Before a joint hearing of the

Otago Regional Council	RM20.024
Waitaki District Council	201.2019.1454

Under	the Resource Management Act 1991
In the matter of	applications by Oceana Gold (New Zealand) Limited for resource consents for the Deepdell North Stage III project

Statement of evidence of Mandy Tocher for Oceana Gold (New Zealand) Limited

4 August 2019

Qualifications and experience

1 My name is Mandy D. Tocher.

2 I am a Principal Ecologist and Herpetologist for Ryder Environmental Limited. I have held this position since October 2017. I have worked in the field of Herpetology (lizards and frogs) for over 30 years. Prior to taking up my position with Ryder Environmental, I was employed by another ecological consultancy from 2011. From 1996-2011 (16-years) I was employed by the Department of Conservation as a research scientist specialising in management of South Island lizards and frogs, including carrying out 10-years of lizard research at Macraes Flat[1].

3 I hold a Ph.D. from the University of Canterbury awarded in 1997, where I researched the effects of forest fragmentation, forest destruction, edge effects, and matrix habitat on herpetofauna using grant money awarded from the Smithsonian Institute in Washington, USA and the WWF. This work culminated in the publication of multiple scientific publications and book chapters[2].

4 I also hold a Master of Science (1st class honours), awarded from the University of Canterbury in 1992; for part of this degree I researched the eco-physiology of Otago and Canterbury geckos including their tolerance to cold, and their ability to adapt physiologically to cold conditions[3]. As part of this work, I also researched alpine geckos and their ability to hibernate.

5 As part of my 10-years of research at Macraes Flat, I studied the effects of introduced predators and their control on multiple populations of grand and Otago skinks[4]. I also researched life history[5], diet[6], and movement patterns of these rare species between outcrops in different matrix types[7].

6 I am an author of book chapters, scientific and popular articles on New Zealand native lizards and frogs, including recovery plans for nationally threatened species[8]. I have

[1] Berry, O., Tocher, M.D., Gleeson, D., and S. Sarre (2005). Effect of vegetation matrix on animal dispersal: genetic evidence from a study of endangered skinks. *Conservation Biology* 19: 855-864.
[2] Tocher, M.D., Gascon, C., and Zimmerman, B. (1997). The effects of deforestation on a central Amazonian frog community. In: Tropical Forest Remnants: Ecology, Management, and Conservation of Fragmented Communities. William F. Laurance and Richard O. Bierregaard, Jr. (editors). University of Chicago Press.
[3] Tocher, M. D., and Davison, W. (1996). Differential thermal acclimation of metabolic rate in two populations of the New Zealand common gecko *Hoplodactylus maculatus* (Reptilia: Gekkonidae). *The Journal of Experimental Biology* 275: 8-14.
[4] Tocher, M.D. (2006). Survival of grand and Otago skinks following predator control. *Journal of Wildlife Management* 70(1):31-.
[5] Tocher, M.D. (2009). Life history traits contribute to decline of critically endangered lizards at Macraes Flat, Otago. *New Zealand Journal of Ecology*, 33(2): 125–137.
[6]Tocher, M.D. (2003). The diet of grand skinks (*Oligosoma grande*) and Otago skinks (*O. otagense*) in Otago seral tussock grasslands *New Zealand Journal of Zoology*, 2003, Vol. 30: 243–257.
[7] Berry, O., Tocher, M.D., S. Sarre (2004). Can assignment tests measure dispersal? Molecular Ecology 13: 551-561.
[8] Bishop, P., Daglish, L., Haigh, A., Marshall, L. and M.D. Tocher. Native Frog (Leiopelma spp.) Recovery Plan, 2013-2018. Threatened Species recovery plan 63. Department of conservation.

also written multiple best practice manuals[9], technical guidance documents[10] and strategic plans. I very recently co-authored, for DOC, a review document of conservation values of the Taieri River Catchment, which includes the Macraes Ecological District; and have recently completed the lizard chapter for the 2nd Edition of Sir Alan Marks seminal New Zealand alpine book named "Above the Treeline: A Nature Guide to the New Zealand Mountains".

7 I was a co-author of a lizard conservation strategy entitled "Conservation of lizards in the Otago Conservancy"[11] and facilitated the production (and provided technical advice) for similar publications for the West Coast, Canterbury, and Nelson-Marlborough DOC Conservancy areas.

8 I am a member of the DOC reptile threat ranking panel and co-author of the most recent national threat ranking lists for lizards[12]. I am a member of the Society for Reptile and Amphibian Research in New Zealand, the New Zealand Amphibian Specialist Group for the IUCN, the New Zealand Reintroduction Specialist Group and a past member of the DOC Herpetofauna Advisory Group, the Native Frog Recovery group, and the RMLA.

9 I have been associate editor for the *New Zealand Journal of Zoology* for the last 3-years.

10 I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note. This evidence is within my area of expertise, except where I state that I am relying on what I have been told by another person.

11 I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed. I have specified where my opinion is based on limited or partial information and identified any assumptions, I have made in forming my opinions.

12 In preparing my evidence I have studied the relevant documents provided as part of the Deepdell North III Project Resource Consent application including:

(a) The Deepdell North Stage III Project Assessment of Environmental Effects (AEE, Oceana Gold Ltd, dated 29 January 2020).

[9] Tocher, M.D. (2013): Key principles for lizard salvage and transfer in New Zealand. Contract Report No. 3198. Prepared for Department of Conservation, Wellington. 16 pp.
[10] Tocher, M.D. (2015): Lizard & frog habitat disturbance/removal: Technical guidance for RMA, Concession, Access Agreements and Pastoral Lease applications. Contract Report No. 3461. Prepared for Department of Conservation. 38 pp. plus appendices.
[11] Whitaker, T., Tocher, M.D. and Blair, T. (2002). Conservation of lizards in Otago Conservancy. Stand-alone publication, Department of Conservation, Wellington. vi + 92 p.
[12] Rod Hitchmough, Ben Barr, Marieke Lettink, Jo Monks, James Reardon, Mandy Tocher, Dylan van Winkel and Jeremy Rolfe. 2015. Conservation status of New Zealand reptiles, 2015. New Zealand Threat Classification Series 17. 14 p.

