REVIEW OF ECOLOGICAL ASPECTS OF THE APPLICATION TO REROUTE SH3 AT MT MESSENGER, NORTH TARANAKI

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REVIEW OF ECOLOGICAL ASPECTS OF THE APPLICATION TO REROUTE SH3 AT MT MESSENGER, NORTH TARANAKI

Valley to east of SH3, Mount Messenger

Contract Report No. 4402b

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1. INTRODUCTION

New Plymouth District Council commissioned Wildland Consultants Ltd to provide an independent audit of the ecological components of a resource consent application to reroute SH3 at Mount Messenger, Taranaki. The New Zealand Transport Agency has selected a preferred route that passes to the east of the existing SH3 at Mount Messenger. The regulatory processes are being navigated by an Alliance led by Tonkin & Taylor, and the following ecologists are in the Alliance:

- Opus International: John Turner, Roger MacGibbon.
- Tonkin and Taylor: Brett Ogilvie, Matt Baber.
- Ecology NZ: Simon Chapman (bats and herpetofauna).
- Independents: Nick Singers (vegetation), Keith Hamill (aquatic), John McLennan (birds), Corinne Watts (Landcare Research; invertebrates).

A site meeting with New Plymouth District Council, Taranaki Regional Council, New Zealand Transport Agency, the Alliance, and Wildland Consultants was held on 19 September 2017. Following this, drafts of specialist reports covering vegetation, marine ecology, herpetofauna, bats, aquatic habitats, and terrestrial invertebrates, were supplied to Wildland Consultants prior to lodgement, in October 2017. An initial assessment of the Alliance specialist ecology reports was provided to New Plymouth District Council in late October 2017 (Wildland Consultants 2017).

This assessment was provided to Alliance ecologists, and the opportunity provided to revise specialist reports prior to lodgement. Resource consents and Notice of Requirement (NoR) was subsequently lodged on 15 December 2017, and the lodged specialist reports were subsequently provided to Wildland Consultants for review.

This report is an assessment of the Application (the Notice of Requirement Technical Reports), and follows on from the review of the draft assessment (Wildland Consultants 2017). In particular, the current review has focussed on issues raised in the initial review of the draft assessments, and the degree to which these have been addressed and resolved in the Application. Any new issues that have arisen in the Application technical reports have also been considered.

2. METHODS

2.1 Review of draft assessment in October 2017

- A literature search was undertaken to identify relevant ecological information pertaining to the site, which was then collated and reviewed.
- An on-site meeting was undertaken with the client, New Zealand Transport Agency, Taranaki Regional Council, and Alliance representatives on 19 September 2017.
- Vegetation and habitat types, within the proposed footprint and the wider area, were viewed from several roadside vantage points. At two locations, forested areas were briefly explored on foot: one site in the Parininihi Forest, to the east of

the proposed alignment, and one site in the lower valley at the southern end of the proposed alignment, where the road will pass through tawa-dominant forest.

- Samples of obvious insect damage to indigenous plants were collected for later identification and analysis, together with samples of forest litter.
- Representative photographs were taken in the field and these are provided in Appendix 1.
- Specialist ecology reports for the assessment of ecological effects were received from the Alliance on 4 October 2017 (for bats, aquatic habitats, marine ecology, and terrestrial invertebrates), 6 October 2017 for herpetofauna and avifauna), and 16 October 2017 (vegetation and mitigation).
- The Alliance reports were assessed by relevant specialists, mostly using a consistent review structure:
  - Methods.
  - Assessment of effects.
  - Information gaps.
- Separate assessments were made of the proposed ecological mitigation and the offsetting approach used.
- Inconsistencies between reports were identified.
- A summary of key issues was produced, followed by a succinct conclusion.

2.2 Review of the application in January 2018

- The draft assessment (October 2017) and the Application documents were systematically compared to identify components that were revised for the Application.
- The review of the Application considered the adequacy of response to issues raised with the draft assessment.
- Where necessary, new literature sources were found and have been cited as required.

2.3 Terminology for reporting by the Applicant

Throughout this review, the reports provided by the Applicant in October 2017 are referred to as the "draft assessment'. Reports provided by the Applicant in December 2017, for the NOR, are referred to as "the Application". Where relevant, each particular specialist report referred to in the Application is also referenced.

3. VEGETATION REVIEW

3.1 Methods

The review of the draft assessment (Wildland Consultants 2017) identified a number of shortcomings, some of which are fundamental to how relevant vegetation types have been assessed for ecological significance.

It was noted in Section 1.4 of the draft assessment that initial ecological field work was undertaken in the Parininihi catchment (west of SH3), and investigations did not occur along the current road alignment (east of SH3) until January and June 2017. This represented a very late change of focus in the investigation, and resulted in information gaps. Section 2.2 of the Application (Technical Report 7a) notes that the northern part of Mangapekepeke Valley has not yet been surveyed, as access permission has not been granted.

Page 14 of the draft assessment stated that consultation was undertaken with various experts and agencies. Consultation with NPDC was not undertaken and there is no reference to the Significant Natural Areas (SNA) project that Wildlands is undertaking for NPDC. This has not been addressed in the Application (Technical Report 7a).

The review of the draft assessment (Wildland Consultants 2017) questioned why unbounded recce plots were established (Section 2.2), as these have relatively low utility for provision of quantitative information, and other more robust methods, such as measurement of tree stem diameters in fixed size vegetation plots, would have provided good quality data for the biodiversity offsetting model. The rationale for unbounded recce plots has not been addressed in the Application (Technical Report 7a).

In the review of the draft assessment (Section 2.2.1.1) it was noted that the criteria for identification of significant trees (i.e. large old emergent trees, which have important flowering or fruiting resources, or cavities for bat roosts) are not consistent with rejection of tawa, rewarewa, or kamahi, which are not included as significant trees, irrespective of size. The Application (Technical Report 7a) also rejects these species as being significant, without justification. As the significant tree layer has been important for project design, this shortcoming will have generated potentially significant adverse effects on these three tree species that have not been accounted for, and therefore will not be mitigated for by plantings.

It is noted in Section 2.3 of the draft assessment that the author used Davis *et al.* (2016) as a source of significance criteria, not the New Plymouth District Plan criteria. It is possible that this could result in significant differences in assessments. For example the 'naturalness' criterion of Davis *et al*. (2016) is not widely accepted in recent territorial local authority (TLA) significance criteria sets. The New Plymouth District Plan criteria still have not been addressed in the Application (Technical Report 7a).

3.2 Assessment of effects

In Section 2.3.2 of the draft assessment, a five metre edge effects parcel is described in relation to the 'Project footprint'. Actual edge effects are likely to be much larger and it is considered standard to consider edge effects as encroaching 50-100 metres into an area of vegetation. Although the references cited illustrate the extent of typical edge effects, they are not used in the report, and are much greater than accounted for in the NOR. This gives the impression of reducing the affected area so as to minimise predicted adverse effects. The author considers five metres to be 'appropriate' but gives no evidence in support of this assertion in the Application (Technical Report 7a).

