefully to be optimistic over time, and that might be 35 years, 50 years, and with pest control, I think there might be not such a bad outcome for birds, because they are so mobile. They can move out, but they can move back in.

Mr Muir: Thank you, very much. Mr Dale.

Mr Dale: Kia ora. Yeah, most of the detail of what I would be covering has been covered very well by the previous experts. So to summarise at a high level, in my view the negative effects on ecological values are highly significant. The proposed offset and compensation package, in my view, is manifestly inadequate to address the residual effects, leading to a significant loss of indigenous ecological values.

And there is a lot of uncertainty as to the effectiveness of the management framework. There's a lot of, I think, well intended but experimental methods that are involved in here. It creates, yeah, the uncertainty that that creates I don't think can be under-stated.

And I think the rest of the detail I'll leave for the subsequent topics, thank you.

Mr Muir: Right, thank you. Could I just round back, before I go the Panel to Dr Baber, if there's anything that you wanted to comment on, by way of reply? No, right, okay. From the Panel:

Mr MacGibbon: No. I think there's more issues in the later questions.

Mr Muir: Fine. Any cross-examination?

CROSS-EXAMINATION BY MR RANDAL:

Mr Randal: I have a question that I'll ask now. It's relevant I think to all of the topics, but I'll get it out early.

Mr Muir: This is for the record, Mr Randal.

Mr Randal: Mr Randal, thank you, for Otago Regional Council. I think, maybe it's a question for you Dr Baber. Just thought we should spare a moment for the wetlands, not one of the more common types of effect – projects like this. But obviously of importance for the Regional Council. I think a conclusion is reached by the applicant's experts that there'll be a demonstrable net gain – sorry in terms of marsh swamp wetlands, there are some wetlands within the DDF that are to be rehabilitated to a net gain standard. Net gain in extent and condition.

I just want to pick up on a couple of paragraphs in the joint witness statement regarding effects management, which follows on from the joint witness statement on water matters, both statements obviously are late breaking developments. Effectively, it's right isn't, Dr Baber, that conclusion as to net gain for those wetlands is premised on an assumption about availability of water? That's right isn't it?

Dr Baber: Yes. But there's two parts to that. So, the net gain for wetlands is a net gain specifically for swamp marsh, where we've stated a net loss for fen wetlands, because [inaudible- coughing] loss and - - -

Mr Randal: Yes, I was focusing on the swamp marsh.

Dr Baber: Okay, so when you say wetlands, swamp marsh wetlands, yes it is entirely dependent on the hydrological regime and whether that can function to facilitate the establishment and maintenance of the wetland that we are proposing to rehabilitate adverse effects on swamp marsh that we're having.

Mr Randal: Yes. Thank you. And it's again more of a process question, I suppose, but I think the joint witness statement records that that assessment isn't yet available, or hasn't been made available to you, but it can be at some point in the future. Can you explain to us how that's come into the process.

Dr Baber: Yes. [over speaking] so we cannot, at this stage, categorically say that that will happen because that information is still forthcoming, the detail around that. And that information on the hydrological regime, my understanding is that well we're not the experts as ecologists in generating that hydrology. So our ability to make that claim is dependent on the hydrological regime and whether that can be established, which is yet, it is my understanding, it's yet to be confirmed, or with adequate detail to provide that assurance.

Mr Randal: And the same is true of the proposed wetland in the tailing storage facility, the six hectares wetland there, the same is true, it's - - -

Dr Baber: That mainly what I was talking about. So when you're talking about the seven point – are you talking about the 7.5 hectares swamp?

Mr Randal: I'm talking about, sorry, paragraphs 53 and 54 of the joint witness statement around effects management. So both of those categories are wetland in 53 and 54?

Dr Baber: Yes, that same is true, yes.

Mr Randal: Yes. Yes, thank you. And so, yeah again just the how and the when question really. So I think you've explained that your – for swamp marsh wetlands, your conclusion as to a net gain is premised on an assumption that hasn't yet been borne out, based on the hydrological information that isn't yet available. So when is that going to come into this process to verify your conclusion, in a way that the Panel can rely on?

Dr Baber: That's a valid question. I can't answer the when. Yes.

Mr Randal: Thank you.

Ms Vella: Sir, I have a follow up question to that, if I may?

Mr Muir: Just one moment. Ms Vella.

CROSS-EXAMINATION BY MS VELLA:

Ms Vella: Thank you. Dr Baber, could I just clarify, have you taken the re-establishment of the wetlands into account in considering the magnitude of effects in your ECIAG assessment?

Dr Baber: Yes.

Ms Vella: You have?

Dr Baber: Yes. On the point that the magnitude of effects is set a residual effects, is an assessment undertaken after avoid, minimise or remediate, or rehabilitate. And that is intended to be a created and rehabilitated wetland, on the basis that the work is done within, at the point of impact, within the point of impact, as opposed to a positive effect elsewhere. So it's a reinstatement or re-creation to account for the loss of a wetland, at point of impact.

Mr Muir: Within the same mini-system you mean, effectively?

Dr Baber: Yes sir.

Mr Muir: At a different altitude, probably?

Dr Baber: Yes. Yes. Yes sir.

Ms Vella: Well haven't you just said that whether that's achievable is entirely dependent on the hydrological regime and whether it can function to establish the wetland that is being proposed to rehabilitate the adverse effects on the swamp marsh?

Dr Baber: Yes, so it is dependent on that and it is in the consent conditions that that will be undertaken, and I worked on the assumption that consent conditions would be complied with.

Ms Vella: But you can't say whether that's possible?

Mr Muir: Well it's not for him to say, is it? He's not a hydrologist.

Ms Vella: True, thank you.

Mr Muir: You've got to work on that premise and save your powder for next week.

Ms Vella: I pass that one on to [inaudible] in that case.

Dr Ussher: May I add a statement that might assist?

Ms Vella: Yes.

Dr Ussher: This concept wasn't dreamed up on day one. This is part of a discussion between myself, Dr Simcock, and others around any engineering team on how the surface of the TSF may support a wet environment or not, and that was dependent on how drainage on the TSF was looked at, the contributing catchment size, and the permeability of the cap. So all of that went into preliminary design and is how we arrived at a preliminary assessment of the feasibility of wetlands being created on the TSF.

So paragraphs 53 and 54, are relating to detailed confirmation from a geo-hydrologist or so forth to confirm some of the statistics in their preliminary design that we used. I'd suggest that Dr Simcock probably has more detail on that, if you required that.

Ms Vella: Thank you. What's vexing me a little bit is that, in the earlier discussion of vegetation context there was also discussion about the fact, that despite the fact that rehabilitation of the dryland ecosystem is expected to be – is accepted to be, sorry, experimental, that has also been taken into account in determining the overall magnitude of effect, is that correct?

Dr Baber: So you're asking about the dryland elements, or the wetland elements?

Mr Muir: We've moved from wetlands to drylands?

Ms Vella: Yes, I've moved from from wetlands to drylands, but the common theme of course is the level, or the rehabilitation that is at least in the dryland ecosystem context experimental, it's accepted by everybody it's experimental, being taken into account in determining the magnitude of effects, in your assessment of effects.