(b) The Deepdell North III project Impact Management Report (IMR, Ahika, dated December 2019).

(c) The draft report by Waitaki District Council ecologists entitled “Review of terrestrial ecology aspects of the Oceana Gold Ltd application for the proposed Deepdell North Mine at Macraes” dated July 2020.

(d) The Aukaha and DOC submissions on the lodged consent application (available on the ORC website).

(e) The survey report of Bovill (2018), provided to me by Dr Thorsen, Ahika.

(f) A Waitaki District Council (WDC) RMA Section 92 Request for Further Information (s92) dated 7th February, 2020.

(g) The Ahika response to the WDC s92, dated 19th February 2020.

(h) A letter, dated 16th March, provided to OGL by Herb Familton, Department of Conservation (DOC, without prejudice), providing preliminary comments and feedback on proposed lizard management relating to the project (and other ecological matters).

(i) High-level findings (provided via a summary email June 11th 2020) from a brief lizard survey carried out by council ecologists, 5th February 2020.

(j) Descriptions and monitoring results relating to artificial lizard habitat created as mitigation for other OGL projects (led by Dr Cathy Rufaut).

(k) Herpetofauna context data downloaded from the DOC Herpetofauna database.

(l) Results from lizard surveys undertaken near to the PIA/EEA.

(m) PIA and EEA Zoning and overlay/mapped area information from the operative Waitaki District Plan (2010).

(n) Otago Regional Council Regional Policy Statement policies and schedules relating to biodiversity.

Scope of evidence

13 I have been asked by Oceana Gold Ltd (OGL) to prepare evidence on the results of an independent review I undertook, in June 2020, on the proposed lizard management relating to the Deepdell North III project (DDNIII project).

14 I have also been asked to provide a draft Lizard Management Plan (LMP), dated July 4th 2020, that addresses issues raised in the review; and those raised by DOC, the Otago Regional Council and Waitaki District Council.

15 I provide explanatory evidence on selected components of the Draft LMP including the anticipated ecological outcomes of its implementation.

16 I explain where agreement has been reached between OGL and DOC on the components of the Draft LMP, and where agreement is pending, or requires additional information from OGL to allow agreement to be reached.

Review of Lizard Management detailed in the project AEE and IMP

17 I first became involved in the DDNIII project on May 26 2020, when I was asked by OGL to undertake an independent review of all aspects of the proposed lizard management relating to the project.

18 I was specifically asked to use my expert judgement to determine whether the proposed mitigation package (any avoidance, remedial, and mitigation actions) was sufficient to ensure a no net loss outcome for lizard species and their habitat over the Macraes Ecological District (ED), post-project.

19 I was also asked to provide recommendations, should the mitigation package fail to be sufficient, on actions to ensure a no net loss outcome could be achieved. In making my recommendations, I was asked to remain aware of the dual purpose of the lizard management objectives; to satisfy both RMA (1991) and the Wildlife Act (1954) requirements.

20 In carrying out my review[13] and forming my recommendations, various supporting documents and field-data were referenced, including those mentioned in paragraph 12. In addition to referencing these documents, I made a brief site visit to the Principle Impact Area (PIA) and the proposed Ecological Enhancement Area (EEA) on Redbank, Wednesday June 3rd 2020. I also contacted Mr John Keene, DOC, and was provided informal information on the extent and location of predator trapping that was being undertaken on the Redbank Scientific Reserve and associated public conservation land within the Macraes Ecological District (ED).

21 My review reached the conclusion that the proposed mitigation package, as described in the reviewed documents, was insufficient to achieve the goal of no-net-loss for lizard values (lizard populations and lizard habitat).

[13] Tocher, MD. 2020. Deepdell North III Lizard Management Review. June 23rd 2020. Report prepared for Oceana Gold Ltd by Ryder Environmental. 27 pages including 5 Appendices.

22 I based my conclusion on:

(a) The contrasting evidence of the lizard populations of the PIA. For example, preliminary DOC feedback on a submitted Wildlife Act authority (86065-FAU) suggested population numbers in the AEE (cited as 185 reptile individuals on page 97 on the AEE) were underestimates; underestimates were also supported by the draft WDC ecologists report,[14] and email correspondence I received[16]. Moreover, my own field visit to the PIA on June 3rd helped form my opinion that the populations of the PIA were indeed underestimated in the AEE.

(b) The apparent extent of good-quality lizard habitat over the PIA, that was not well-detailed in the AEE. For example, during my site visit June 3rd 2020 I noticed an extensive area of rough pasture, with high indigenous vegetation cover, over the sloping ground over the south of the footprint; this area formed good habitat for at risk declining[15] Southern grass skink (*Oligosoma* aff. *polychroma* clade 5), and maybe the at risk declining cryptic skink (*O. inconspicuum*). This area was also highlighted by the WDC ecologist as an area of potential high-value for lizard habitat for the Southern grass skink[16].

(c) The planning protection already afforded to the Redbank EEA through zoning as Rural Scenic, which limits afforestation; and the skink management mapped area/overlay, Appendix J of the Waitaki District Plan, which controls most earthworks and indigenous vegetation clearance.

23 With respect to 22 (c), I make the point that during my assessment of background documents for my review, it was not clear to me whether lizards of all species were considered as significant beneficiaries of the proposed management of the Redbank EEA.

24 Lizards were given a brief mention in this respect on page 200 of the AEE as follows:

"*Lizard habitat is being remedied at the base of the rock stacks and the offset area will be managed for nature conservation (terrestrial ecology) values that will exceed those values being lost within the footprint of the proposal*". Page 200, AEE.

25 For the purposes of my review, therefore, I assumed that lizards were not expected to benefit from the proposed management of the Redbank EEA, as described in the background documents.