Mānuka communities, as mapped in Figure 3.3, were not fully surveyed for the draft assessment, and have been ranked as 'low' ecological value in Table 3.1. The review of the draft assessment requested better justification following site visits, and better descriptions of ecological values, including its value as habitat for other species (e.g. 'At Risk' gecko species; elegant gecko, forest gecko, Pacific gecko). This has not been addressed in the Application (Technical Report 7a).

In the draft assessment (Table 3.1), kahikatea-swamp maire forest is only ranked as 'High'. Given its rarity and representativeness, this vegetation type should be one of the highest value forest types. It is also noted that 'dry cliff' is ranked as 'Moderate' but could be habitat for uncommon species, and thus may warrant a higher ranking. The Application (Technical Report 7a) does not give further justification for these rankings.

In Section 3.4.1 of the Application, some of the kahikatea trees in the photographs are larger and older than the text descriptions of 'poles' suggests. Diameters and heights are given that are estimates for 'most' of the trees present. For transparency, the size of the largest individuals present should also be noted.

For Section 3.4.2 of the draft assessment, the kahikatea/*Carex* spp. treeland would be better classed as a *Carex* sedgeland with emergent kahikatea, thus reflecting its wetland status. This has not been addressed in the Application (Technical Report 7a).

In the draft assessment, the whekī-ramarama vegetation type described as potentially affected in Section 3.4.4 appears to be an ecologically interesting and important habitat, but is not included for the ranking of ecological values in Table 3.1. This has not been addressed in the Application (Technical Report 7a).

In the review of the draft assessment (Wildland Consultants 2017) it was noted that all alluvial forest, whether secondary or primary, should have been assigned a 'Very High' ranking, due to the significantly reduced extent of this forest type locally, regionally, and nationally. It should also be recognised that these areas of alluvial forest often form intact sequences with hillslope forest, and these ecological sequences are also significantly reduced at a national scale. All herbaceous freshwater wetlands dominated by indigenous species should also be ranked as 'Very High' or 'High', as less than 0.1 percent of this vegetation type remains in North Taranaki Ecological District. No further justification for these lower than expected rankings is provided in the Application.

In the Application (Technical Report 7a), Section 3.9 (Rare and threatened plants) does not address adverse effects on *Astelia trinervia*, which was listed in the vegetation description for miro-rewarewa-kamahi forest and was identified in Section 2.1.1 as being regionally distinctive.

In Section 4.1 of the draft assessment, only two New Plymouth District Plan criteria (1 and 3) were referred to, and they are not the criteria defined in Schedule 21.1 of the Operative Plan, nor those in Policy IB-P1 of the draft New Plymouth District Plan. In the Application, it states that only Criteria 1 and 3 were assessed, as Criteria 2, 4, and 6 were not considered relevant, and Criteria 5 was more relevant to fauna than flora. The Application (Technical Report 7a) provides no explanation as to why Criteria 2, 4, and 6 are not relevant, and this justification either needs to be provided, or the assessment of significance needs to be reassessed based on the full set of operative significance criteria.

In the review of the draft assessment (Table 4.1) we noted that different vegetation units were grouped into broad ecosystem categories. This resulted in the significance of particular units has been downgraded because of the inclusion of other vegetation types of lower value within the same ecosystem type. For example, a representative area of kahikatea-swamp maire forest was included within "kahikatea-pukatea forest" and subsequently ranked as "High", when if assessed separately, would qualify as "Very High". Areas of tawa, kohekohe, rewarewa, hinau, podocarp forest, noted in the Applications as "highly representative" and "nationally uncommon ecosystem" are only ranked as "Moderate-High" as they are grouped with communities in the north where "diversity and complexity declines".

It is critical for the accuracy and usefulness of the Application that the significance of each vegetation unit is evaluated separately. Other biodiversity values, such as habitats and populations of indigenous fauna, also need to be included and addressed in the ecological significance assessment. The grouping of vegetation types, and the assessment of their values in isolation from their fauna values, downplays the values of the habitats within the project footprint. This has not been addressed in the Application (Technical Report 7a).

In Section 4.2.6 of the draft assessment, it was concluded that roadside batters will be suitable for cliff specialist species and that this will address the loss of 0.4 hectares of mapped cliff habitat, and thus the project should have a positive effect on cliff communities in the long-term. Further evidence for this is not provided by the Application (Technical Report 7a).

In Section 4.3.2 of the Application (Technical Report 7a), the loss of large trees is discussed, and it is considered that pest animal control can mitigate some of the loss. Effects of pest animal control on the health of large trees have not been quantified, so the extent to which pest animal control could mitigate the effects of loss of large trees is uncertain. The number and species of large, emergent trees within the area of proposed pest control, and their vulnerability to browsing by introduced mammals, should be quantified. In general, it is very difficult to mitigate the adverse effects of loss of large trees which may be over 500 years old. They are not able to be replaced, except in extremely long timeframes, as the report notes.

Section 4.3.3 of the Application, regarding edge effects, is identical to the draft assessment. Discussion provided in the Application illustrates why an additional five metres of habitat loss along edges may not adequately deal with edge effects. The Applicant notes that forest interiors within 50-100 metres of edges will experience changes in environmental conditions, and also notes the potential increase of windthrow for large trees retained on forest edges. The Applicant still only includes an additional five metres for calculation of edge effects, and the use of a five metre buffer is not backed up by any evidence. Additionally, the assessment of loss for significant trees (Table 3.2, Figures 3.19 and 3.20) appears to regard significant trees as retained if they are beyond the project footprint, regardless of distance from the edge of clearance. The Applicant should acknowledge that some (many) significant trees will be lost in the future, due to ongoing windthrow and other edge effects, as discussed above, and include these in the calculations for mitigation plantings. Plantings should compensate for all significant trees within the project footprint, and those within at least 50 metres of the maximum extent of clearance.

The discussion of important plant species in the Application (Section 4.3.4) is identical to the draft assessment. In the review of the draft assessment it was noted that *Pittosporum cornifolium* is likely to be most widespread regionally significant plant throughout the route, and that the regionally distinctive *Astelia trinervia* has also been omitted from the discussion of effects on regionally distinctive plant species.

In Section 4.4 of the draft assessment, the overall unmitigated magnitude of effects on vegetation was assessed as only 'High' despite the two most affected types being associated with 'Very High' effects. This has not been addressed in the Application.

In the draft assessment and the Application (Section 5.1) it states the following:

> *"some design improvements could be made, for example, reducing the loss of secondary pole kahikatea forest on private land within the Mangapepeke Valley. Until physically surveyed these cannot be made. Further design improvements should continue to be investigated, including identifying whether any loss of significant trees can be prevented on the Project margins. These improvements have been discussed with the design team and are likely to be able to be implemented."*

Until the project footprint can be fully surveyed, the extent of loss of indigenous habitats remains uncertain, and it is premature to attempt to quantify the nature and extent of mitigation required.

In the Application (Section 5.1), the control of introduced pest animals is the major focus of mitigation and the Applicant recognises that "most gains would quickly be lost within 10-20 years if management stopped" (Section 5.1). The Application states that:

> *"For this reason it is recommended that pest densities be suppressed to target levels until necessary to maintain the benefits accrued."*

The Application states that pest control would occur "until necessary". To provide greater certainty, and to act as a major component of the mitigation package, the

permanent habitat loss associated with road construction needs to countered by pest control in perpetuity.