Dr Baber: It has been taken into account. I will – I will pass over to Dr Ussher, but ultimately we are engaging in an ecological rehabilitation programme. How the uncertainty has been taken into account is through the modelling that Dr Ussher has done, who will speak to that in a second, and also time lag has been factored in, because there is a discount, or a time lag between when the impact will occur and when we're expecting the stated outcomes that we've recorded. And I'll pass over to Dr Ussher, if that's okay?

Ms Vella: Well if I could just continue this question?

Dr Baber: Yes, sure.

Ms Vella: Where I'm leading to with this, is that we have an exchange this morning, in the context of lizards where you said that you haven't relied on rehabilitation in the lizard context because - - -

Dr Baber: No. I said I hadn't relied on salvaging, which is different.

Ms Vella: Salvaging to ...

Dr Baber: Yes, so that's [over speaking]

Ms Vella: - - - in terms of you haven't relied on that in terms of your adverse – to lower a real assessment of adverse effects?

Dr Baber: Yes. Yes. That is correct. So, there's avoidance measures and what we can't avoid we aim to minimise by a salvage/relocation by reducing or ideally reducing certain harm to the lizards via relocation, albeit only the lizards we're relocating. And then the next step in the process is rehabilitation. And as per my evidence and the evidence of Dr Ussher, we consider it likely that the rehabilitation from a lizard standpoint will result in habitat for lizards, over time, through the enhancement and through the plantings that we're proposing to undertake. And we've spelt that out, or our views around that, throughout the assessment of effects and the evidence. And then further to that, the degree to which we reduce the severity of effects is played out in Dr Ussher's modelling.

Ms Vella: So I guess my question is, is there not an inconsistent approach being taken between those three, in the sense that there's uncertainty around the salvaging efforts, and outcomes of salvaging for lizards, and you told me earlier that you haven't taken that into account in reducing the severity of effects, and yet in the context of both wetlands and dryland ecosystems there is significant uncertainty, at least dryland ecosystems that I'm aware of, that the rehabilitation outcomes are incredibly uncertain and they're experimental. So is there not an inconsistency in the way that you're dealing with that uncertainty, vis á vis the overall level of severity of effects.

Dr Baber: Yeah, good question. So it's a burden of proof scenario, right. So we are – there is pretty much no evidence around where the salvage and relocation works at the scale that we're proposing, and in the setting we're talking about. So, we're not prepared to assume that things are going to work.

Conversely, when we're looking at the rehabilitation and we're looking at what we're proposing and the quality of habitat that we're finding these lizards in, i.e. they live everywhere in the landscape, including intensive crop land, and including on the edge of roads and side-castings and everything. We're looking at what we're producing with the rehabilitation, which is a – which we expect to be considerably better than those habitat types with the enhancement we're proposing.

So while there is uncertainty and we've taken to account, we think, on balance, and with good confidence and valid reasons, that that rehabilitation will work.

Ms Vella: Lizards, sorry, are we talking about – still talking about lizards?

Dr Baber: [inaudible]

Ms Vella: Yes, okay, good. Yeah.

Mr Muir: Dr Baber is talking about lizards at the moment.

Dr Baber: Yeah, and then, and so – so that is the difference in approach, is the burden of proof and the degree to which we're confident, or that things will work.

When it comes to the wetlands, we have – I think the difference there is, we can stand alone, Graham and I, and comment on the lizards, but the wetlands is a multi-disciplinary situation, and we have to rely on what we're told by hydrologists, because we're not experts, that this approach will work. And on that basis we know that we can cover the wetland angle. So, we have to – and as Dr Ussher mentioned previously, and I should've passed onto him, and that was my mistake, himself, Dr Simcock and the engineers have been working, and had a plan, and had made the decision that it could be done and at this point in the process we're just dealing with verification around that, and more confirmation or certainty. But they're not – I would – those – I can't speak for them, but I would imagine it's unlikely that if they thought there was no chance in hell, or it was highly uncertain, we wouldn't have put that on the table.

So we only put that on the table when we felt we were at a point where we've discussed it, we've thought about it, there's a plan to do it, so we've got enough certainty to put that in the table. But evidently there's some more verification and assurance required.

Ms Vella: In terms of dryland ecosystems, there's – I don't know if I've heard any confidence that the proposed rehabilitation will occur and yet my understanding is that you've taken it into account in reducing the overall level of severity of effects, or am I incorrect about that last point?

Dr Baber: So in terms of reducing overall, no you're correct. In terms of reducing the overall severity of effect, it doesn't get us an incredibly long way because of the time lag, in terms of working towards no net loss, or reducing that severity of effect, due to the time lag and the uncertainty. But, we're advised by our experts, Dr Norton, Dr Simcock, and their experts that while challenging we can do it. It's also baked into consent conditions, so we have to do it. So yeah, sure, there'll be some experimental and some trial and error, but we've got to do it otherwise we don't comply.

So given all that, we've got enough certainty that the rehabilitation will work, and if it doesn't work there's adaptive management, or if it doesn't work to the degree that we want or need it to, there's adaptive management and contingency, to my understanding in play to deal with that.

So all, in the round, my view we've got enough to say, "This is a valid approach to reduce the severity of effects". So I'm quite comfortable doing that.

Ms Vella: Thank you. Mr Harding, I wonder if you could comment on whether there is inconsistency in your view, in the approach between taken between the lizard salvaging and the dryland ecosystems, based on your experience with dryland ecosystems?

Mr Harding: I'm sorry I'm not – I don't clearly recollect how it's been dealt with in the table, but I guess the point I would make though is that in my view assessing magnitude of effect should not assume success or experimental, or uncertain actions.

Mr Muir: I think you can leave it to the Panel, Ms Vella, to assess whether there was any inconsistency on those issues.

Ms Vella: Thank you sir.

Mr Muir: Thank you. Any further cross-examination? Right. Topic 2: the implementation effects of the effects management hierarchy.

TOPIC 2: IMPLEMENTATION EFFECTS OF THE EFFECTS MANAGEMENT HIERARCHY.

Mr Muir: Who's leading off the applicant on this?

Dr Baber: I'm a little – sorry, do you guys, unless someone wants to talk to it from our side, would you guys like to initiate discussions? Do you want to do them in reverse order?

Mr Muir: Right. I'll get lost if I don't start on this side of the room. Why don't we start with Ms Teele, or I'll get lost.

Ms Teele: Here we go again. So I'm focused on the implementation of effects and I think you'll find throughout our joint witness statement on effects management and vegetation, we've addressed these matters. I'll go through four key issues that I think exist for actually being able to implement the effects management that is proposed.

Firstly, as has been stated many times today, is the experimental nature of management plans. But, and I'm not going to belabour that point any further. What I will say is all experts, in our joint witness statement, said that there is a lack of one repeated coherent set list of clear performance measures which should be itemised as consent conditions. And I think we can work away on management plans, if that is required. But overall what would provide greatest clarity is having that set list of what is – what are the targets, what are the performance measures, and what are the contingencies?