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[14] The draft report by Waitaki District Council ecologists entitled "Review of terrestrial ecology aspects of the Oceana Gold Ltd application for the proposed Deepdell North Mine at Macraes" dated July 2020.
[15] Rod Hitchmough, Ben Barr, Marieke Lettink, Jo Monks, James Reardon, Mandy Tocher, Dylan van Winkel and Jeremy Rolfe. 2015. Conservation status of New Zealand reptiles, 2015. New Zealand Threat Classification Series 17. 14 p.
[16] High-level findings (provided via a summary email June 11th 2020) from a brief lizard survey carried out by council ecologists, 5th February 2020.

26 I believe that the uncertainty around the documented lizard values of the PIA resulted in the effects assessment of the AEE being conservative. A conservative effects assessment, where the scale and significance of effects were largely unknown, then led to deficiencies in the mitigation proposed.

27 My review recommended a standalone LMP was prepared, that adopted an adaptive approach to managing lizard values and effects. This was the first mention of a "sliding scale" approach to effects management for the LMP; an approach that in my opinion, acknowledges the uncertainty around the lizard values of the PIA (habitat and populations) and the effects of the DDNIII project on these values. To manage this uncertainty, it was recommended that a range of mitigation options was included in the draft LMP, for various scenarios of lizard population sizes and habitat-use.

28 Suggestions were also included, in the review document, on methods that could be employed to eventually (and before works begun) verify the actual lizard populations of the PIA; these suggestions were carried through to the draft LMP (Appendix A of this brief).

29 Lastly, as part of my review, I provided a number of suggestions for components of a revised mitigation package. There suggestions included:

(a) A salvage and release program to rescue lizards from the PIA;

(b) Intensive predator control at Redbank EEA, or at an OGL Covenant;

(c) Management of grazing through removal of stock from the rehabilitated WRS; and

(d) Habitat enhancement to facilitate connectivity between existing lizards' populations.

30 Some of these suggestions were carried through to the draft LMP (Appendix A).

Draft Lizard Management Plan (see Appendix A)

LMPs under both the RMA (1991) and Wildlife Act (1954)

31 Lizard Management Plans, including the draft LMP for the DDNIII project, work under a rigid statutory regime having to primarily satisfy the protective powers of the Wildlife Act (1954), while also giving effect to the RMA (1991).

32 Under the RMA (1991) Councils have a responsibility to recognise and provide for significant habitats of indigenous species (in this case lizards) as well as a general responsibility to maintain biodiversity. I therefore consider that Councils need to turn their minds both to species, and the habitats they occupy.

33 Consideration of species under the RMA should extend to a consideration of all impacted species, not just those that are Threatened or At Risk, although the assessment of the significance of effects on a species (and the corresponding actions that are reasonable to address those effects) will in part relate to the conservation status of the species in question.

Residual Effects Management within the DDNIII LMP

34 The evidence of Mr Kyle explains the planning context of the draft LMP (Appendix 3). In short, however, the paucity of technical information relating to the lizard values of the PIA has meant that I have adopted a compensation approach to address residual effects of the DDNIII project on lizard values. This compensation approach was fully supported by DOC during our discussions on the contents of the draft LMP.[17]

35 I note WDC ecologists in their draft report use korero gecko as an example in multiple places to inform "Appendix 1 Explanation of biodiversity offsetting terminology", but raise no issues on the approach I have adopted to manage residual effects on lizard values to help ensure a no net loss outcome, post-project, over the Macraes ED.

Lizard Species and Population Size of Each over the PIA

36 There is agreement across all parties that the DDNIII PIA has populations and habitat for korero gecko, Southern grass skink and McCann's skink (see Figure 1). The actual numbers of individuals affected, however, has been contested. Both DOC and the WDC ecologists suggested the population size estimates provided in the AEE were underestimates, and I concur.

37 Estimates in the AEE were almost entirely based on a lizard survey carried out by Luke Bovill, on 16 & 17 February 2018, on behalf of Ahika.

38 In both the review report, and in the draft LMP, my estimates of population size were significantly higher than the estimates provided in the AEE of "185 reptile individuals" (Section 5.10.3 of the AEE); and higher than the estimates provided by WDC ecologists[18]. Based on detailed lizard habitat mapping, described below over paragraphs 45-49, I estimate that a maximum number of 750 korero geckos; 750 McCann's skinks; 204 Southern grass skinks and 40 cryptic skinks could be directly affected by the project (see paragraphs 45-49). Given these figures are much higher than any previous estimates, and can be only verified through survey/index counts

[17] Outcome of discussions held July 9th 2020 between myself, and Lynn Adams and Karina Sidaway from DOC.

[18] The WDC ecologist located *c*. 52 korero gecko and *c.* 30 McCann's skinks "within a few hours on site".

proposed in the draft LMP, I am not aware of any outstanding disagreement between parties on population sizes of each species over the PIA.

39 The presence of cryptic skink, and its habitat, over the PIA was described in Section 2.16.4 of the AEE as follows:

"*The possibility exists that this was a misidentification of a subadult skink of another species…)*" page 53 of the AEE.

40 The WDC ecologists came to the same conclusion, and refer to the reported sighting as "*likely to be a mis-identification as suitable habitat for this species was not observed*…." Section 3.6 of the draft WDC ecologists report.

41 Based on detailed lizard habitat mapping, described below over paragraphs 45-49, I can confirm habitat for cryptic skink exists over the PIA (Table 1).

42 In preparing the draft LMP (Appendix A) I have, therefore, adopted a precautionary principle with regards to cryptic skink, and assumed that not only is the habitat for this species present, but also that the PIA may support a small population of cryptic skinks. Adopting a precautionary approach to the lizard values of the PIA is directly supported by Kā Rūnaka in the submission prepared by Aukaha[19], who state:

"*Kā Rūnaka are concerned about the lack of information available to determine what the potential negative effects on some species might be e.g. very little information is provided on potential effects on lizards and invertebrates. Where this is the case, Kā Rūnaka support the use of the precautionary principle*." Section 4.4, Page 6.

43 Adopting a precautionary approach to adverse effects and is also supported by Policy 5.4.3 of the partially operative Otago RPS 2019 (Changes as a result of appeals version).