In Section 5.2.3 of the draft assessment and the Application, it is noted that greater than estimated loss could occur, for example if landslides that result from earthworks exceed the five-metre edge effects allowance. The Application states that actual loss should be quantified at the end of the construction period. It is unclear what if any additional mitigation would be implemented if the extent of loss is greater than expected.

In Section 5.5 of the Application it states that up to eight hectares of swamp forest and wetland plantings will be undertaken to offset significant residual effects. Stating a maximum, but no minimum area, creates significant uncertainty as to the scale of mitigation planting proposed (i.e. this statement also encompasses only one hectare of plantings). Additionally, until extent of habitat loss for the route can be surveyed and quantified (e.g. Section 5.1 discussed above), an appropriate extent of mitigation planting cannot be determined.

In Section 6 of the draft assessment and the Application, it states that the areas of highest ecological value in the project footprint are 1.231 hectares of kahikatea forest (refer to Table 4.4) and areas of hill-country forest.. It is notable that the Applicant does not state here the type or extent of hill-country forest to be lost, and that this comprises 19.852 hectares of tawa, kohekohe, rewarewa, hinau, podocarp forest. The Applicant notes that this forest type is a "national uncommon ecosystem type (Table 4.4). The Application would have greater transparency if it also stated here the extent of hill country forest to be lost.

What is certain, for both the draft assessment and the Application is that the road project will have a very significant adverse effect on the forest vegetation through which the road traverses, both from the predictable direct clearance required to clear the way for road construction, indirect and ongoing edge effects such as alteration of forest interior microclimate, windthrow of trees, and altered hydrology, and from unpredictable direct effects such as increases in erosion, landslides, and sedimentation effects. It is also clear that there remains considerable uncertainty regarding the extent of indigenous vegetation loss, and the nature and extent of the mitigation proposed.

3.3 Key information gaps remaining in the Application

- Incomplete field assessment of indigenous vegetation in the north of the project area (Mangapekepeke Valley).
- Uncertainty regarding extent of proposed indigenous habitat loss, and the ecological values of those habitats.
- Uncertainty as to the type and extent of mitigation plantings proposed.
- The assessment of significance needs to be undertaken with respect to the full criteria set in the operative New Plymouth District Plan.
- Justification needs to be provided for the failure to account for significant, large, tawa, rewarewa, and kamahi trees. Alternatively, adverse effects on these trees

need to be assessed and avoidance and mitigation proposals developed to address these effects.

- Edge effects need to be more accurately estimated and avoided, remedied, or mitigated, including allowance for additional loss of significant trees on newly-exposed forest edges.

4. BAT REVIEW

4.1 Overview

4.2 Methods

In the review of the draft assessment (Wildland Consultants 2017), the following was noted:

> *"The desktop review largely focused on the following reports:*
>
> - *Opus (2017a). Mount Messenger Bypass Investigation. Bat Baseline Survey and Preliminary Assessment of Effects, April 2017. New Zealand Transport Agency*
> - *Opus (2017b). Mount Messenger Bypass: Option MC23 - Bat Survey Addendum, Memo dated 25 July 2017.*
>
> *However, at the time of writing, these reports had not been provided by the Applicant with the report for review."*

The two reports noted above have not yet been provided by the Applicant for review.

For the previous review, we noted that the data used to assess the bat fauna within the proposed project area was of limited use because the surveys occurred only within the winter and autumn periods, when bats are less likely to be active. It has been acknowledged by the authors that surveys took place at sub-optimal times of year (Section 1.4 Background to the ecological assessment of the Project):

> *"In the absence of detailed baseline fauna surveys undertaken during the optimal season within the Project footprint, it has been conservatively assumed that species recorded west of SH3 are also present in similar habitats to the east of SH3".*

In Section 2.2.2.2 ABM deployments on Page 16 it states:

> *"Winter is not the ideal time for bat surveys in New Zealand as both native species utilise torpor (periods of substantially reduced activity best described as short-term hibernation) to conserve energy during periods of cold weather."*

It was therefore assumed by the Applicant that species present to the west of SH3 are also present in similar habitats to the east of SH3.

In addition to records from the west of the project footprint, the Department of Conservation bat database (received 24 July 2017) includes records of both long-

tailed bats and central lesser short-tailed bats approximately seven kilometres to the east of the project footprint in 1994 and 1995, as well as more recent records of central lesser short-tailed bats from Mt Damper, approximately 20 kilometres east of the project footprint in April 2016. The older records are closer than the 15 kilometres quoted in the report, and indicate that both species should be considered highly likely to be present within the project footprint. Despite this being the case, the authors suggest that it is "*unlikely that they [short-tailed bats] are present within the Project footprint*" (Executive Summary Page 3)."

Given that there has been no additional information provided about the distribution of bats within the proposed project footprint, our assessment of the methods used in the Application (Technical Report 7f) remains the same as previously:

- There are significant information gaps.
- Adequate surveys have not taken place, or been reported on, during the warmer months when bats are more likely to be detected.

It appears that the entire area of the proposed project footprint has not yet been surveyed, or reported upon. Indeed, the Application (Technical Report 7f) states that: "*The northernmost 1.5km of the Project footprint was not surveyed due to access restrictions*." (Section 2.2.2.1, Page 9).

4.3 Assessment of effects

In the review of the draft assessment we noted the following:

> *"The assessment of bat ecological values within the Project footprint have been assessed as "Very High" for long-tailed bats and "High" for central lesser short-tailed bats. This is reasonable, given the relatively high threat classification ranking of both species. However, the threat classifications of both species considered present in the footprint area require updating. A recent review of bat threat classifications found that long-tailed bats are now considered "Threatened-Nationally Critical" - that is, more threatened than previously described, whilst central lesser short-tailed bats ranking remains "At Risk-Declining" (O'Donnell et al. in press)."*

This has not been addressed in the Application (Technical Report 7f), which continues to use the out-of-date threat classifications. These old threat classifications suggest that long-tailed bats have a lesser threat classification.

In the review of the draft assessment, we noted that:

> *"The five metre wide edge effects strip proposed by the Applicant is too small given that the effects of roads on bats can extend over far greater distances. Berthinussen and Altringham's (2012) research into the effects of roads on British bat species showed that activity and diversity were affected as far as 1.6 kilometres from major roads. Recent research funded by the New Zealand Transport Agency (Borkin et al. 2016 as discussed in the bat report which presented information from Smith et al. 2017a) shows that roads affect long-tailed bat activity. Along roads, Borkin et al. (2016) and Smith et al. (2017a) found long-tailed bat activity was reduced compared to edges 200 metres or more distant from roads used at night. This is contrary to the suggestion by the Applicant that long-tailed bats may benefit from*

the increased edges due to the road's construction. In addition, in Section 4.3.3 Edge Effects, the Applicant's vegetation report acknowledges that effects on forest structure may occur along newly-created edges due to changes in "diurnal fluctuations in light, temperature and humidity" for distances 50-100 metres from the forest edge. Edges are:

typically drier and hotter than forest interiors, with elevated tree mortality.