Secondly, is the level of expertise and money that is going to be required to implement these. And I don't mean – it's not just expertise in restoration. It's invertebrate expertise, it's herpetofauna expertise, it's the whole round. It crosses all, and it has to be expertise as closely as possible related to the Central Otago dryland environment. It's no mean feat.

What the third point is the fact that these management plans, predator control, weed control, habitat restoration and it's on-going maintenance needs to occur in perpetuity to actually maintain these ecological gains. All experts have agreed in the joint witness statement that it is essential that plant and animal pest control continue in perpetuity to ensure these gains are maintained. As soon as you take away predator control and/or weed control you'll just reverse back any gains that you might have been able to make.

And the fourth point I'll make on that is the complexity of management that is going to be required through a number of documents, and I can understand why. It's going to be a complex undertaking and you need, you do need a number of documents to do that. And in terms of the complexity also comes in the uncertainty of who will be implementing the management and the effectiveness of monitoring and enforcement.

So I believe in terms of implementing the effects management plan, there are a number of unanswered questions as to if it can be.

Mr Muir: Ms Anderson, does that capture your views too?

Ms Anderson: I would just like to make a brief comment in regards to lizards, if that's possible.

Mr Muir: Yes.

Ms Anderson: I just wanted to point out that it is challenging for me to determine whether or not the effects management hierarchy has been complied with, because we're in a place where we haven't actually, in my view, accurately determined what the effects are. And the key issue around this is for southern grass skink, and Kawarau gecko,, and the lack of mapping in regards to the habitats that they occupy. Particularly in regards to southern grass skink, they don't occupy the whole site. They're likely to be contained to key areas, and we don't have any information from the applicant detailing where they are. But we do know that there is likely to be a reasonable

amount of habitat within the DDF, but we're unable to make an assessment on what proportion of that is compared with the rest of the site.

Mr Muir: Mr Head.

Mr Head: [inaudible] but in terms of the effects management hierarchy, the comment I would make it seems that they've jumped straight to offsetting and skirted around the requirement to avoid significant impacts on indigenous – significant indigenous biodiversity. For the reasons we talked about earlier, the scoring system they use means that in their framework the values and effects come under this critical threshold, which would otherwise mean avoid. So they've gone straight to offsetting. That's all I can say on that really.

Then the question is, are the limits to offsetting breached? That's another question. I would say, "Yes they are" but it's probably best dealt in the next topic 3.

Mr Muir: Yes Mr Harding.

Mr Harding: Thank you. I'll just address the second part of that question, the effects management hierarchy as set out in point 6 of the MPSIB. And I just want to comment briefly, because we have talked about this before. But in my view, because there's values there that are irreplaceable and vulnerable. If you work sequentially through the effects management hierarchy, the only option you have is to avoid.

And the only other comment I'd make there is that when the applicant responds to that, Dr Baber suggests that that should not be interpreted that way, that there's another option available to you. I don't agree. I think the policy is quite clear. It doesn't provide any sort of wiggle room. That's not what the policy says. The policy's quite specific.

Mr Muir: Well that's at least in a non-FTAA environment [inaudible]

Mr Harding: Oh possibly. But we were, in this respect, referring to the MPSIB and so in that regard, my views remain the same.

Mr Muir: Thank you. Mr Crowe.

Mr Crowe: Yes, thank you. I'd just like to agree with my colleagues who have already raised some very good points, [inaudible] raise them. But, I wanted to address some of the responses that have been provided by the applicant's ecology, with respect to – in response to the question regarding the uncertainty of some of these proposed rehabilitation and offsetting methods. And that response is largely that adaptive management can be applied. And that reliance on compliance with consent conditions can be relied on, as a mechanism to ensure that these things will occur.

Now it's outside my brief to speak on the relative merits of consent conditions, whether they're actually achieving compliance.

But with respect to adaptive management there are key factors that need to be provided to have confidence that they will be effective. And that is the monitoring

needs to be able to detect change when it occurs; there needs to be triggers set in advance so that when action is required it is taken; and there needs to be effective management actions that can address those effects before they become irreversible. And in my opinion, that assurance has not been provided in the case for this – for many of the rehabilitation offsetting methods that have been proposed.

Mr Muir: Dr Giejesztowt.

Dr Giejsztowt: Yeah, so I think that some aspects of the effects management hierarchy have been dealt with really well by my colleagues who have discussed the importance of avoidance. But I wanted to focus on the other end of the effects management hierarchy.

The words "offsetting" and "compensation" have been confused by everybody throughout all of these proceedings, and in all of the documentation. There is actually a really big difference between offsetting and compensation, in the fact that offsetting is – there's a lot of rules surrounding them, and I won't go through what all of those rules are. But what we get at the end of that is some assurance that we know that the level of effects, residual effects that we have are met by the amount of mitigation actions that were undertaken. So that's what offsetting means.

And I would argue that the vast majority of the actions that have been undertaken – that are proposed to be undertaken as a part of the effects management package, are actually compensation and not offsetting at all. Of the 32 values for which we say that there should be offsetting or compensation, some kind of modelling has only been provided for eight, and I would argue that of those, seven are grossly under-parameterised. So I would say that possibly there's only one, and that one is the shrubland Bowen, and that model is subject to this on-going debate about what the baseline is for vegetation, and whether woody shrubland vegetation is going upwards or downwards. And that has a critical implication on whether we have any trust in the outcomes of that model.

So yeah, overall I think the effects management hierarchy really requires that a good attempt is made at real offsetting, and I don't believe that this has been done here. And I think that that's really underlined by the fact that we keep coming back to uncertainty throughout this entire proceedings. Thank you.

Mr Muir: For the purposes of the record, look I'm sorry I should have – the stenographers indicated spelling of the Doctor's surname. It is Giejsztowt. Thank you. Mr Chinn.

Mr Chinn: Thank you. So I don't really have a steer on the effects hierarchy as it relates to the applicant's invertebrates survey. What I do have is that their survey turned up at least 419 species, the majority of which were indigenous, 18 were selected as being special species for attention. But the number of species that remains ambiguous, so we don't even quite know how many species the survey comprises of. Nonetheless, if we put those 18 species of interest aside, what remains of the 402

species is really a pretty ambiguous direction there. I haven't got any knowledge of what they're going to do with them, or what it means, or if they've got any significance. So it's all a bit hung in the air still, to be honest. Thank you.

Mr Muir: Thank you. Mr Colbourne is there any aviculture perspective on this that you wanted to add? You're on mute I think at the moment.

Mr Colbourne: At this point, probably not. No.

Mr Muir: Right. No, thank you. Thank you very much. Mr Dale?

Mr Dale: Thank you. At risk of repeating myself, yeah for me there's a lot in this that relies on adaptive management frameworks, and for that to be effective we need clear triggers and actions. At the moment there's too much uncertainty to have any confidence we can achieve that.

And I'll draw the Panel's attention to 132 to 134 of the effects management joint witness statement around the biodiversity advisory group. I won't read that out verbatim, but I would highlight the importance of that group in addressing, at least some of the uncertainty that we have at this stage. I don't have confidence the application can be adequately assessed with the current degree of uncertainty. But frameworks, such as this, or groups, such as this, are going to be essential moving forward to be able to implement both the adaptive management frameworks and to ensure compliance with the conditions of any application that may be granted.