44 I want to lastly make a minor point regarding McCann's skink, which is described in the AEE as clade 4 (as per O'Neill *et al*. 2008[20]). The depiction of McCann's skink in the AEE is mis-leading to the reader as it is widely accepted amongst New Zealand herpetologists that there is no equivalence between *O. polychroma* clades, of which clade 5 is present over the PIA, and genetic variation in McCann's skink[21].

[19] Submission to ORC by Kāti Huirapa Rūnaka ki Puketeraki and Te Rūnanga o Ōtākou (referred to as Kā Rūnaka) and prepared by Aukaha, 29th May 2020.
[20] O'Neill, S.B; Chapple, D.G; Daugherty, C.H; Ritchie, P.A. 2008. Phylogeography of two New Zealand lizards: McCann's skink (*Oligosoma maccanni*) and the brown skink (*O. zelandicum*). Molecular Phylogenetics and Evolution 48: 1168-1177.
[21] There is some variation over all McCann populations but this is as is to be expected in a widespread species, but not enough to describe clades.

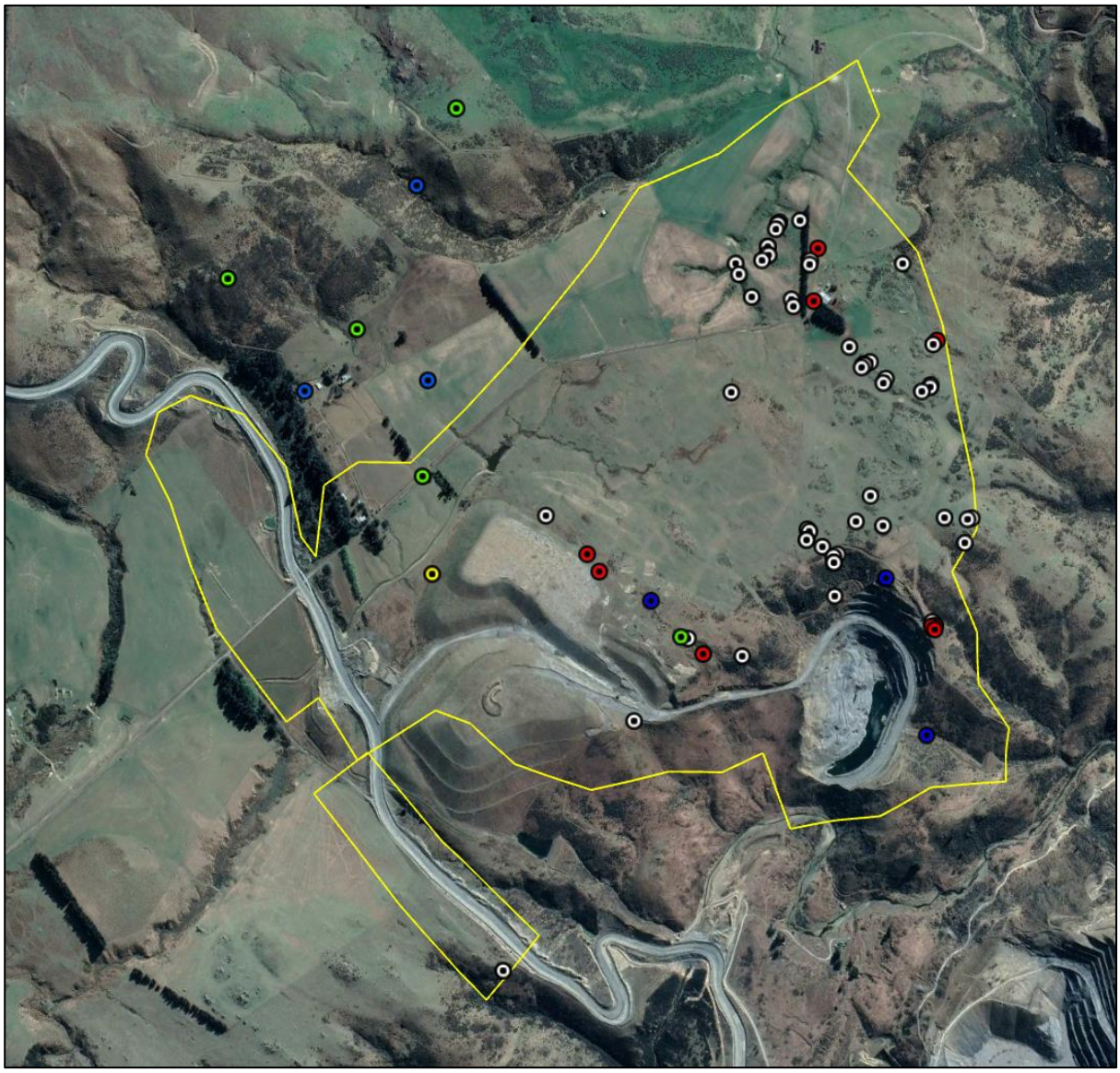

Figure 1: Lizard sightings made by Bovill, 2018 (*n*=12 inside and outside PIA) and lizard observations and korero gecko sign observed by author, July 2020 over the PIA and 100 m buffer area (yellow line). Blue symbol=unidentified skink; red=McCann's skink; white=korero gecko; yellow=cryptic skink and green= southern grass skink. Note: the Bovill (2018) survey extended to the hill country north-west of the PIA where he saw 6 skinks.

Lizard Habitats of the PIA

45 A main finding of my June 2020 review[22] was that lizard habitats of the PIA were poorly qualified and quantified in the AEE. This concern was also raised by DOC and WDC ecologists; and can be inferred from the Aukaha submission on the notified consent.

46 On July 9th 2020, agreement was reached between myself, on behalf of OGL, and DOC to carry out lizard habitat mapping of the PIA[23]. It was agreed that an assessment of relative habitat quality be made simultaneously, as far as practical given lizards were expected to be in hibernation over July, to help assess potential population size of the affected lizard species. There was also agreement between DOC and OGL, that although not an ideal proxy for additional lizard survey of the PIA; habitat mapping would fully align with consenting timelines. Moreover, any additional survey would only be effective if carried out over spring-summer months of 2020/21, so it was agreed that additional survey was not a good option to pursue.

