BEFORE THE NEW PLYMOUTH DISTRICT AND TARANAKI REGIONAL COUNCILS

IN THE MATTER	of the Resource Management Act 1991 ("the Act")
AND	
IN THE MATTER	of applications from NZTA to alter a designation and for resource consents for the Mt Messenger Bypass Project - SH 3 between Uruti and Ahititi ("the Project")

LYNN KAREN ADAMS

EVIDENCE ON BEHALF OF THE DIRECTOR-GENERAL OF CONSERVATION

(Herpetofauna)

Dated: 24 July 2018

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1. QUALIFICATIONS AND EXPERIENCE

1.1. My full name is Lynn Karen Adams. I hold the degrees of Master of Science and Batchelor of Science in Biological Sciences.

1.2. For the past 23 years, I have worked for the Department of Conservation (the Department) in a variety of roles. During the last 6 years I have been employed in the National Office as a Technical Advisor, Fauna in the Biodiversity group. For 21 of the last 23 years my role in the Department has been to provide technical advice, support and delivery of terrestrial indigenous fauna conservation programmes throughout New Zealand.

1.3. I have researched, planned and implemented management and monitoring programmes on native New Zealand fauna, including translocations, pest control and wide-scale restoration. Most of this work has been to improve conservation management for Threatened or At Risk fauna.

1.4. I have been the leader of the New Zealand Lizard Technical Advisory Group for the last nine years, a group of experts who provide advice on the conservation management of lizard species nationally. I am the leader of the Hihi Recovery

Group and the Tuatara Recovery Group, and a member of the frog and bat national Recovery Groups.

1.5. I am a member of the Society for Research on Amphibians and Reptiles of New Zealand, the Ornithological Society of New Zealand (Birds NZ), and a member of the IUCN Species Survival Commission.

1.6. I attended a site visit on 8 August 2017, so I am familiar with the area to which these applications relate.

1.7. I am presenting this evidence at the request of the Director-General of Conservation in relation to lizards. I will be commenting on the Applicant's ecological evidence in relation to the Mt Messenger Notice of Requirement and resource consent applications ("NOR"). My evidence also considers the Applicant's proposed mitigation and compensation package and its benefits to compensate the proposal's impacts on lizards. My evidence considers some improvements that could be made to the Ecological and Landscape Management Plan to better reflect the advice that the Applicant's herpetofauna expert, Mr Simon Chapman, has recommended.

1.8. I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to comply with it. I confirm that the issues addressed in this brief of evidence are within my area of expertise.

1.9. 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.

1.10. My opinions rely in part on the Evidence in Chief presented by expert witnesses appearing for NZ Transport Agency, in particular the statement of evidence of Mr Chapman

1.11. In addition, in preparing my evidence I have reviewed the relevant documents provided as part of the Mt Messenger Project NOR including:

- Ecological and Landscape Management Plan (ELMP) (17 July 2018); and
- Proposed consent conditions attached to Mr Roan's evidence.

2. SCOPE

2.1. I have been asked to provide evidence on lizards. Specifically, I discuss the following issues:

- The areas of agreement and disagreement with Mr Chapman, the Applicant's herpetofauna expert;
- The limitations in locating lizards;
- The reasons why a predator-proof fenced site is the best option for compensating for potential adverse effects on lizards, and what details are needed to ensure success;
- How the lizard management in the Ecological and Landscape Management Plan and consent conditions need greater detail to ensure Mr Chapman's evidence is implemented; and
- Conclusions.

2.2. In formulating my views, I have relied on information provided in the Applicant's draft ELMP and Mr Chapmans evidence. I have also relied on my experience of this subject matter, research undertaken in NZ on lizards, together with published literature and other unpublished data.

2.3. I acknowledge that there is uncertainty regarding the subject matter of my evidence. We have incomplete knowledge of New Zealand lizard ecology, of the threats to lizards and the tools to manage them effectively.

3. AREAS OF AGREEMENT AND DISAGREEMENT WITH MR CHAPMAN

3.1. Habitat loss, coupled with predation from introduced predators has been the leading cause of decline for all lizard species in New Zealand, historically. Habitat loss and predation both continue today. Complete loss of habitat from urbanisation, land intensification and vegetation clearance is contracting species ranges (Hitchmough et. al. 2016). Further, habitat degradation is also having impacts by reducing carrying capacity and range (e.g. browsers reduce ground cover; restoration planting removes favoured rank grass (Hitchmough et. al. 2016)).

3.2. I concur with the description of herpetofauna record within the Project footprint and wider Project area as stated by Mr Chapman.[1] I agree that the most significant herpetofauna species present in Taranaki's indigenous forest habitat is the striped skink, forest gecko, goldstripe gecko and Wellington green gecko (all have threat status of At Risk, Declining, Hitchmough *et a*l 2016). Nationally the two geckos have several secure sites, but striped skink do not, thus elevating the importance of striped skinks.