Mr Muir: Right, questions from the Panel?

Ms Sweetman: [inaudible]

Mr Muir: Oh yes, that's right. I'm sorry we've gone the wrong order around. That's right, come back to the applicant, thank you, Ms Sweetman.

Dr Baber: I'll just have any initial response. So there's a number of values that, with residual effects, that are moderate or greater, that we have looked at and ruled out. We cannot offset or compensate for. And there's other values that we think we can. And those are the ones that we are trying to achieve stated outcomes for, and they're in conditions, and so we need to comply with those, acknowledging the experimental nature of some of those. As agreed that this is a giant experiment and hasn't been done before.

Secondly, yes we're in agreement there needs to be targets. There needs to be contingencies, adaptive management plans, et cetera, so more work needs to be done. So and there's been some really helpful discussions around that, and that is appreciated.

That's all I was going to say, but is – sorry Dr Barber.

Mr Muir: Yes.

Mr Barber: Keith Barber, applicant's ecologist. Just in response to Ms Teele's comment around in perpetuity for the pest control, particularly for mammalian pest

control and also for a less degree plants. In perpetuity, or inter-generational is a long time and my – a comment I focus on is that as long as it's needed. So if an animal ceases to exist or if a plant pest ceases to be a threat, then I don't see the point in having a condition that require actions that are intended to control that organism if it's not there. So having some caveat or rider that it's fine in perpetuity as long as that action is actually needed and would have some benefit. So just that's my comment.

Mr Muir: Can I ask a left-field question, Dr Barber?

Dr Baber: Barber or Baber?

Ms Sweetman: Dr Baber, Mr Barber.

Mr Muir: [inaudible]

Mr Barber: That is me.

Mr Muir: If at closure, what was formerly an area subject to conservation covenants, but which has been actively farmed and grazed, were to pass into a new structure in respect of which there was no grazing, and was effectively invited to return to whatever natural state it would over a 50 to a hundred year period, what would we end up with? How much further are all of these compensations and proposed mitigations, how much further are they taking us than would, an area allowed to revert to wilderness with no livestock in it?

Mr Barber: That's a complex question that I believe Professor Norton might be better equipped to answer.

Prof Norton: That's why I saw several fingers being pointed at me then. It's a complex question, and I mean I think some of the points that, you know, Mr Harding and others have made about this being a dynamic system, you know, change is a very complex process in this environment. I think a couple of points.

Yeah, if we think about the conservation, the Bendigo Conservation Covenant, which your question was specifically about, the proposal, as I understand it, the Bendigo Conservation Covenant for the area outside the direct disturbance footprint and we have found out in the last few days there'll be a small area of that will be subject, or is being proposed for some further drilling potentially. But for the rest of that, my understanding is that it's part of the MRZ zone, or it's part of the Bendigo Sanctuary.

So that area will be subject to active conservation management over the 35 years of this consent. So it won't just be sitting there. It'll be actively managed, and the Bendigo Sanctury will have a fence around it, and so forth.

But I think the bigger question, and I mean my expertise is around Ardgour more than anywhere else, but the same principle applies. I think what we are doing through restorative management, we're talking about restoration here not rehabilitation. We're talking about trying to restore, particularly in Ardgour more woody system, other greater diversity of species in both plants and birds as well.

But I think the key issue is the issue that Rebecca Teele raised right at the very beginning of this particular discussion is the need for the certainty around the long-term management. Because you can do all the work in the world, in the next 35 years. If we're to walk away from the site, it'll all be gone within a decade. And I think to me the biggest issue then is how we guarantee that certainty for the long term security of the site and that relates to its tenure, but it also relates to management tenure on its own is not a guarantee of certainty of outcome. It's about management.

And so I understand that Mr Spring has made a proposal through some evidence of his around funding and I gather there's more coming in that space in the next short time. I don't know if that answers your question but - - -

Ms Sweetman: That was your paragraphs, joint everyone, 135 to 141 of the effects management JWS, in terms of long term? Yeah.

Prof Norton: I mean I should just add a comment, I mean I've published on the importance of non-wasting endowment funds, particularly in a situation where we have invasive plants and animals. I think it's a very important issue.

Mr Muir: Very good. Cross-examination on this topic? Yes, thank you. Yes Mr van Mierlo

CROSS-EXAMINATION BY MR VAN MIERLO:

Mr van Mierlo: A question for Dr Baber. You mentioned adaptive management and I think you referred to use of it, and I think you did acknowledge you need to do some more work and things are under discussion. So I just wanted to test that little bit with you in the context of this project. And perhaps if we – if we do that in the context of lizards.

First – first pre-requisite if you like for adaptive management is baseline information. And I put it to you that despite the survey work that's been undertaken, the baseline data for lizards, there are still uncertainties there. There's uncertainties around species descriptions and identification. Not all the areas have been surveyed. Lizards themselves are a cryptic species. Would you accept there's uncertainties there in terms of baseline information?

Dr Baber: No, I mean there's always uncertainties. So it's the degree to which that occurs. What I accept is that we've ultimately done two years of seasonal surveys. We've had teams out there and I've set out, and when I say "we" that's – there's a – there's a lizard survey report, Dr Graham Ussher, with 30 years experience and his team and we've set out the level of effort in those, the types of methods, we're using, how many we deployed and I can't remember the number of actual lizards that are found.

On top of that we've run a – started a baseline biodiversity monitoring programme undertaken in February and March, as part of the biodiversity outcome monitor plan, and we have monitored 280 sites and done 140 hour, persons hours of further manual

searching, and picked up the same usual suspects. I think we've got good confidence about what's there, and their general abundance and habitat use. Albeit there's still some uncertainty. You can't prove a negative, if you're not finding stuff. And some of these things we can't rule out, and we haven't ruled out, that there's nothing else there.

So I think we've got – we know enough to know what's there, the importance and also when we look at the effects management side of things, where we end up and based on all that information, we're not saying everything's great. We're still saying we've got high levels of residual effects, and that's where we're at, at the moment, with what's on the table. So yeah, I don't – I think that uncertainty has been well overplayed to be honest.

Mr van Mierlo: And in terms of monitoring, you've acknowledged it's not possible to monitor the success of salvage and relocation.

Dr Baber: I wouldn't say it's not possible. There's no viable accepted technique, at the moment, short of – oh when I say "acceptable" toe clipping is a technique that works but it's not acceptable or deemed ethical, so that's off the table. There are emerging techniques that have been employed overseas that are getting good results, and they look like a really good option. So it's – we're not ruling out that we can, through a salvage programme undertaken in the near future, be geared up and mobilised to implement that, so that we can monitor success. So, it's not off the table. We can do it, it's just right now – yeah.

Mr van Mierlo: Just haven't got it at the moment?

Dr Baber: Haven't got it at the moment, but peer-reviewed – Dr Ussher can talk to a little bit more [inaudible].

Mr van Mierlo: And then in terms of trigger methods and thresholds - - -

Dr Baber: Yes.

Mr van Mierlo: - - - if there's difficulties in monitoring, it's difficult to set trigger methods and thresholds isn't it?