47 Lizard habitat mapping carried out by the author over 2 days during July 2020, combined with cursory lizard searches to estimate relative habitat quality for each of the lizard species known to be present. Fifteen habitats were mapped over the PIA (Figure 2), 1 of which was to be avoided as it had significance as a historic site (mapped as habitat 15 in Figure 2). Discussions between myself and OGL on July 30th 2020 resulted in two further areas being avoided; these areas marked as 'habitat 16' (that was mapped as high-quality lizard rock habitat) and habitat 17 (that was mapped as rough pasture with high indigenous vegetation cover).

48 Based on my experience studying indigenous lizard communities in the Macraes ED (*c.* 10-years), the extent of each mapped habitat that was actually usable by each species was then estimated using a 7-point scale: 100 %; 75 %; 50 %; 25 %; 5 %; 1 % and 0 %. For example, 75 % of the mapped shrubland habitat (18.44 ha; Table 2), was estimated as habitat for korero gecko and it was this amount (*c.* 13.83 ha of shrubland; Table 1) that was deemed korero gecko habitat and used in the effect's assessment and in the design of the mitigation package for korero gecko (paragraphs 63-67 below).

Where habitat was severely degraded and offered very little cover for any lizard, the habitat scored 0 % for all species; this was the case for the degraded red tussock land even though this habitat could potentially support 2 species of lizards under a different (less severe) grazing regime (Table 1).

[22] Tocher, MD. 2020. Deepdell North III Lizard Management Review. June 23rd 2020. Report prepared for Oceana Gold Ltd by Ryder Environmental. 27 pages including 5 Appendices.
[23] DOC meeting July 9th 2020 with LMP author, Karina Sidaway and Lynn Adams.

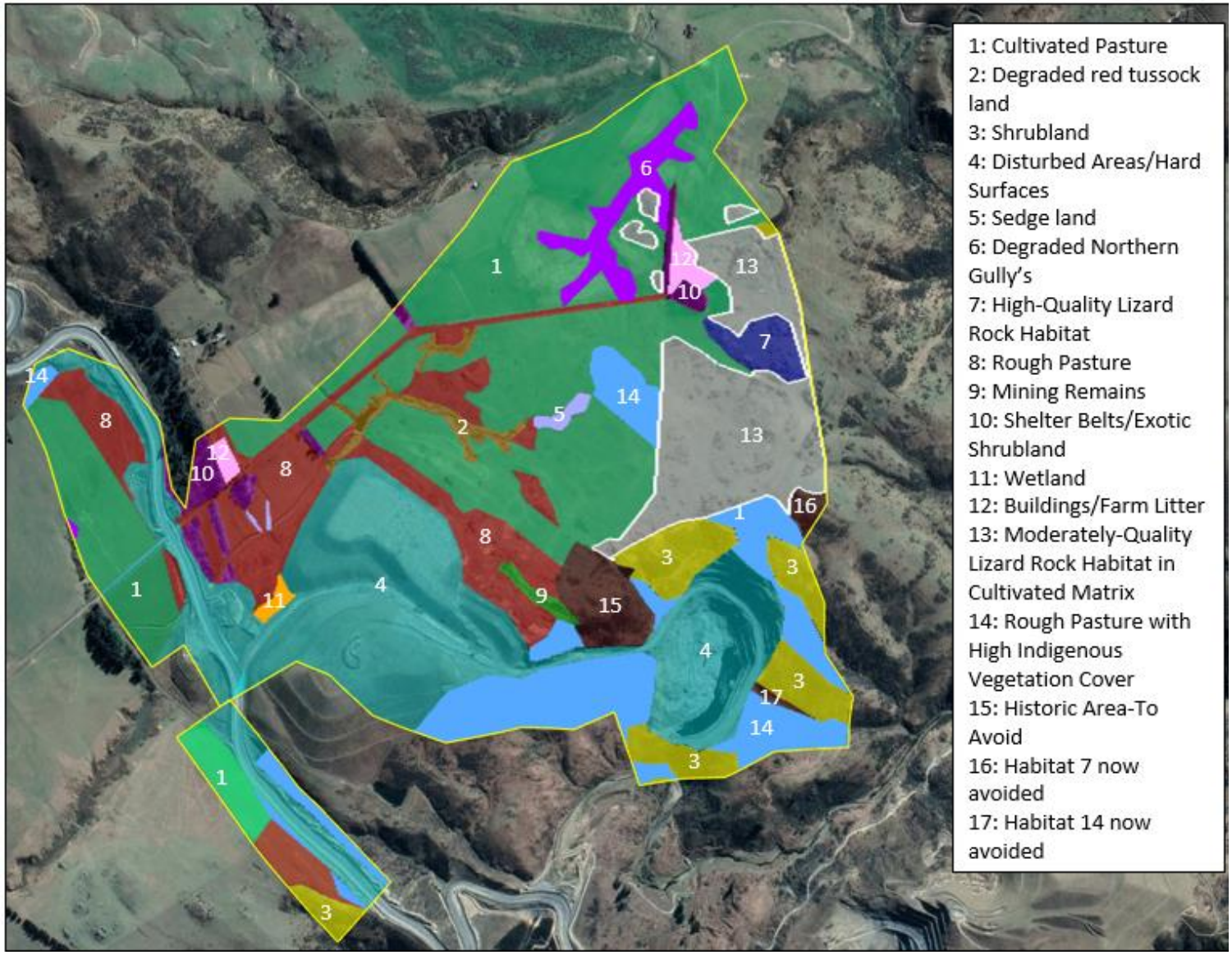

Figure 2: Mapped lizard habitat over the PIA and 100m buffer area (not shown). See Table 1 for areas mapped and estimates of usable lizard habitat.

Table 1: Habitats and extent of habitats over the PIA, and shown in Figure 2, based on lizard habitat mapping carried out over July 2020. For each species and habitat an estimate of the percentage of area mapped that was useable habitat was made using a 7-point score: 100 %; 75 %; 50 %; 25 %; 5 %; 1 % and 0 %. For example, 100 % was given when all mapped habitat was usable for a given species. Condition relates to existing state as lizard habitat not potential condition under, for example, a reduced grazing regime. Condition does not take into consideration exotic predator loading, which is unknown for all habitats. A, "- " means the habitat was considered not suitable for that species, whereas 0 % means habitat suitable but the condition of it meant none of it was deemed usable at the time of assessment.