3.3. I agree with Mr Chapman's recommendation[2] to take a precautionary approach to assessing the overall unmitigated effects on herpetofauna due to uncertainties over what species of herpetofauna are actually present in the Project footprint. On this basis Mr Chapman lists overall unmitigated effects for herpetofauna rating 'moderate'. While I agree with this assessment, I find the lumping of frogs, skinks and geckos (herpetofauna) artificial, and it risks masking effects on individual species.

3.4. I also agree with Mr Chapman's list of potential adverse effects on herpetofauna.[3]

3.5. Mr Chapman states:[4]

> *"In my EIC I commented that the Restoration Package , including the 1085 ha PMA, was "likely to have a neutral to slightly beneficial effect on herpetofauna" Despite the paucity of published information, I continue to hold the view I expressed in my EIC which is that some lizards- especially arboreal species – are likely to benefit (e.g., improved recruitment/survival due to reduced predation) from the PMA even though the control of mice will not be a focus of pest control."*

3.6. In my opinion, the proposed Pest Management Area ("PMA") will provide no benefit to lizards with the proposed pest management targets. Mr Chapman and I disagree on this point.

3.7. The reason I disagree is because the proposed PMA will not control mice populations, yet we know mice impact lizard populations (Newman, 1994). Lizards are very sensitive to predation even at very low densities of predators.

[1] Mr Chapman EIC at [25] and [37] – [39].
[2] Mr Chapman EIC at [65].
[3] Mr Chapman EIC at [64(b)(iii)].
[4] Mr Chapman supplementary evidence at [36].

Mice populations erupt following removal of other predators and competitors (especially rats) (Wilson, *et al* 2018; Innes *et al* 1995; Murphy *et al* 1999). Mice, and mouse eruptions have detrimental effects to lizards (Newman, 1994; Nelson *et. al.* 2016; Romijn, 2013). Further, intensive pest control efforts across mainland New Zealand have shown no measurable benefits to lizard populations (Dumont, 2015). We do not have mainland pest management tools that are effective enough to allow lizard recovery except in one notable exception at Macrae's, Central Otago (Reardon *et. al.* 2012), an area with naturally low rodent densities and where more than 4000ha is intensively managed for all predators to protect a 40ha core management area.

3.8. The current body of science has never shown recovery of lizard populations under the sort of management that is proposed to offset effects of this project.

3.9. I agree with Mr Chapman[5] that a predator-proof fence (which also excludes mice), and using the design shown Figure 7.1 of the ELMP, is the best option to allow recover of lizards. I agree with Mr Chapman that the fence should protect an existing population of striped skink (*Oligosoma striatum*); a species likely to be within the footprint that is nationally and regionally important. Other considerations for this fenced site are outlined later in my evidence.

3.10. Predator-proof fencing currently provides the only option that allows recovery of lizards within forests, on the mainland. Therefore I agree with Mr Chapman that it would be appropriate to protect an existing lizard population using a predator-proof fence, which may also be used as receiver site to transfer salvaged lizards. This is stated by Mr Chapman as follows:[6]

> *"The installation of predator-proof fencing and the eradication of mammalian predators (including mice) at any site with a striped skink population would be of immediate benefit to the existing lizard populations…"*

Further, I also support the principles outlined by Mr Chapman that the area must contain an existing population, must be at least 1ha to ensure a viable population, and must have suitable habitat "*i.e. large native trees with abundant epiphytes*".[7]

[5] Mr Chapman supplementary evidence at [37].
[6] Mr Chapman supplementary evidence at [38].
[7] Mr Chapman supplementary evidence at [38] – [39].

3.11. Improvements are needed to the proposed consent conditions and the Ecology and Landscape Management Plan to ensure the evidence provided by Mr Chapman is implemented. There is currently a strong focus on a predator-proof lizard enclosure but the details of achieving this are deficient.

3.12. Mr Chapman's evidence does not go into the detail of how sites will be selected, although he does refer to our discussions and narrowing of options for sites that are being explored[8] . Given the site has not yet been settled upon, in section 6 I set out the general principles that would guide the choice of a predator-proof fence site.

4. LIZARDS ARE DIFFICULT TO LOCATE

4.1. Lizards are difficult to detect. The monitoring and survey tools available (Inventory and Monitoring Toolbox, DOC) has only recently been developed. Methods are still being refined and improved. The main difficulty is that it is near impossible to definitively confirm absence of lizards, particularly in complex environments like forests. That is made even more difficult when populations are sparse, patchy, or where lizards utilise habitats inaccessible to people (e.g. epiphytes or canopy). Lettink and Monks (2016) acknowledge that arboreal species and low-density populations present sampling challenges that require further attention.