Dr Baber: That's a good question. So it is – it's impossible for determining the success of the salvage and relocation programme, which we're not banking as we've discussed. We haven't suggested it's reducing the severity of effects. But it's an entirely different story if we're talking about offsetting or compensation. And so ultimately we look at the baseline conditions in the offset compensation areas, then we implement the conservation action. Whether that's a pest exclusion fence, or something different, and then we track the change over time, after that conservation action's been undertaken, and we can measure and understand the lift. So, it's how much lift you get per unit area and we benchmark that against our impact expectations, and we can get a quantifiable understanding of whether we have

achieved or exceeded the loss, factoring in time lag and uncertainty, and there are some challenges for the methods. But it's possible to do if it's done right, yes.

Mr van Mierlo: And then the final sort of criterium, if you like, is reversibility. [inaudible-coughing] difference here. This is not like, for example, a windfarm where you can remove turbines and you get – go back to something which was roughly there prior to the project. The impacts are essentially irreversible once you go in there with the diggers. Would you agree that's a fundamental difference here?

Dr Baber: Not if you can achieve demonstrable conservation outcomes and the lizards, in fact the lizards are better off from those. But it's irreversible if that effort isn't undertaken, yes.

Mr van Mierlo: Okay. Thank you, I'll leave it there.

Mr Muir: Any further cross-examination? No. Right. Item 4, my feeling is that we have given item 4 a fairly good - - -

Ms Sweetman: Three. We're only up to 3.

TOPIC 3: THE SCOPE OF THE OFFSET AND COMPENSATION PACKAGE:

Mr Muir: Only item 3. [inaudible]. Mm, yes my goodness, it has been a long afternoon. The scope of the offset and compensation package. Right, well we have touched on this in multiple facets during the day. So I'm going to ask people to be very concise in dealing with this issue. We're going to start with the – with the applicants, or do you want to reverse the order, Dr Baber?

Dr Baber: Yes, I'd just like – yes I would like to reverse the order too.

Mr Muir: Very good. Well then I'll start with Ms Teele.

Ms Teele: Thank you. The scope of the offset and compensation package does not cover the loss of ecological value that is proposed to occur. Importantly, I don't think the AEE and Terrestrial Ecological Impact Assessment shies away from this. In fact my reading of it confirms this. It's the degree to which the package does not cover this loss that is in question. I obviously think it doesn't cover it to a far larger degree. I'll leave it there for time's sake.

Mr Muir: Yes. Certainly a point that has been imprinted on me during the day, consistently from a number of experts. Could I ask is there any other of the experts for the invitees that wishes to say anything about this issue? Yes, thank you.

Mr Head: Nicholas Head. I've really struggled to unravel the package. I mean the requirement is to have clear transparency, which means, you know, how we deal with offsets and compensation be clearly separate. They're all merged together and blended together in one package to address a whole lot of different effects. And so it's very, very hard, and it's poor practise. There's no question about that. You know, it states clearly transparency requires a clear pathway for each. But it's all blended together. So it's been very, very difficult to really work out what's what. I'm not

sure what, you know, what action is addressing what impact. And so I can't really provide - - -

Mr Muir: Well that's not entirely fair is it? I mean there are many instances where you've got specific – whether I'm going to call them an offset or a compensation. I would've thought an offset. If you're going to go and put rock stacks everywhere, or any number of them for the purposes of providing new habitat for lizards, I mean it's something that is finite, that is identifiable.

Mr Head: Well I – I can't comment for lizards because I'm - - -

Mr Muir: You're not a lizard man?

Mr Head: No.

Mr Muir: But - - -

Mr Head: At least not today anyway. I've lost my train of thought.

Mr Muir: That was the intention.

Mr Head: Oh I had a great point I was going to make too. So no I'll leave it there.

Mr Muir: We'll come back to it if we need to, Mr Head. Is there any other invitee expert that wants to comment.

Mr Crowe: Max Crowe for Department of Conservation. The point, first of all acknowledging the very articulate points that Ms Teele has already made. In full agreement with those. But with respect to the scope of the offsetting and compensation package, it was striking to me that despite proposing to revoke a large proportion of this – not a large proportion relatively to the size of the covenant – but some significant values from the covenant in terms of protection, that none of the compensation or offsetting works proposed to be undertaken within the covenant area, which seems to me to be an interesting choice.

And just to raise that it has been identified that discussions were had in the workshops in February with respect to opportunities for, while not necessarily compensation in a strict sense, because these values are irreplaceable, but if there are values, cushionfield values particularly on the valley floor where development might occur, it could be avoided by purchasing those areas. And I understand that it is still a live conversation but something that we still don't have clarity on, exactly what the scope of that would be.

Mr Muir: Any of our on-line experts wish to contribute?

Mr Dale: Yes, thank you Mr Chair. I think for me - - -

Mr Muir: Sorry, Mr Dale.

Mr Dale: - - - I feel there's a requirement to take a little bit of a step back and look at that ki uta ki tai, mountain to sea or integrated approach. And I don't feel like the scope of the current package adequately addresses that. And I include scale in that

as well. You know, it's my view that the scale of, for example, for the fenced sanctuaries is significantly smaller than what would be required as an effective offset, or compensation.

And I think where I struggle, I'm unsure as to what logic has been used for the location, the scale of the current proposal, of around I think in the mid 40s of two combined sanctuaries. For me, I feel the starting point should be essentially a like for like. So if you look at the DDF at 600, just over 600 hectares, I feel that should be your starting point, if you're looking at no net loss. And then from there, as you build, stack other compensation activities on top of it, you may have an opportunity to reduce scale to effect no net loss. But that should be your starting point, not trying to fit other offsets, or compensations around starting at that smaller scale. And so I feel the fundamental approach is almost doomed to failure in its ability to reach no net loss.

And also picking up on the point that the location, the considerations for location seem to be somewhat limited, particularly with the impacts on existing covenants. I would hope there would be an opportunity to look broader than the immediate piece of land surrounding, you know, owned by the applicant. There seems to be, or it's very clear, I think it's agreed by all of the experts that the area currently proposed within those fenced sanctuaries doesn't cover the full breadth of ecosystems that are being affected by the proposed activity. Again I feel that should be a starting point. Where, how wide do we need to go to capture those areas, although it's habitat types, and that's your starting point. And you can work down from there, based on stacking compensation on top of that.

And finally, and this will be a controversial one, but I'm going to put it in there anyway. We have had, and this relates directly to scope. There's been general agreement from the experts that the reintroduction of species not currently within the – within the site should be considered, because of the uncertainty around there. And I feel we need to challenge the applicant, and potentially the Panel on this, in that within a fast track process, my question, and maybe for planners and lawyers, is do we have an opportunity to integrate those in a way that we might not have an opportunity to do under the RMA, for example? Can we get some more certainty around the reintroduction of Otago skinks, grand skinks, jewelled geckos, Clutha flathead galaxiids in a fresh water sense, and be able to restore things that have lost – have been lost, as part of a wider offset or compensation package.