"Large roads can also alter wind patterns within a forest, and combined with a loss of vegetation shelter, branch damage and or windthrow (especially of tall trees) adjoining the new road, adverse effects are likely to occur, potentially for several decades after construction. Predicting the scale of these effects is speculative because windthrow could also have occurred even if the forest remained intact. It is reasonable however to expect that edge effects will occur from the road construction and will result in impacts to adjoining vegetation. Tall trees are likely to bear the greatest impact of this effect, especially those which suffer root damage during construction and/or exposure to increased windiness".

The oldest and tallest trees in indigenous forest are those most likely to be selected by bats as roosts (Alexander 2001; Sedgeley and O'Donnell 1999). Consequently, the effects of new edge creation, as required by this project, may be substantially greater than the five metres suggested by both the bat report and the vegetation report, affect bat roosts, and remain long-term.

With regards to habitat fragmentation, the Application (Technical Report 7f) states in Section 4.2.3 that:

"The Project also shifts this potential fragmenting feature [the road] in the environment to the east away from the more contiguous and highly valued forested areas of Parininihi. Compared to the existing road, the Project design is likely to present less of a barrier for bat movements as it incorporates a tunnel and a bridge. In addition, the Project may provide long-tailed bats an opportunity to utilise the bush margins of the existing road edge for foraging".

This statement is misleading, and not based on current knowledge of the ecology of New Zealand bat species. It is likely that the specific placement of the proposed road footprint along numerous watercourses including an "*ecologically significant wetland area*" will result in increased effects on long-tailed bats because this species is detected foraging along waterways at higher rates than in other locations (Borkin and Parsons 2009). The project does not "*shift this potential fragmenting feature*", it adds an additional potentially fragmenting feature, another road. The cumulative effect of two roads placed relatively close to each other, both with their corresponding edge and potential barrier effects for long-tailed bats and short-tailed bats, is not addressed in the bat report.

The authors acknowledge in Section 4.2 of the Application (Technical Report 7f) that:

"new roads have the potential to adversely impact bats, both during construction (e.g. as a result of direct physical disturbance) and on an ongoing basis from road operation and maintenance."

We note that there has been no change in the magnitude of the area considered as part of the area affected by edge effects. Cumulative effects of two roads that potentially fragment the landscape for bats, and which are relatively close to each other have not been addressed. In addition, the effect of the placement of the proposed road footprint in an "*ecologically significant wetland area*" with its potential for increased effects on long-tailed bats in particular, remains unconsidered.

The review of the draft assessment noted that:

> *"At least one key potential impact has been omitted from the assessment. Lighting during road operation, from both road and tunnel lighting, and from vehicle headlights, may affect bat activity. These effects have not been addressed in the proposed avoidance, mitigation, offset, and monitoring outlined in the Opus (2017) mitigation-focussed report."*

The potential effects outlined above have not been addressed in the Application (Technical Report 7f), apart from the addition of vehicle lights (Section 4.2), and only "*operational lighting*" has been addressed in the ecological mitigation report (Technical Report 7h).

In the review of the draft assessment, we noted the following:

"The authors acknowledge that effects on the local bat population will be higher than their overall assessment ("negligible") if an occupied roost is felled. However, Section 4.4 of the Application states that

> *"The loss of any occupied roost tree(s) would constitute an adverse effect of 'Very High' magnitude for both bat species."*

It is unclear how the likelihood of this occurring is to be reduced.

Vegetation removal protocols remain untested, and therefore their efficacy remains unknown.

The review of the draft assessment noted that:

> *"It is likely that residual effects will be greater than suggested in the bat report because the extent of pest management that is proposed as the main mitigation offset (562 hectares) is small in comparison to that required to protect long-tailed bat populations at roosts. O'Donnell (2014) identified that predator control to benefit bats should occur over a minimum area of 1000 hectares. Additionally, a recent study by O'Donnell et al. (2017) found no measurable benefits to bats when rats were controlled using bait stations over 650 hectares, and positive population growth rates were found when the area of control exceeded 3,000 hectares. It should be noted that possums also prey on long-tailed bats (O'Donnell 2000a)."*

The Opus (2017) mitigation-focussed report (Technical Report 7h) also suggested that region-wide benefits will occur for bats because:

> *"When the carrying capacity of each species is met "surplus" juveniles of mobile species (birds and bats) will move out into the wider Project area and increase populations in those areas. This is sometimes referred to as the "halo effect"*

(Opus 2017: Section 4.4.4 Likely outcomes from intensive long-term pest management Page 38).

It is unknown whether the "*halo effect*", i.e. dispersal of juveniles to an area wider than their natal area (the area that they were born in) may occur for bats. This is because research into long-tailed bats shows that bats return to their natal social group to breed (O'Donnell 2000b). Social groups occupy traditional areas long-term, and individual bats rarely switch or leave their social groups rarely, although rates may increase as density increases (O'Donnell 2000b). During winter it appears that long-tailed bats remain in their summer areas and do not disperse to other areas (Griffiths 1996).

Consequently, the assessment of effects on bat fauna as "negligible" is not supported.

Because the size of the area that is proposed in the Application for implementation of "long-term pest control" (Technical Report 7h) has not been expanded, and it appears that there have not been surveys to confirm the presence of either bat species within the proposed pest control area, the assessment of effects on bat fauna as "negligible" remains unsupported. Further, it is noted that in the Application (Technical Report 7f), that the timeframe within which effects on bats are considered likely to be negligible is "medium-term". This has changed from the draft assessment in which it was considered to be "medium to long-term". The Applicant provides no basis for changing the trajectory from long-term to medium, as there appears to be no additional mitigation that will substantially benefit bats. The area of proposed pest control remains at approximately half the extent required to benefit bats, based on the lowest estimates available in the literature.

4.4 Information gaps

The review of the draft assessment outlined the following information gaps:

> *"As no full survey of the project area has taken place during warmer months, when bats are more likely to be active and therefore detected (Smith et al. 2017b), it is premature to report definitively on the distribution of bat fauna within the project footprint. This is particularly the case for lesser short-tailed bats, which are notoriously difficult to detect even in areas where their presence is known or highly likely, because their echolocation calls attenuate over relatively short distances (Borkin and Parsons 2010). In addition, bat surveys are generally considered to only determine presence and not absence of bats, as suggested by this report, due to difficulties in detection. Furthermore, there is limited information provided about the placement of monitoring equipment (Automated Bat Monitoring units: ABMs), but what is provided raises doubt about the design of the early monitoring programme, and its likelihood of detection of short-tailed bats. For at least the initial surveys (of an alternative route's footprint, Section 2.2.2.2 ABM Deployment) these appear to have been placed largely at sites that would have been more likely to detect long-tailed bats than short-tailed bats (i.e. ridge line tracks and forest edges adjacent to farmland). This is because long-tailed bats are more likely to be detected along edges in comparison to short-tailed bats, which are more likely to be detected in forest interiors (O'Donnell et al. 2006)."*

Additional information has not been provided in the Application (Technical Report 7f) regarding the placement of ABMs.