4.2. Generally, several years of monitoring effort is required to form a base of information. The survey effort undertaken by the Applicant was not of sufficient duration to have a high chance of detecting sparse lizard populations. For example, it took over one year of monitoring (totalling 6 weeks of intensive ACO checks) to detect a single Hokitika skink who is found in simple rank grassland habitat (*pers. obs*.). The surveys undertaken by the Applicant were not of sufficient duration nor intensity to have a high likelihood of detecting patchy or sparse populations, or even abundant populations in areas inaccessible or not surveyed by the project experts. The lack of effort was further compounded because surveys initially focused on the alignment west of the existing SH3.

4.3. Given the limitations in detecting lizards, the Applicant has assumed that lizard species will be present where there is suitable habitat and conditions. This approach is appropriate and is supported (noting however that lizards can

[8] Mr Chapman Supplementary evidence at [37].

occupy a range of habitat types, including those highly modified, as demonstrated in results from this application; copper skink records that were found under farm debris.)

5. PREDATOR-PROOF FENCES ALLOW LIZARD RECOVERY

5.1. Given the limited tools to protect lizards, avoiding loss of habitat is the best approach. The current alignment has avoided areas of higher value. The proposed alignment does appear to minimise potential for effects however, the area impacted is still of high value.

5.2. In the absence of 'avoiding' effects, predator-proof fences allow lizard recovery, provided the site is carefully chosen and managed in perpetuity.

5.3. In situations where lizard populations are impacted by habitat loss a range of tools are commonly used to mitigate these impacts. These tools are poorly developed, and I am not aware of any research that confirms they result in either survival of individuals, or recovery of populations. The commonly used tools include:

- Salvage (internationally known as mitigation driven translocation);
- Restoration planting;
- Habitat enhancement;
- Pest control.

5.4. Salvage, or mitigation driven translocation, is the deliberate act of moving lizards away from habitat that will be damaged or removed. It assumes moved individuals will survive where they are released, and contribute to establishing either a new population, or growing a larger population. There is no evidence to support this.

5.5. The portion of a population that is salvaged has not been measured. The only published study I'm aware of that has attempted to quantify the portion of lizards caught, showed it was highly variable, and usually low (<50%; ranged from 0.002 ± 0.001 (SE unless stated otherwise) to 0.470 ± 0.069), even with reasonable effort (Lettink *et. al.* 2011). We can therefore assume that only a portion of the population will be caught during salvage. The limited salvage effort is warranted in this case because the predator-proof fence is the primary method of compensating impacts.

5.6. In addition, I am also not aware of any data that measures the portion of individuals that survive salvaged attempts, nor their relative contribution to populations.[9] Internationally mitigation-driven translocations have poor success (Germano, et al 2015). In New Zealand even conservation translocation, which generally have a higher success rate (Germano and Bishop, 2009) have relatively poor outcomes (Romijn and Hartley, 2016; Sherley et al 2010)

5.7. Restoration planting. The purpose of planting needs to be clear if there any chance in having an ecological benefit for lizards (Lettink *et. al*. 2010). For example, chipped logs are unsuitable for lizard, conversely intact logs could improve habitat for ground dwelling lizards by providing refuge cover. Hitchmough *et al* (2016) summaries the issues:

> *"Lizards can be negatively impacted by conservation or restoration initiatives. Restoration planting into rank exotic grasslands creates an unsuitable environment as the canopy closes, shading out the grass cover, but native understory vegetation is much slower to establish. Even when greater diversity and layering of the forest structure does develop, the habitat suits a very different lizard fauna (e.g. Stephens 2004). If suitable source populations are not present in the immediate area lizards will remain absent without a planned translocation."*

5.8. Habitat enhancement: Habitat enhancement is where habitat elements are added to existing habitat to enhance it for the targeted species. It ranges from small additions such as flitches/ rounds of wood or rock, to direct transfer of entire habitat. Enhancement is often used alongside salvage where its purpose is to improve carrying capacity at the release location or provides secure habitat from predators. Neither theory has been proven (Romijn and Hartley, 2006; Lettink *et al*). In New Zealand there is very little evidence that show this approach is successful.

5.9. Predator control. I have outlined in more detail why predator control is largely unsuccessful at allowing recovery of lizard populations.

[9] I am only aware of one study that has resulted in population level improvements as a result of salvage, but it too ultimately failed. This was a salvage operation at Whangamata. The salvaged population grew for 5 years while pest control occurred around the release site. But the population disappeared after pest control was stopped and was assumed to have gone extinct (C. Wedding pers. com.). I'm not aware of any other study that has shown population level benefits.