Habitat # (as per Figure 2)	Description: Condition	Colour in Figure 2	Total Area over the PIA (ha)	Species Likely to be present			
				korero gecko (% habitat usable)	Southern grass skink (% habitat usable)	cryptic skink (% habitat usable)	McCann's skink (% habitat usable)
1	Cultivated Pasture: Not Good Habitat	green	63.04	1% (*c*. 0.63 ha)	1% (*c*. 0.63 ha)	-	1% (*c*. 0.63 ha)
2	Degraded red tussock land: Not Good Habitat	orange - opaque	2.65	-	0 %	0 %	-
3	Shrubland: Good	yellow	18.44	75% (*c*. 13.83 ha)	75% (*c*. 13.83 ha)	1% (*c*. 0.18 ha)	75% (*c*. 13.83 ha)
4	Disturbed Areas/Hard Surfaces: Not Good Habitat except roadsides in places.	teal	53.19	1% (*c*. 0.53 ha)	1% (*c*. 0.53 ha)	1% (*c*. 0.53 ha)	5% (*c*. 2.66 ha)
5	Sedge land: Not Good Habitat	mauve - solid	0.76	-	1% (*c*. 0.01 ha)	0 %	-
6	Degraded Northern Gully's: Not Good Habitat	purple	3.85	5% (*c*. 0.19 ha)	0 %	0 %	5% (*c*. 0.19 ha)
7	High-Quality Lizard Rock Habitat: Very Good	dark blue	2.25	100% (*c*. 2.25 ha)	1% (*c*. 0.022 ha)	-	100% (*c*. 2.25 ha)
8	Rough Pasture: Good in places	red	24.90	25% (*c*. 6.23 ha)	25% (*c*. 6.23 ha)	-	25% (*c*. 6.23 ha)
9	Mining Remains: Very good	Bright green	0.74	50% (*c*. 0.37 ha)	5% (*c*. 0.04 ha)	-	100% (*c*. 0.74 ha)

Habitat # (as per Figure 2)	Description: Condition	Colour in Figure 2	Total Area over the PIA (ha)	Species Likely to be present			
				korero gecko (% habitat usable)	Southern grass skink (% habitat usable)	cryptic skink (% habitat usable)	McCann's skink (% habitat usable)
10	Shelter Belts/Exotic Shrubland: Not Good Habitat	magenta	3.99	-	-	-	1% (*c*. 0.04 ha)
11	Wetland: Very Good	solid orange	0.49	-	100 % (*c*. 0.49 ha)	100 % (*c*. 0.49 ha)	-
12	Buildings/Farm Litter: Very good	pink	1.44	25% (*c*. 0.36 ha)	1% (*c*. 0.01 ha)	-	25% (*c*. 0.36 ha)
13	Moderately-Quality Lizard Rock Habitat in Cultivated Matrix: Good	white	21.08	100% (*c*. 21.08 ha)	25% (*c*. 5.27 ha)	-	100% (*c*. 21.08 ha)
14	Rough Pasture with High Indigenous Vegetation Cover: Very Good	light blue	22.62	75% (*c*. 16.97 ha)	100 % (*c*. 22.62 ha)	1% (*c*. 0.23 ha)	75% (*c*. 16.97 ha)
	Totals for Area (ha)		**219.44**	**62.44**	**49.682**	**1.43**	**64.98**
	% of 225 ha PIA			**28%**	**22%**	**0.64%**	**29%**
15	To Avoid. Historic Reserve	brown	4.51	n/a	n/a	n/a	n/a
16	To Avoid. Habitat 7	brown	0.89	n/a	n/a	n/a	n/a
17	To Avoid. Habitat 14	brown	0.29	n/a	n/a	n/a	n/a

The Mitigation Packages – Overview of Sliding Scale Approach

49 Following the lizard habitat mapping I had sufficient information on the amount of lizard habitat affected by the project[24]; but I still did not know with certainty the population size of each species affected by the project. For this reason, I adopted a sliding-scale approach to the design of three separate mitigation packages (termed three scenarios; Appendix 3 of the draft LMP), that differed only in the number of lizards affected.

50 Agreement was sought and then reached between myself on behalf of OGL, and DOC, to adopt this sliding scale approach for the effect's assessment, and then the design of mitigation packages within the draft LMP.[25]

Population Size Estimates

51 I note that should no lizards of a given species be confirmed present over the PIA (through the methods described in paragraphs 57-59), no remedial, mitigation or compensation actions will be required by the draft LMP (Appendix A).

52 To estimate population size over the PIA for each species, I made a realistic upper estimate of the potential population size of each species, over each habitat (see Table 3 in the draft LMP for the detail of my calculations). I then summed these figures across habitats to get a total number of individuals affected, for each species, over the PIA.

53 This subjective assessment was based largely on my experience of these habitats and these species in the Macraes Ecological District; and from observations I made in the field during July 2020. The population size estimates I generated, which are subject to numerous assumptions/caveats that I have detailed in the draft LMP, Section 6 (Appendix A), indicate that a maximum number of 750 korero geckos; 750 McCann's skinks; 204 Southern grass skinks and 40 cryptic skinks could be directly affected by the project (also noted above in paragraph 38).

54 I then used these estimates to form the upper limit of the 'realistic' mitigation package scenario (Table 2). To get the lower limit for the realistic scenario, I simply halved the upper population level. For the least-impact scenario, I set the lower value arbitrarily at 1 for cryptic skink, the rarest skink of the 4 species in the Macraes Ecological District; 10 for the not-threatened McCann's skink, and 5 for both korero gecko and Southern grass skink. Should such small populations of these species occur over the PIA, I consider that the project will have only a minor adverse effect on populations. All other

[24] Note: further commentary on how mapped habitats were included into the mitigation packages is provided in Section 6: Calculation of Extent of Habitat Affected by the Project of the draft LMP (Appendix A of this brief).
[25] DOC meeting July 9th 2020 with LMP author, Karina Sidaway and Lynn Adams.

values are self-explanatory, with values derived from values already explained (Table 2).