The review of the draft assessment went on to state:

> *"No surveys for either bat species have taken place in the northern part of the project footprint."*

This continues to be the case as stated in the Application (Technical Report 7f):

> *"The northernmost 1.5km of the Project footprint was not surveyed due to access restrictions."* (Section 2.2.2.1, Page 9).

The review of the draft assessment stated:

> *"The authors recommend that bat monitoring does not take place post-construction of the new road. Post-construction monitoring is recommended by the recently published NZTA Framework document (Smith et al. 2017c) in order to determine the effectiveness of mitigation measures. This also contradicts the Opus (2017) mitigation-focused report which suggests that monitoring will take place:*
>
> *to determine if the target outcomes [of predator control] are being achieved (Section 4.4.2 Page 36)".*

The authors instead suggest that effects will be such that this is not considered necessary because:

> *"the Project footprint represents only a relatively small proportion of the available habitat for bats in the wider Project area, and the benefits of large-scale long-term predator management for bats have been confirmed by a published study (O'Donnell et al. 2017) (Section 5.4.3 Monitoring)".*

Information provided on the proposed long-term predator management suggests that its extent will be too small to adequately protect roosting areas of long-tailed bats, and expected benefits to bat populations are therefore unlikely to occur. In the Eglinton Valley (Fiordland), long-tailed bat populations were not protected adequately when predator control took place over 650 hectares, and only appeared sufficient to protect populations, or social groups, when the control took place over greater than 3,000 hectares (O'Donnell *et al.* 2017). The proposed "*intensive long term integrated pest management*" will apparently take place "*over a core area of 222 hectares plus an additional 340 hectares buffer area, for a total area to be managed for pests of approximately 560 hectares* (Section 3.3.2.2 Offset of residual effects - as derived from the Biodiversity Offset Calculation Report - see Appendix A; Technical Report 7h)." However, the buffer that is suggested will only be maintained "*where it is practicable to maintain such a buffer* (Technical Report 7h: Section 4.4.2 and possibly not to the same level as the core management area:

> *"This buffer area, if managed to the same intensity as the core area, is expected to be sufficient to reduce to low levels the number of pests that reach the core management area."* Technical Report 7h: Section 4.4.3 Pest Management Area Page 39).

Consequently, significant doubt remains about the extent of the proposed mitigation and its ability to mitigate or offset residual adverse effects.

The Application reports (Technical Reports 7f and 7h) continue to maintain that monitoring of bats using either population monitoring or acoustic monitoring is not necessary on the basis that the extent of the proposed pest control will be adequate to protect bat populations. The scientific paper that Application (Technical Report 7f) uses to support this argument instead states that far larger areas are required to be under predator control if long-tailed bat populations are to begin increasing in numbers.

The review of the draft assessment stated:

> *"In the report focusing on mitigation, Opus (2017) reported that radio-tracking of bats will take place prior to the commencement of construction to identify the location of bat roosts. It should be acknowledged that whilst this approach may identify bat roosts, if bats are able to be captured and their roosts found, it is unlikely to identify all bat roosts in the vicinity or within the project footprint."*

The Application (Technical Reports 7f and 7h) have not been altered to reflect that, with the methods proposed, some, but not all, roosts within the proposed project area will be located.

The review of the draft assessment stated that:

> *"The report refers to the vegetation report to support this technical report on effects on bat species. The bat report appears to rely heavily on the baseline habitat assessments included in the vegetation report to predict which fauna would be present in the project area. Both the vegetation report and the bat report did not survey the area in the northern Mangapepeke Valley, and this is a significant information gap."*

The area to the north still appears to have not been surveyed. This information gap has not been addressed.

The review of the draft assessment stated that:

> *"The area of pest management that is proposed in the Opus (2017) report is 560 hectares (Executive Summary). Whilst it is acknowledged by this reviewer that predator control is the most effective tool in the tool box to improve survival of long-tailed bats, this is only the case if predator control takes place over large areas (O'Donnell 2014; O'Donnell et al. 2017). O'Donnell (2014) suggests that predator control designed to protect long-tailed bats at their roosts should take place over areas of at least 1000 hectares, and preferably over several thousand hectares. The proposed pest management area is far smaller than this."*

The extent of the proposed pest management area has not been revised in the Application (Technical Reports 7f and 7h).

The review of the draft assessment stated that:

> *"There is no supporting evidence provided for the assessment of areas of vegetation communities and their suitability for indigenous bat roosting (Table 3.1). Indeed, there is evidence that long-tailed bats do use tree ferns as*

roosts (Borkin and Parsons 2011) but this vegetation type (mānuka-treefern scrub) has not been considered suitable for roosting in the bat report. The information supporting habitat suitability assessments in Table 3.1 is a significant information gap."

Mānuka treefern scrub has not been included as a marginal area for potential suitability for bat roosts (the Application (Technical Report 7f Section 3.1.1 Table 3.1 Page 17)), However, no information has been provided to support the assessment of any of the areas of vegetation communities' suitability as bat roosting areas. This remains a significant information gap.

The review of the draft assessment stated that:

"Areas considered important to bats have not yet been identified. Work beginning to aid an understanding of the relative importance of areas to bats is planned to take place over summer 2017-2018. This is a significant information gap."

There has been no additional reporting on bat-focussed surveys and consequently the information gap remains.

The review of the draft assessment stated that:

"In conclusion, the authors of the bat report acknowledge that surveys for bats are not complete. As such significant information gaps remain, including:

- *The lack of a full, and robustly-designed, survey of the project area over the warmer months of the year, followed by analysis and subsequent significance assessment.*
- *Supporting evidence for habitat suitability assessment for bat roosting as outlined in Table 3.1 in the bat report.*
- *Information about, and identification of, areas considered important to bats within the project footprint.*
- *Information regarding the presence and distribution of bat species in the proposed long-term predator management area."*

Apart from the addition of the mānuka treefern scrub, which the Application (Technical Report 7f) suggests has marginal potential suitability for bat roosts (Section 3.1.1 Table 3.1 Page 17), it appears that the above information gaps have not been addressed. Consequently, as previously noted in our review, they remain as significant outstanding information gaps.

5. AVIFAUNA REVIEW

5.1 Overview

In the review of the draft assessment we identified a number of issues. Overall, the Application (Technical Report 7e) is largely identical to the draft assessment, and the majority of issues raised in the initial review have not been addressed.

5.2 Methodological issues

No Baseline Data for Forest/Farmland Birds have been Collected within the Project Footprint

The authors state that baseline data will be collected between October 2017 and March 2018. Assuming that this occurs, this may or may not address this issue. No detail is provided in Application (Technical Report 7e) regarding species to be surveyed, methods of survey, distribution of survey points, and sample sizes. Consequently the adequacy of the proposed field work is not known.

No Surveys of Wetland Birds has Occurred Within the Project Footprint

It is not clear if the baseline data to be collected between October 2017 and March 2018 will include wetland birds, specifically mātātā/fernbird, pūweto/spotless crake, and matuku/Australasian bittern, which were highlighted in the review of the draft assessment. If the proposed baseline data collection does not survey for these three wetland bird species, this issue has not been resolved.