It's a rabbit hole we could go down for a lot more time than I think we have tonight. But I did want to just place that there gently and step away. I feel like we have an opportunity here and again looking at that landscape scale, mountain to sea approach, it's something that I feel that has been under-explored, certainly up to this point. And with a view of not finishing at 9 o'clock tonight, I will stop there, thank you.

Mr Muir: That is probably quite a controversial proposition, because if you took it perhaps even further, and you went further down the road of trying to recreate a

previous ecosystem on that site, then you might get some fatalities, mightn't you among things that we've spending an awful lot of the day trying to protect, like cushionfields and spring annuals? Because as shrubby woodlands are redeveloped in a way that might have been the case in pre-farming times, as they developed so we might lose those highly rated for their rarity plants. This is a reflection of the dynamic nature, isn't it, Mr Dale, of this earlier called degraded, now called modified environment.

Mr Dale: Yes, well that is the joy of being an ecologist, is that you have to be able to account for species interaction. And multi-species interaction, even in just the predator prey dynamics, as we've talked about in our evidence and throughout this, is complex. And I think that is another case for considering scale of particularly these sanctuaries, that you need to be able to allow for those interactions and provide scale for those temporal effects, as you say, of regenerating forest or scrub land, we need to have scale to be able to actually cover those different ecosystem types. But yes, we absolutely have to have those interactions in mind, and as ecosystems move into new phases, as succession happens, there will be winners and losers throughout that, and that's where, as ecologists I feel we earn our keep in understanding and hopefully managing for those.

Mr Muir: Yes. Sometimes one feels like ecologists are a little like King Canute or what was reputedly King Canute used to do, and that you're trying to sort of cast in aspic something in the sense of holding back this dynamic change. That's perhaps too far too unfair an observation to make at 5.30.

Ms Sweetman: [inaudible]

Mr Muir: Yes, I've been reminded there are more of you than of us. So we won't get too philosophical at half past five. Right. I've got to now round – round back to the applicant's experts on this. Dr Baber are you going to lead off on this, Dr Baber, or ...

Dr Baber: Can I just pass over to Dr Ussher. There's a few things [inaudible]

Dr Ussher: I would just like to quickly say I think there's a couple of delicious ironies in here that we've just had an inspirational proposal to release critically threatened lizards onto environment with all the risk and uncertainty associated with that, but we're quite happy to consider uncertainty for the rest of the project be a negative. I'll just reflect on that.

The other aspect that I'd just like to reiterate my point of view that the – that yes we've concluded as a group of experts, and myself included, that there will be significant residual adverse effects, resulting from the project but that the depth of that residual effect is the point that I've spent a lot of my time in putting into this project, is to tackle through design and solutions and to provide some level of assurance of works that will provide benefits on the site.

Top of my mind is still that the rehabilitative land form, and I'd just like to – this is my final word on the matter – and I'd like to encourage the Panel to consider it not to be as a desert, as I think has been communicated by some other experts, but as to be a land form that is going to support life, and woody vegetation, and lizards. And I'm sure from your site visit you would've appreciated that going back, in the passage of time, a fair chunk of that environment was sluicings and old mining camps and so forth. Lizards are now all through those environments, as are rare plants and rare invertebrates, and they haven't held a conferencing session to be allowed to repopulate those areas and re-establish communities. They've just gone out and done it, and so that will happen after there rehabilitation works. The way that we're designing them will ensure, in my mind that it does occur.

Mr Muir: Questions from the Panel.

Prof Norton: Could I make a comment as well?

Mr Muir: Yes.

Prof Norton: Okay just sort of the last point that you raised, and Mr Dale raised around scale and some of those issues, I mean I think it's import to realise that the Ardgour restoration area alone would be the largest actively managed conservation area, in the Dunstan ecological district, at low to mid elevations. If we add in the MRZ as well, it's an even – it's nearly 2,000 hectares at low to mid elevations. And it does provide linkages from the higher parts of the range where there is existing conservation land to the lower parts. So there is some of those, you know, mountain to sea connections. The scale issues are there, and I think it's worth remembering that we are talking about large areas in the restoration part of the programme.

Mr Muir: Yes, thank you, Emeritus Professor. Any questions from the Panel. No. Cross-examination on this subject? No. Right.

Ms Sweetman: Level of Uncertainty and Residual Effects, and then Long Term Effects. It feels like we've talked about, a lot about this.

Mr Muir: Yes. Yes, we feel we have had quite a bit on the uncertainty and residual effects.

TOPIC 4: LEVEL OF UNCERTAINTY AND RESIDUAL EFFECTS:

Dr Giejsztowt: Would you mind if I just spoke to this subject, just because I haven't been part of any of the other - - -

Mr Muir: Absolutely.

Dr Giejsztowt: - - - things, so I haven't made my opinions on this.

Mr Muir: That's an excellent idea. Well we'll introduce this topic now, is the level of uncertainty and residual effects, and acknowledging that one of our expert panel participants hasn't been here earlier in the day. So thank you Dr Giejsztowt.

Dr Giejsztowt: Thank you for indulging me. So I can understand why you're over the word "uncertainty". I think that, as a statistician, I would say a mean has no meaning without an uncertainty. And I think that we have been using the word uncertainty, and we've been using it over and over, but we haven't really taken the time to understand what that uncertainty actually means.

So in terms of uncertainty around the fact that, for example, offsets might not be successful, we can look to the literature, for example. How often are offsets successful? What we actually see, so I'm thinking of a paper from 2019, Global Analysis of Comparable Jurisdictions, so USA, Canada, Australia and Europe, found that 30 per cent of offsets are successful in achieving no net loss where that was their intended outcome. So I'm not saying that we should expect that the applicant will be unsuccessful. I just think that we should root our understanding of uncertainty with that context.

We also know that those rates of failure are relevant in the local context. We have very good local examples where effects management has not been effectively – yeah sorry. I'm a bit nervous. But I wanted to say that in all of those jurisdictions, adaptive management is always part of the plan. So I don't think that we should be thinking that adaptive management is some kind of get out of free card which gets us away from the realities of those uncertainties and how they actually scale.

The other point that I wanted to make about uncertainty, is that very, very many values within this assessment have been assessed as un – it's not unknown. It's - - -

Mr Crowe: Uncertain.

Dr Giejsztowt: - - - uncertain sorry. So we've got two plants, one bird and 18 nationally or regionally threatened or at risk invertebrate species. And I think that we can think uncertain means equally likely to be more positive, or equally likely to be more negative, and I would hesitate to encourage you to think in that way.

I think if we break down where that uncertainty comes from, we actually – there are some aspects of this that we are certain of, and there are some that we are not certain of. So what we are certain of is that this very large mine will have detrimental impacts on these values, right. So those might be larger, or smaller, because we don't have a very good understanding of their populations. But we know that there are going to be detrimental effects. But then the place where the uncertainty comes from is that we have no idea how effective that effects management will be. And as we've heard throughout these entire sessions, as experimental, and now I'm telling you often unsuccessful, it's all compensation not offsetting. I'd just really like to put that context around that uncertainty conversation.

Mr Muir: Dr Ussher, do you have any comment on that or Dr Baber?

Dr Ussher: I don't thank you.

Mr Muir: Dr Baber?