55 I then set about designing mitigation packages that were appropriate for the range of population estimates, for each species, for each scenario. For example, for the realistic scenario, 375-750 korero geckos could be affected by the project. The proposed mitigation package for korero gecko was then designed to manage adverse effects on between 375 and 750 korero geckos.

Table 2: Estimated range in lizard population-size across 3 scenarios, each with a unique mitigation package proposed in the draft LMP (Appendix A).

	Sliding Scale Scenarios				
Lizard Species affected (habitat affected, ha)	Least Impact		Realistic		Worse-case
	Lower	Upper	Lower	Upper	
# korero gecko (62.44)	5	<375	375	750	>750
# Southern grass skink (49.68)	5	<102	102	204	>204
# McCann's skink (64.98)	10	<375	375	750	>750
# cryptic skink (1.43)	1	<20	20	40	>40

Choice of Scenario

56 In order to determine which of the three scenarios fit best with the actual lizard populations over the PIA, I have included a requirement to carry out index counts for McCann's skink and korero geckos, over the PIA, into the draft LMP. These counts are to be carried out during suitable weather over September-October 2020, and be carried out by an experienced observer.

57 For Southern grass skinks and cryptic skinks, salvage (rescue from the PIA) forms part of the mitigation package in the draft LMP. In my view, the salvage itself will inform the best-fit mitigation scenario for these 2 species, selected from the mitigation tables in Appendix 3 of the draft LMP (Appendix A).

58 I have designed the tables in Appendix 3 of the draft LMP to allow selection of 'hybrid scenarios' whereby a set of actions for any given species in one Table, can be implemented in isolation from entries for other species in the same table. In other words, the mitigation package for korero gecko, as an example, can be selected from any of the three tables that best represent the population size affected. The table selected for korero gecko need not be the same table that best suits any other species.

Components of Proposed Mitigation Packages

59 Mitigation packages were designed for three population-size scenarios, across all 4 species:

(a) Worse-case, whereby many lizards of each species were affected by the project;
(b) Realistic (using my estimates in Table 1 as the upper population size estimate); and
(c) Least Impact where fewer lizards were affected.

60 The 'realistic scenario' is just that: the scenario that seems to best match the habitat quality and incidence of lizard sightings I observed over the PIA. The 'worse-case scenario' mitigation package is based on high population estimates for all 4 species; and the 'least impact' scenario is based on the lowest population estimates. These packages are summarised in Appendix 3 of the draft LMP, and due to the complexity of the tables, are not included in this brief (but see Appendix A).

61 The mitigation hierarchy was applied to all species and their habitats, and as detailed over paragraphs 34-35 compensation was applied where residual adverse effects remained. For the mitigation tables in Appendix 3 of the draft LMP, lizard populations and their habitats are tabulated, but the overview of the planned mitigation components for each species below, combines all actions for brevity.

Mitigation Components for korero gecko

62 A small area of korero gecko habitat will be avoided (see Habitat 16; Figure 1). No remedial actions are planned for korero gecko, but actions planned for McCann's skink may benefit korero geckos in the longer-term (detailed in paragraphs 80-84 below).

63 Proposed mitigation actions include intensive predator control that will be carried out for 5-years, with outcome monitoring. The development of a robust outcome monitoring method by an experienced herpetologist forms part of the mitigation action planned for korero gecko.

64 As a compensation action, I have proposed a research project that investigates how best to translocate korero geckos into ready-made rock habitat. The proposal seeks to investigate how artificial cover objects can support the establishment of a newly translocated korero gecko population. This research project has been selected as a topic that will add to the mitigation 'toolbox' for korero gecko in the Macraes Ecological District; and aligns well with existing research being carried out by Dr Cathy Rufaut related to the Coronation North project[26].

[26] See Rufaut *et al.* October 2019. Research Scope Report entitled "Lizard mitigation research at Macraes Gold Mine: Replacement of Coronation habitat areas".

65 The research compensation action only applies to the worse-case and realistic scenarios where >350 korero geckos and their habitat are affected by the project.

66 Actions proposed for korero gecko and their habitat in the draft LMP gained support, in principle, from DOC on July 31st, with a single caveat. In order to fully support the research compensation action involving translocation and artificial cover objects, DOC have requested a research brief to be prepared and submitted to them ahead of the hearing.

Mitigation Components for Southern grass skink

67 OGL had originally proposed to position the Deepdell East Waste Rock Stack over an area to the north-west of the current location, over a mix of cultivated pasture and hill country with rough pasture. Based on the results of the lizard survey over this area carried out by Bovill (2018)[27] for Ahika (the sightings of which are shown in Figure 1); and viewing the area on google earth, I am quite sure extensive areas of habitat for Southern grass skink was avoided by the decision to locate the WRS at the current proposed location.

68 I note here, however, that the decision on where to locate the WRS was not informed by lizard values, but instead, attempted to avoid effects on other ecological components such as waterways and botanical values (see Section 7 of the AEE Assessment of Alternatives).

69 As well as moving the waste rock stack to an area with less Southern grass skink habitat than other options considered, discussions on July 31st between myself and OGL led to another area of Southern grass skink habitat to be avoided (mapped as Habitat 17 in Figure 2). This area small area was also damp under foot, and as such could contain both cryptic skinks and Southern grass skinks.

70 No remediation actions are planned for Southern grass skinks and their habitat.

71 Proposed mitigation actions include salvage (rescue) from the PIA ahead of works with captured lizards released into the Cranky Jim's covenants. To support the establishment of these rescued lizards, intensive predator control will be carried out for 5-years, with outcome monitoring.

72 As a compensation action, I have proposed a 7- year research project that investigates Southern grass skink populations (over three fenced sites) respond to the removal of grazing through stock exclusion fencing. The monitoring of rodents and hedgehogs, and how they respond to grazing removal, forms part of the compensation action for

[27] Bovill, L. 2018. Deepdell North Reptile Survey. 16th January and 17th January 2018.

the worse-case scenario only, where >204 Southern grass skinks and their habitat are affected by the project.