If it is intended to survey wetland birds between October and March, caution will be needed in interpreting results. This timing overlaps with the breeding season of mātātā/fernbird, pūweto/spotless crake, and matuku/Australasian bittern. The exact timing of the survey may reduce the probability of detection. For example, pūweto/spotless crake do not call during incubation and only sporadically thereafter while raising chicks,. The survey intensity should reflect the potential for variable detection probability and the cryptic nature of pūweto/spotless crake and matuku/Australasian bittern, and may need to be supplemented with surveys outside of the breeding season.

References to wetland bird presence in the initial report were unclear, and this has not been resolved in the Application (Technical Report 7e). It remains uncertain whether key wetland bird species are in fact present in or adjacent to the Project Area; some sentences have simply been deleted rather than further detail provided.

The draft assessment included the following statement referring to wetland birds:

> *"fernbird and spotless crake have been detected in close proximity to the Project footprint and may be present in low numbers within the Project footprint" (section 3.1.42 of October 2017 draft, Technical Report 7e).*

This sentence has been removed from the Application (Technical Report 7e). The reason for this is unclear. If the authors had previously detected mātātā/fernbird or pūweto/spotless crake in close proximity to the Project footprint, it would be appropriate to provide more detail on this, rather than less:

> *"A total of 36 diurnal and two nocturnal bird species were recorded during the surveys in the Project Area. Twenty-three of these species are indigenous, nine of which are currently listed as 'At Risk' (Robertson et al. 2016), including fernbird (Bowdleria punctata), spotless crake (Porzana tabuensis)…"* (Executive Summary of lodged Technical Report 7e)

This sentence was also presented in the draft assessment, although previously referred to "forest and farmland" instead of "Project Area". No definition of "Project Area" is provided; therefore it is unclear if this refers to the project footprint, or the wider project area (which are both defined in the Glossary). The sentence also provides no further clarity as to the location of mātātā/fernbird and pūweto/spotless crake detections.

> *"While not encountered in field surveys around the MC23 alignment…. fernbird ('At Risk-Declining) and spotless crake ('At Risk-Declining') are included in the assessment of effects on native birds (Table 3.1)"* (Section 3.4 of lodged Technical Report 7e)

This statement creates further confusion as to whether these species were detected:

> *"The Project is expected to have a 'Low' magnitude of unmitigated effect on wetland bird species. Wetland species affected include the critically endangered Australasian bittern (which is assumed to be present), spotless crake and fernbird (noting that fernbird also inhabit forest margins and shrublands)… A 'Low' magnitude of effect is expected as most of the sedgeland/wetland habitat is degraded swamp forest and of poor quality for wetland birds"* (Section 4.3.4 of lodged Technical Report 7e).

The first sentence above again indicates that mātātā/fernbird and pūweto/spotless crake are present, despite the stated low quality of the habitat. The apparently degraded and poor quality habitat is in contrast to the following statement (from the mitigation report) which states that high quality habitat is present directly adjacent to the Project footprint.

> *"The wetland area to the east of the existing SH3 corridor (adjacent to the southern portion of the Project footprint), is existing high quality habitat suitable for wetland birds including fernbird (Megalurus punctatus) and spotless crake (Porzana tabuensis)"* (Section 1.3, lodged version of Technical Report 7h).

In summary, the detail presented about the presence of wetland birds, and the location and quality of wetland bird habitat, is contradictory and confusing. Given this, combined with the absence of robust surveys, the local, regional and national importance of the Project Area and adjacent habitats for wetland bird species of conservation concern cannot be determined.

<u>Mention of Autumn/Winter 2017 Surveys but No Data Presented</u>

This data is not presented in either the draft assessment or the Application (Technical Report 7e), despite being mentioned in section 1.4 of both reports:

> *"… data have been gathered along the Project footprint during the 2017 autumn and winter periods to augment this earlier survey information obtained to the west…"*

Mention of Audio Recordings but no Data Provided or Further Mention of These

There is an isolated mention of audio recordings in Section 3.2 *(Long-tailed cuckoo … were noted during audio recordings made from February to March")*, but no further detail provided. This has not been addressed in the Application (Technical Report 7e).

5.3 Assessment of effects

Effects on Wetland Bird Species Cannot be Assessed Without Survey Data

Until robust information on the presence and distribution of wetland birds is obtained, it is not possible to accurately assess the level of effects on wetland birds.

In addition to the information gap above, in our previous review we raised the following issues, which have not been addressed:

- The statement "if any eggs or young are present during habitat loss activities, only a few birds (if any) are likely to be present" does not consider the potential population-level effects of such habitat loss. If only a few individuals of a particular species are present, the effects of loss of nests or young would be of 'High' magnitude, and could drive the species to local extinction. For 'Threatened' and 'At Risk' species, and regionally threatened species, such local extinctions may be significant and need to be addressed.

- Sedimentation controls are proposed, and if effective, should avoid adverse effects on high quality wetland habitat outside and downstream of the project footprint. However, in a worse-case scenario in which sedimentation controls failed, potential effects on wetland birds may be 'High'. This possibility is not addressed in the lodged report, other than stating it has not been assessed given that sedimentation controls have been developed.

Kiwi Numbers to East Unknown

As stated in the review of the draft assessment, the current status of kiwi in the project footprint is largely unknown. Hence we support the conservative approach that has been adopted in the Application.

Effects on Kōkako

In the draft assessment, the authors state an expected "Low" magnitude of effect on kōkako dispersing into the project footprint. In the review of the draft assessment, we stated that we support the statement that there is a low probability that kōkako will disperse into the project footprint. However, we also stated that if this does occur, the magnitude of effect would be "Moderate" to "High". This has not been addressed by the authors, although the section relating to this (4.3.4) has been reworded. The draft assessment included the following sentence that has now been removed:

> *"However there is a possibility that some kōkako will disperse into the Project footprint and immediate surrounds in the short to intermediate term"* (Section 4.3.4 of draft Technical Report 7e, October 2017)

Initial monitoring of the first cohort of released kōkako has occurred over the past few months, with 14 of the 20 released kōkako located in Parininihi, where survey efforts have been concentrated (D. Bryden, pers. comm., 11 January 2018). Limited walk-through surveys (i.e. not full surveys following best practice) of adjacent ridges have occurred to the east of SH3, with no kōkako detected (D. Bryden, pers. comm., 11 January 2018).

This early result indicates a reasonably high survival rate, and also that the initial dispersal of birds out of Parininihi may be low. Further, the limited surveys undertaken to the east of SH3 do not provide any indication whether the six missing birds have dispersed in this direction, but should not be taken as conclusive proof that this has not occurred. This early monitoring should be considered as preliminary information only. Further releases are planned, and ongoing monitoring may yet detect dispersal from Parininihi, possibly to the east. The Project footprint is well within the known post-release dispersal distances of kōkako at other reintroduction sites.

The following sentence from the draft assessment has also been deleted:

> *"There is some uncertainty around the potential for construction activities to affect kōkako, although vegetation clearance and noise could disrupt roosts, breeding and feeding"* (Section 4.3.4 of draft Technical Report 7e, October 2017)

It is not clear why this statement has been deleted. No further information has been obtained or presented to suggest that this statement is not correct. Should kōkako settle within the proposed Project footprint, habitat clearance within kōkako territories would undoubtedly have adverse effects.