5.10. To gain the best outcome from a predator-proof fence, the chosen area would protect known populations of lizards. The area would focus on protecting the most significant species found at Mt Messenger from a national and regional perspective (e.g. striped skink, arboreal geckos), have the greatest diversity of species and be large enough to allow a self-sustaining population to persist long term. If this were achieved, it would provide appropriate compensation for lizards.

6. THE ECOLOGICAL AND LANDSCAPE MANAGEMENT PLAN AND CONSENT CONDITIONS

6.1. A number of key details are currently missing from the predator-proof fencing proposal which will ultimately determine is success. For example, consent conditions[10] only require mapping "*the location of possible lizard enclosure area*". The choice of the area will be vital to its success. The details of ensuring predators remain at zero density in perpetuity have also not been addressed. Even well-managed fenced sites will have periodic pest mammal incursions that need to be addressed.

6.2. Site selection: The location and size of a predator-proof fence is important and will determine success or failure in securing a lizard population. I have had some discussions with Mr Chapman on potential locations for the predator-proof fenced area, but a site has not been chosen and so I set out criteria for the site below. I have already stated that the site must contain remnant population(s) of species most highly threatened, nationally or regionally (lizards have very low dispersal abilities so must be present within the area from the outset). I agree with Mr Chapman that striped skinks best met this criteria.[11] Ideally the predator-proof fence would include lizard values and habitat that:

- Include species identified as potentially present within the Mt Messenger footprint.
- Has multiple species within the area.
- Has a large enough founder population to establish a genetically robust population, long-term.
- Is large enough to sustain a large population (hundreds of individuals of each species). I agree with Mr Chapman that >1ha would achieve this for arboreal species.

[10] Condition 29A(b).
[11] Mr Chapman supplementary at [109].

- Has a high chance of successfully excluding all predators to a threshold of zero abundance.
- Has habitat suitable to allow recovery of resident species but is sufficiently diverse to provide potential habitat for reintroduction of new species by future managers; I agree with Mr Chapman that adequate habitat should include large native trees with abundant epiphytes.
- Has a biosecurity and management plan implemented long-term; and
- Has secure land tenure in the long-term.

6.3. Construction and eradication of mammalian predators: A predator-proof fence is a c.2.2m high fence, capped to prevent jumping animals gaining entry, covered in small mesh to exclude juvenile mice (6mm high), and with a skirt along the base to prevent burrowing. Mammals are then eradicated within the fence. The fence design shown in Figure 7.1 of the ELMP meets this criterion and is supported. Also see Appendix A for examples used to protect lizards in NZ.

6.4. Eradication of mammalian predators within the fence is a critical element of establishing a secure population of lizards. Eradication is complex and is normally only confirmed successful after several years of rigorous monitoring to detect mammals, yet there is no reference to any actions beyond building a fence. More detail on eradication and post-eradication managment is needed in the ELMP

6.5. Legal protection: To enable effective management in perpetuity a legal mechanism needs to be in place to allow future access and management activities. The area needs to be protected from future threats including land development, vegetation clearance etc. A range of options could be investigated but the purpose of any protection measures should be to ensure long term persistence of lizard populations. This needs to be outlined in the ELMP.

6.6. Long term management and biosecurity: Fences require a high level of vigilance and maintenance to ensure prolonged success (Norbury *et. al*. 2014). To maintain the functionality of the fence and maintain eradication status, annual maintenance is required (Norbury *et. al*. 2014; Burns *et. al*. 2012). This includes (but is not limited to):

- biosecurity to prevent and detect incursions,
- maintenance of fence integrity including regular fence inspections,

- eradication costs following occasional pest incursions and
- clearance of vegetation and grass along perimeters

6.7. The above points are currently details that will determine the success or failure of establishing a healthy lizard population.

6.8. Monitoring: The draft ELMP states that lizard monitoring is not required because of "*inherent difficulties with obtaining and interpreting meaningful "before" and "after" data*"[12] . I disagree. Lizard populations in a successful pest free site are likely to go from barely detectable to abundant within 12 years (i.e. within the same timeframes proposed for bird monitoring). Robust herpetofauna monitoring tools, like the bird monitoring tools, have recently been developed and are freely available on the DOC website (DOC Herpetofauna and Monitoring toolbox) and I believe it is important to monitor lizard populations to be able to show that the predator-proof fence, and its long term management, is successful at protecting such population(s).

7. CONCLUSION

7.1. A predator-proof fence that meets all or most of the criteria outlined in this evidence is supported. However the consent conditions and/or the ELMP must outline requirements for site selection, construction specifications, eradication and long-term management to ensure the predator-proof fence meets the objective of excluding all mammalian predators to allow lizards recovery in perpetuity.

[12] EMMP at [7.4.7].

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APPENDIX ONE: Examples of predator-proof fences

Photo A: Example of a predator-proof exclusion fence (left Macreas Flat; right Mokomoko Sanctuary)