73 Actions proposed for Southern grass skink and their habitat in the draft LMP gained support, in principle, from DOC on July 31st 2020 to the extent that DOC recommended that OGL initiated work on a predator management plan for Cranky Jim's covenant. DOC made the point that, in order to support the Southern grass skink salvage action, predator control must be underway at Cranky Jim's covenant ahead of the release of rescued lizards; I agree with this point made by DOC.

Mitigation Components for cryptic skink

74 A small amount of cryptic skink habitat *may* have been avoided with the avoidance of Habitat 17 in Figure 1; but avoidance of this particular area was primarily to avoid Southern grass skink habitat. For this reason, I have not included any avoidance actions for cryptic skink, or their habitat, into the mitigation tables (Appendix 3 of the draft LMP). Also, no remediation actions are planned for cryptic skink or their habitat.

75 I make the point here, however, that in order to apply avoidance actions, a more definite idea of where cryptic skinks exist over the PIA is required. In other words, I am of the opinion that there seems little to gain in avoiding ''potential'' habitat of cryptic skink. Moreover, given the rarity of this species over the Macraes Ecological District[28], populations over the PIA are likely to be low. This assertion is reflected in the estimates provided in Table 2 where I estimate, realistically, between 20-40 cryptic skinks occur over the PIA. In short, avoidance does not make much sense given this context.

76 Proposed mitigation actions for cryptic skink include salvage (rescue) from the PIA ahead of works with captured lizards released into the Cranky Jim's covenants. To support the establishment of these rescued lizards, intensive predator control will be carried out for 5-years, with outcome monitoring.

77 As a compensation action, for the worse-case scenario only where >40 cryptic skinks are affected by the project, I have proposed a 7- year research project that investigates a cryptic skinks population response to the removal of grazing through stock exclusion fencing.

78 Actions proposed for cryptic skink and their habitat in the draft LMP gained support, in principle, from DOC on July 31st 2020, and as mentioned for Southern grass skink, support was gained to the extent that DOC recommended that OGL initiated work on a

[28]Whitaker, T., Tocher, M.D. and Blair, T. (2002). Conservation of lizards in Otago Conservancy. Stand-alone publication, Department of Conservation, Wellington. vi + 92 p.

predator management plan for Cranky Jim's covenant in anticipations of salvage being undertaken in the future. OGL have agreed to begin this work.

Mitigation Components for McCann's skink

79 A small area of McCann's skink habitat will be avoided (see Habitat 16; Figure 1) but the primary action to manage adverse effects of the project on McCann's skink is a remedial action proposed for all three mitigation scenarios (Appendix 3 of the draft LMP).

80 I have proposed that a lizard-habitat specific rehabilitation plan is developed, in collaboration with an experienced herpetologist, and ultimately approved by DOC, for the Deepdell East WRS; or for the Deepdell South Pit[29].

81 Key actions related to the rehabilitation include:

(a) Extract weathered, lichen-encrusted rock slabs from the PIA, ahead of works, and stockpile nearby works area (on bare ground with no existing ecological value) to use for rehabilitation, post-works. If the Deepdell South Pit is used, following back filling, rehabilitation can begin concurrently with the DDNIII project meaning stockpiling rock would no longer be necessary. The use of a back filled Deepdell South Pit is my preferred option which then addresses all concerns raised by DOC, July 31st 2020 relating to stockpiling of rock.

(b) Install a lizard drift fence around the rock stock pile to ensure lizards do not colonise the pile ahead of its use in rehabilitation (not required if Deepdell South Pit is used).

(c) 10 ha of the footprint of the WRS, or Deepdell South Pit, will be rehabilitated in a way that connects with existing habitat (overcomes barriers caused by the WRS drains), and mimics present habitat. Note: in my opinion, better connectivity with natural land cover can be attained by rehabilitating the Deepdell South Pit and then rehabilitating the site, instead of rehabilitating the DDNIII WRS.

(d) Some planting will be carried out to replicate what is there now.

(e) The 10-ha lizard habitat will be fenced to exclude stock.

(f) Monitoring of passive migration into the area will occur for 5 years; details to be included in the lizard-habitat specific rehabilitation plan.

[29] The option to use the back-filled Deepdell South Pit was tabled as this evidence was drafted and is not reflected in the draft LMP (Appendix A).

82 No mitigation or compensation actions are planned for McCann's skinks and their habitat in the draft LMP.

83 Actions proposed for McCann's skink and their habitat in the draft LMP gained support, in principle, from DOC on July 31st 2020.

Contingency Mitigation

84 I note that agreement was reached between DOC and OGL that the draft LMP will include a contingency mitigation action for each outcome monitoring action[30]. Moreover, there was agreement that contingency mitigation actions must be developed in full consultation with DOC, but actions are to be resourced and managed by OGL. I agree that this approach is appropriate.

Outstanding Issues Relating to Lizard Management

85 At the time of writing, there were only three areas remaining where agreement between OGL and DOC has yet to be reached:

(a) Support for the translocation research proposed as compensation for korero gecko and their habitat;

(b) Agreement on whether there are still residual effects to address for 1 or more lizard species of the PIA; and

(c) Agreement on the nature of any contingency mitigation, should any of the anticipated adverse effects fail to be successfully managed as anticipated in the draft LMP. For each outcome monitoring action, a contingency action will be included in the draft LMP.

Conclusion

86 There are very few issues unresolved between DOC and OGL pertaining to Lizard Management related to the DDNIII project; and no outstanding issues remain between OGL and councils.

87 In my opinion, the resolution of the 3 outstanding issues (paragraph 86) will result in a final LMP with the necessary flexibility to effectively apply an appropriate set of mitigation actions (package) for the lizard values affected.

[30] Meeting July 31st 2020 with myself and Duncan Ross (OGL), and Karina Sidaway and Lynn Adams of DOC.

88 If the final LMP is implemented effectively, a no net loss outcome for lizard values of the Macraes Ecological District will occur.

Dr Mandy Tocher

4 August 2020

Appendix A Draft LMP.