> *"Monitoring of the dispersal of release kōkako will continue and will further inform the anticipated level of effect on kōkako from the Project"* (Section 4.3.4 of draft assessment, October 2017)

It is not clear why this statement has been deleted. Ongoing monitoring is planned, and will continue to inform the level of effect on kōkako.

We suggest that a kōkako survey - using playback calls and experienced personnel - be undertaken within the project footprint prior to the commencement of construction, to specifically determine if kōkako have dispersed into this area. A contingency plan should be developed to guide decision-making in the event that kōkako are detected within the proposed project footprint.

5.4 Information gaps

Wildland Consultants (2017) identified two major information gaps, which are still outstanding, as discussed above:

- No baseline data for forest/farmland birds in the project footprint. This may be addressed if surveys are completed by March 2018. However, the adequacy of data cannot be currently assessed.

- No survey of wetland birds in and adjacent to the project footprint. It is not clear if wetland birds will be specifically targeted in the proposed surveys between October 2017 and March 2018. If surveys are not undertaken for mātātā/fernbird, pūweto/spotless crake, and matuku/Australasian bittern, this issue has not been addressed. If yes, this issue will be addressed, although the adequacy of data cannot be assessed.

6. HERPETOFAUNA REVIEW

6.1 Overview

In the review of the draft assessment (Wildland Consultants 2017), a number of information gaps were identified, most significantly the lack of a robust herpetofauna field survey having yet taken place within the project footprint.

It was noted in Section 1.4 of the draft assessment that initial ecological field work was undertaken in the Parininihi catchment (west of SH3), and preliminary investigations on habitat suitability for indigenous herpetofauna did not occur along the current road alignment (east of SH3) until winter 2017. It was acknowledged that surveys within the project footprint would be required during an appropriate time of year, and that this was to be scheduled for the fourth quarter of 2017. However, at the time of the submission of the Application (Technical Report 7d, December 2017), these surveys remained incomplete and as such, no further survey results have been presented.

6.2 Field methods

As no new information has been presented in the Application, it is unknown whether or not suggestions by the reviewer to improve field survey methods have been implemented in the subsequent surveys, if these have been undertaken.

Queries around field methods described in the draft assessment include:

> *"No ACOs appear to have been installed within interior forest areas (i.e. along the same transects that CCFCs were installed along) to target terrestrial skink species. It would have been beneficial to have included provisions to sample for skinks (in addition to opportunistic visual searches) throughout these forested areas, given they were accessible and in use for arboreal CCFC refuges."*

Additional suggestions for the review of the draft assessment included the use of alternative detection tools such as tracking tunnels, which are less sensitive to survey variables such as time of day, and the level of surveyor expertise to identify lizard sign such as scat and slough.

Additionally, the review of the draft assessment stated that:

> *"Spotlighting for nocturnal species was restricted due to steep terrain, and associated safety concerns. This is acceptable, however, it means that significant knowledge gaps around gecko presence and density remain for the majority of the area surveyed. As such, it is risky to make any assumptions around gecko*

abundance in the project footprint, particularly when much of it will also be inaccessible when the time comes to survey it."

As the surveys within the project footprint have yet to be completed and reported upon, it remains unknown how much of the footprint is or isn't accessible for spotlighting surveys. Until this information is available it is not possible to adequately assess the potential for significant lizard populations to remain undetected.

6.3 Transferability of survey results

The review of the draft assessment commented on the transferability of survey results from the original MC23 alignment to the project footprint, as follows:

"The author comments in Section 2.2.1 on the quality of habitat within the Project footprint as lower than the survey area, due to a lack of consistent pest control. This is used to justify the transferability of the survey results from the MC23 alignment, to the project area. This is a poor assumption as i) spatial distribution and dispersal behaviour of New Zealand lizards remain poorly understood, ii) indigenous lizards are anecdotally reported to commonly be found in degraded habitats, and iii) several indigenous lizard species, including Duvaucel's gecko (Hoplodactylus duvaucelii) and common gecko, have been found to exhibit spatially aggregative behaviours, with large populations holding residence in a small discrete areas, despite the abundance of suitable available refugia throughout the wider environment (Hare et al. 2016). In effect, surveys which do not incorporate all potential areas of habitat within a given area, along with a variety of survey techniques, may not detect spatially clustered lizard populations even if a significant search effort is undertaken."

The Application does not provide additional information regarding the presence and/or distribution of herpetofauna within the proposed project footprint. Concerns regarding the transferability of previously collected survey data for use in the Application (Technical Report 7d) therefore remain unaddressed.

There are significant information gaps on the methods and locations of subsequent field surveys, and no site-specific information regarding lizard detections, their locations, and distributions within the project footprint. Adequate surveys have either not yet taken place within the project footprint, or been reported on, during the warmer months when lizards and frogs are more likely to be detected.

6.4 Assessment of effects

The draft assessment states, in Section 2.3, that specialist opinion was used to adapt the EcIA guidelines (EIANZ 2015) and form assessments on i) ecological values, ii) magnitude of unmitigated effect, and iii) level of unmitigated effect, to form overall conclusions on the potential effects of the project on herpetofauna.

The review of the draft assessment noted that the use of this framework was questionable, given its reliance on assessment of magnitude based on information of a "known population or range", which the draft assessment acknowledged the Applicant does not have. As the Application has not reported on any subsequent surveys within the project footprint, information upon resident herpetofauna

populations within the project footprint remain unknown, and therefore, the use of this framework to form meaningful conclusions pertaining to overall effects upon an unknown population is risky.

Species Value Assessment

The Application states that, in the absence of survey results within the project footprint, it can be assumed that up to 13 herpetofauna species may be present (Section 3.3). This, combined with the known abundance of high value habitat for each of these species, infers that the project footprint may have an overall ecological value of 'high', if a conservative approach is being taken as claimed by the Applicant.

The review of the draft assessment noted that the EcIA framework had been adapted to downgrade the ecological value of five 'At Risk-Declining' herpetofauna species from 'High' to 'Moderate-High'. This adaptation was in conflict with EcIA guideline critera, however has consequently been addressed and corrected in the Application (see Table 4.1).

Despite having corrected these values, the overall score remains unchanged as 'Moderate-High', without justification. The review of the draft assessment considered that it should be 'High' given the number of At Risk species that are potentially present, and the abundance of suitable habitat for these species within the project footprint. This has not been addressed in the Application. Given the number of species that have been ranked of higher value it would be expected that the overall ranking would have also been increased accordingly.

Magnitude of Unmitigated Effects

The greatest potential adverse effects on herpetofauna have been appropriately identified in the Application as habitat removal (given the range and quality of vegetation and habitats within the project footprint), the potential for injury and/or mortality (particularly if a 'Nationally Threatened' or 'At Risk-Range Restricted' species are detected), and habitat fragmentation.