Dr Baber: No.

Mr Muir: Anyone – any person from – any expert for the applicant wish to respond to that? Very good okay. And I take it there's no cross-examination topic there?

Ms Sweetman: Everybody's got their head down.

Mr Muir: Right, they've got their heads down. On to the last topic of the week, long term outcomes.

TOPIC 5: LONG TERM OUTCOMES

Mr Muir: Again I suspect that this has been – there's been a fair bit of cross-pollination of this topic too, as the day has gone on.

Ms Sweetman: They were pointing [inaudible]

Mr Muir: Yes, Emeritus Professor, you're in the hot seat.

Prof Norton: I was getting pointed at again.

Mr Muir: Yes.

Prof Norton: I think – I'm not quite sure exactly whoever proposed this topic, but I'll give my take on it. I mean I think the way I look at this project, and look at what we're trying, where we're talking about – I'm talking about the gains that are – we've all accepted the losses. I'm talking about the gains. So long term outcomes from the restorative management.

And I guess, you know, my expertise is with the Ardgour restoration area. But what I say will apply to other parts of the project as well, and we have covered some of this already. I think there are a number of key components to it, to be able to secure these long term outcomes.

We've talked about the management plans quite a bit, and I think, you know, the way I see the management plans is that they are a work in progress. I have certainly appreciated for Ardgour some really positive feedback from workshops and site visits with some of the people in the room here, and I think there's more room to work on those, and I hope that opportunity arises.

I think the questions around resourcing are really important. I mean this work does require appropriate resourcing. It is experimental, as has been discussed a lot, and there has to be the ability to resource that properly to make sure that the things that we are proposing to do, do actually take place. That requires good expertise, and as we said in the joint witness statement, and Rebecca mentioned it before, this idea of the biodiversity advisory group I think is really, really important, to provide that expertise to help guide this process. These are novel environments in terms of this sort of work.

And I think the question around future guarantees. I mean to me, as I said earlier on, you know, this doesn't stop at 35 years. If we were to get these outcomes we need to

be sure that there are the future guarantees. And it's not just around the tenure of the land. It's around how the land is managed in the future.

And I think, and I mentioned this in the joint – when we were doing our conferencing, you know, I wrote a paper back in the 80s where I made the point that simply calling an area a reserve does not guarantee that the values it has are going to be sustained. We need to actively manage these areas, and management needs to be in perpetuity, given that the threats that these values face, whatever they are, cushionfields, regenerating woody vegetation, wetlands, the threats are there in perpetuity. There's no predator free 2050 is not going to happen in my opinion. You know, these things are going to be around for a long time, and as come up in our joint witness statement, climate change is going to be with us as well. It is with us and we need to be able [inaudible - coughing] that.

So I personally believe adaptive management is really important, but it has to be supported by good resourcing and by good expertise. I think monitoring is critical, and I think we can make that better. We've got some good monitoring stuff there already, and I think we can work on that further, and I think we need to think into the future. So – so that's probably my last words today, sorry.

Mr Muir: Right, thank you Professor. Did any of the experts for the section 51, or section 53 parties with to comment on that? Yes, Mr Harding.

Mr Harding: Warren Harding CODC. We've traversed this at length, but there's just a couple of comments I'd like to make. With respect to the long term outcomes and the discussions we've had in conferencing about long term outcomes, there's been a lot of discussion about the relationship between management plans and consent conditions, and there was also discussion about the request, as I understand, that the management plans will be provided back to the Panel shortly.

Mr Muir: Well next iteration.

Mr Harding: Next iteration. I just want to advise the Panel that I haven't looked at those management plans, and it was impractical for me to do so. The timeframes and the number of plans, and the extent of effort that will be required to provide informed comment wasn't practical in that time. So the management plans that you'll, or the version you'll receive back hasn't benefited from the comments of other experts.

Mr Muir: Yes.

Mr Harding: And I'm also of the view, and this is based – I've had quite a bit of experience monitoring compliance with consent conditions at other large activities, such as mines, and I would like to just note the importance of – or rather note that the consent conditions were actually the mechanism that was most – more useful in the management plan.

So my expectation, as an ecologist, if I was asked to be monitoring or reviewing, would be to have very, very good consent conditions, and that the management plans

would subsequently be reviewed and certified for their consistency with those conditions.

Mr Muir: I think you and the Parliamentary Commissioner of the Environment would be on the same page. Thank you. Any other expert, either present or on-line?

Ms Teele: You can go first.

Mr Muir: Yes.

Dr Giejsztowt: Yeah, I just wanted to, it's been said repeatedly throughout the joint witness statements and also here that any gains would require on-going input from people, in terms of management, and money, in the long-term and I would like you to consider what long-term means: 50 years, 200 years. The effects that we expect in the mine, to some extent will be permanent, as Dr Ussher has said. He expects that there will be maybe some more biodiversity values at that site. Other people think that there will be less. Either way I think that we can all agree that it will not be the same, and it will not have as high of a value.

So we're expecting in the very long-term, long-term outcomes that are negative. Whereas we have those values in some more vulnerable versions, which I would say are more akin to gardens or zoos, which if you're a gardener you would know that the work never stops, and in the long-term - - -

Mr Muir: I am, and I do.

Dr Giejsztowt: Good, yeah. So yeah, it's just – it's more vulnerable and less resilient form of biodiversity.

Mr Muir: Thank you. Yes, Ms Teele.

Ms Teele: Thank you. Rebecca Teele for ORC. I think the long-term outcomes are unknown and my position on that has only solidified over the last few days through expert conferencing, for the reason mentioned this morning in regards to ecotoxicity. But, I guess, the more I dig, the more I find out, the more long-term outcomes are unknown and ecotoxicity from an avifauna and wildlife point of view, but also in terms of the proposed rehabilitation.

Another matter, there is a proposed condition, for example, that in the event of incapability between landscape and ecological outcomes, and water quality outcomes, water quality outcomes will prevail. Which I understand from a human health point of view, and a water quality point of view, but this condition is, my understanding, refers to the cap on the TSF which must decrease the permeability of precipitation through to the waste rock, for obvious reasons to us all. But if the cap is not achieving that, this condition states that water quality outcomes will prevail, and there will have to be treatment of that cap in order to achieve that, which means disturbance to the proposed rehabilitation of that area.

So and I understand water quality, in that sense would take precedent. It just adds, from an ecological perspective, another level of unknown of what the long-term outcomes are.

Ms Sweetman: What condition reference was that please?

Ms Teele: I've got "B" in the snapshot that I have with me. I can't find it right now, but I'm happy to supply it to the Panel subsequently through the ORC's counsel.

Mr Muir: Other comments? Any cross-examination?

CROSS-EXAMINATION BY MS GEPP:

Ms Gepp: I do have a question. There's some discussion in the – applicant's experts – there's some discussion in the most recent effects management joint witness statement about exploration drilling. Is your understanding that the purpose of the exploration drilling is to understand the ore reserves in those areas where exploration drilling is being undertaken?

Dr Baber: As an ecologist that question is not best put to me.

Ms Gepp: As people involved in this project, do you understand what the purpose of the exploration drilling is?

Dr Ussher: No.

Ms Gepp: So you can't assist with whether the plan is to then carry out further mining over these areas where exploration drilling - - -

Dr Baber: No.

Ms Gepp: - - - is being undertaken?

Dr Ussher: I've personally got completely no understanding of that.

Ms Gepp: Okay. So and when we – I think somebody mentioned before exploration drilling in some small areas. Are you aware that there's no condition limiting where exploration drilling can occur or the size of the areas of exploration drilling?

Dr Baber: Not aware. Our scope is the DDF and we have no knowledge or understanding outside of that, and outside of our assessment.

Ms Gepp: Thank you. If there's a proposal in the future to mine these areas, that would have an impact on long-term outcomes, wouldn't it?

Dr Ussher: Only if it was approved.

Mr Muir: Anything further Ms Gepp?

Ms Gepp: No, nothing further.

Mr Muir: No. Thank you very much. Coming back to the Panel. I'm aware that there are some questions from the Panel.

CROSS EXAMINATION BY MS VELA:

Ms Vella: Mr Chairman, just one very quick question.

Mr Muir: Yes, Ms Vella.

Ms Vella: I think this is for Professor Norton, but perhaps you could direct me elsewhere if it's not correct. I'm just wanted to refer to the biodiversity advisory group that is proposed by the latest JWS, and paragraph 1(v)(3) of that talks about the scope, the role of it, I suppose. It says it would review biodiversity outcome, reporting and compliance with relevant consent conditions. Am I directing the question in the right direction?

Prof Norton: Yes, and noting Mike Harding sort of came up with most of that work, and most of us signed up to it.

Ms Vella: Okay. Perhaps I could ask you, and if we need – if need be we can go elsewhere. But given the concerns that some of these experts have around the complexity of the management plans and the lack of ability to input and review those properly, would you also – would you agree that the biodiversity advisory group could usefully be used to advise Councils on the certification of those management plans?

Prof Norton: Yes, I can't see – I mean I think the management plans would really benefit from input from a wider range of people, whether it's a biodiversity advisory group, whether it's the Council and other agency ecologists, yeah absolutely it will be beneficial.

Ms Vella: Yes, and the group could also be usefully used to advise the Council on adaptive management measures as the consent sort of progresses?

Prof Norton: Yeah, I feel that – so I'm just speaking to my management plan in Ardgour – I've got an annual workplan renewal process, and then a five yearly management plan renewal process, and I think that would benefit from external review. And I think it's in there, it talks about suitably qualified experts, but I think our feeling over the course of the conferencing has been that could be a group of suitably qualified dryland ecologists providing that advice. And I think it would really help support the staff doing the actual mahi on the ground.

Ms Vella: Thank you.

Mr Enright: Sir, sorry if I can [inaudible] very briefly. I think I may have a condition that generally matches the one described by Ms Teele before for Commissioner Sweetman, which is condition C38 in the common conditions set. It's to do with the LERMP.

Mr Muir: C28?

Mr Enright: 38 was the one I've found sir, that talks about water quality outcomes prevailing in the event of an incompatibility between landscape and ecological outcomes and water quality ones. But Ms Teele I think has something more to say.

Ms Teele: The proposed conditions common to the Central Otago District Council's schedule 1, C38.

Mr Enright: That's the same on I'm talking about.

Ms Teele: Yeah.

Mr Enright: Yes.

Ms Teele: Same one then.

Mr Muir: But it doesn't refer specifically to the issue that you raised, which was a re-encapsulation of the - - -

Ms Teele: It wouldn't be – well whatever is required to decrease permeability down to the waste rock, and that could be – I'm not a hydrologist, I'm not a geochemist. I'm not sure what that treatment of the - - -

Mr Muir: Isn't what is contemplated there, intersection of permeation and treatment. I was somewhat surprised when you suggested that one of the available options under discussion was completely removing all rehabilitated landscape and re-encapsulating the tailings containment facility.

Ms Teele: I haven't done a good job of describing. That wasn't – that's not my reading of this. It's about there is a cap and I'm sure it will be designed to do what it needs to do. But in the event that there is – they need to decrease the precipitation that's going through it, what will need to be done to achieve that will be done regardless of the ecological values that may have been restored on top of that, which is proposed. So it may be they have to put more capping on top to achieve that, or there's a line I have that's outside my - - -

Mr Muir: Or they intersect the flows in some other way, some other point in the process?

Ms Teele: Yes.

Mr Muir: Thank you. Mr Enright was that - - -

Mr Enright: Thank you, sir. Yes.

Mr Muir: Right. Is there any other cross-examination? Now we come back to the Panel, because I know there were some Panel questions. Or at least a Panel question.

QUESTIONS FROM THE PANEL:

Mr Barry: Yes, thank you sir. If I may, with less than 10 minutes to go I would like to take up the opportunity of asking the Emeritus Professor a question, given that he is here in the room. And you've mentioned tenure of land a couple of times in your responses. I mean and we've got Mr Spring giving us some information about a trust

being set up for funding mechanisms, but we've also got some more detail to come from the applicant. In your experience, for something of this sort of scale, is it common on a private piece of land, and if we're talking in perpetuity when Matakanui leave, you know, someone has responsibility for that bit of land, how does that work? Or should it be in public ownership, potentially, in your - - -

Prof Norton: Oh that's a complex question. Look it's novel. You know, I'm not aware, off the top of my head, of any in perpetuity funding arrangements and I think we need it. I mean I think one of the – one of the biggest threats to native biodiversity is uncertainty about future management. Now I guess my point I've been trying to make is that, you know, tenure alone doesn't guarantee management. It doesn't guarantee the future. I think whether it's a covenant or its – we made a comment in the joint witness statement about some of the problems with covenants, and you know whether it's in public ownership. I mean but again there are questions about public land too.

And to me what's more important than tenure, is that there is a guaranteed management pathway, and as I said before, if you know we remove predators, remove these threats, once that managed work that stops they could reinvade again. So to me that's the most important thing. Does that answer your question?

Mr Barry: It does. I mean we've still got – well I've still got some questions in my mind about that, and we'll probably get some more answers from the applicant over time, but yeah thank you for your response.

Mr Muir: Anything else? Well that, with five minutes to spare, concludes our final topic for the day, and the week's sittings. I was forewarned by Commissioner MacGibbon that of all the experts that we would hear from in the course of two weeks, that the ecologists were the most spirited.

Mr MacGibbon: I'm not sure I quite used that word, but - - -

Mr Muir: He didn't use that word. He used another, but I'm reaching for my -- But if that is how you were to be described, you have all conducted yourselves in an exemplary and professional manner and I do thank you greatly for the assistance which you have brought to the Panel, and your adaptability in dealing with the issues in the dynamic way which we have today. It's extremely helpful to us and one wonders honestly how we could otherwise have approached the issues. Certainly not the traditional format of the sequentially calling experts and then returning to them weeks later. It would have just been useless for us. This type of concurrent hearing is indispensable. I thank you all again. I thank counsel for your input throughout the week, and we'll see you all next Monday.

Ms Sweetman: But not the ecologists.

Hearing adjourned