The draft assessment and Application reports state that construction of a tunnel and bridge will provide "*some level of connectivity for herpetofauna across the Project footprint."* However, as noted in the review of the draft assessment, this would only be beneficial for the extremely limited proportion of lizards with home ranges within the immediate location of the tunnel and bridge. For all lizards that reside throughout the rest of the area, the barrier of the road will fragment the wider habitat that would otherwise be available to them. The Applicant correctly identifies the fragmentation effects of creating a second road, however then suggests that the effect of it will be minimised as road traffic will decrease along the existing road. This is contradictory to the report's statement about roads acting as "*hard barriers that species or individuals within a populations would not be able to traverse"*. Contrary to the assumption of the Application (Section 4.2.2), the cumulative effects of creating a secondary 'hard barrier' with its corresponding edge effects is unlikely to be significantly offset by a reduction of traffic volume along the existing road.

The review of the draft assessment noted that construction of the new road will result in the creation of an 'island' of habitat between the existing and new roads which will isolate resident lizard populations. The Application acknowledges this to be correct, and comments upon the resulting reduction of gene flows between the eastern and western sides of the existing SH3, yet does not acknowledge the increased vulnerability of these populations to edge effects, i.e. degraded quality of edge vegetation and habitat, and increased exposure to predation. This should be acknowledged and discussed as an important adverse effect, in addition to fragmentation.

Both the draft assessment and Application documents assess the likely magnitude of effects for each of the species that may be present within the project footprint. However, the Application does not acknowledge the change in species value for all of the 'At Risk' species to High. In combination with the suitability of habitat and likelihood of each species presence within the footprint (as set out in Table 3.4), the maintained assessment of the overall score of Low-Moderate for the unmitigated magnitude of effects upon resident herpetofauna within the project footprint is not conservative, and has been downgraded. For example, within the project footprint there are large areas of suitable habitat for forest gecko, which has an ecological value of 'High' (Table 4.1). Forest gecko has been assessed as having a 'high likelihood of presence' within the project footprint (Table 3.4), yet the unmitigated magnitude of effects upon this species has been 'conservatively' assessed as 'Low'.

Based on the EcIA criteria for describing the magnitude of effect (Table 9 of the EcIA guidelines), a conservative approach should, at the very least, rank the magnitude of effects upon this species as Moderate/High. This example is applicable to the assessments for all of the 'At Risk' species that have a moderate to high likelihood of presence and an abundance of their preferred habitat type within the footprint, i.e. brown skink, elegant gecko, Pacific gecko and ornate skink.

Both the draft assessment and Application documents state that this ranking is a reflection of *"the fact that the herpetofauna population across the wider Project area is unlikely to be affected in any meaningful way by the Project".* The Application fails to justify this ranking in any meaningful way, and this is largely due to the fact that the resident populations of herpetofauna within the project footprint remain unknown.

Furthermore, as stated in the review of the draft assessment, the overall ranking of 'Low' "*seems to contradict the author's finding that the project effects upon an 'At Risk' or 'Threatened' species would be potentially significant if unmitigated (Section 4.3.2). Given that ten of the thirteen species identified as potentially present within the footprint are classified as 'At Risk', there is a considerable likelihood that at least one or more 'At Risk' species will be encountered.*"

If any 'At Risk' or 'Threatened' species are detected within the project footprint by future surveys, the unmitigated magnitude of effects should be regarded as at least "Moderate-High".

The Application remains largely unchanged from the draft assessment, and relies heavily upon a range of assumptions around the presence and quality of vegetation

and habitats in some areas of the project footprint (Section 4.3.2). The Application does not include herpetofauna survey information from within the project footprint, and the comments described above have not been adequately addressed. Until the project footprint can be fully surveyed and the extent of habitat loss quantified, the magnitude of effects of the works upon indigenous herpetofauna remains uncertain. It is premature to make assumptions of presence or absence based upon the presumed degradation of multiple habitats that have yet to be surveyed.

Level of Unmitigated Effects

The draft assessment reported that the overall level of unmitigated effects would likely be 'moderate', stating that it was "*it is likely that a number of herpetofauna species are present within the Project footprint, potentially including Archey's frog (which is Nationally Threatened) and/or other species that are Threatened*".

The Application has revised this ranking (Section 4.3.1) and now states that the in the absence of mitigation the overall effect is assessed as 'Low'. This appears to have been done in order to retain a final conclusion of 'moderate' once uncertainty has been accounted for. However, as the Application correctly points out, *"the unmitigated removal of over 40 hectares of habitat would nonetheless adversely impact a potentially significant herpetofauna community."*

Additionally, this is the result of an overall downgrading of the EcIA framework criteria, for value and magnitude of effects,for each of the species that are potentially present throughout the project footprint.

As the overall level of effects is determined by combining the value of each species with the magnitude of effects, all 'At Risk' species (High value), that will be subject to a 'moderate' or 'high' magnitude of effects, should receive an overall impact assessment between 'high' and 'very high', as based on the criteria set out in the EcIA framework (Table 12 of the EcIA guidelines).

Additionally, the review of the draft assessment noted that *"all herpetofauna species (irrespective of threat status), are absolutely protected under the Wildlife Act 1953. As such, the unmitigated impact of the project upon any species detected, should be considered as at least moderate, due to the removal of 34 hectares of good quality lizard habitat."*

Consequently, the assessment of effects on herpetofauna as either 'low' or 'moderate' is not supported, and should be considered as potentially 'hIgh' or even 'Very High' for the herpetofauna that are potentially present.

6.5 Proposed mitigation options

The draft assessment stated that:

> *"Ideally mitigation planting would reflect the vegetation communities removed during the construction phase of the Project."*

However, in the Application this has been changed to state that restoration planting will take the form of up to nine hectares of mixed plantings and up to eight hectares of swamp forest. There is no explanation given as to how this change in restoration approach better addresses the potential scale of adverse effects on herpetofauna.

While the Application does state that 200 seedlings will be planted for every significant tree felled, the habitats and micro-habitats that are being removed within the project footprint are of a much greater diversity than will be provided by restoration plantings. Until the project footprint can be fully surveyed, the extent of loss of indigenous habitats remains uncertain, and it is premature to quantify the nature and extent of mitigation required.

In the Application (Section 5.1), the control of introduced pest animals is the major focus of mitigation and the Applicant recognises that "most gains would quickly be lost within 10-20 years if management stopped" (Section 5.1). The Application states that:

> *"For this reason it is recommended that pest densities be suppressed to target levels until necessary to maintain the benefits accrued."*

The Application states that pest control would occur "until necessary". To provide greater certainty, and to act as a major component of the mitigation package, the permanent habitat loss associated with road construction needs to be countered by pest control in perpetuity. Additionally, the management of predators that are known to feed on mice (i.e. feral cats and mustelids), without the management of mice themselves, may lead to an explosion of mouse populations within the pest controlled area, and enhanced predation pressures upon indigenous herpetofauna. As noted within the review of the draft assessment, mice are well-documented predators of indigenous lizards (Newman 1984; Reardon *et al.* 2012).

Additionally, the review of the draft assessment of Ecological Mitigation and Offset (Technical report 7h) identified a key contradiction that has not been addressed within the Application document:

> *"The mitigation report provides a higher level of detail on what will be included within lizard management plan, and states that it will include provisions for all of the usual, and expected activities for a project of this scale, including the provision for post-release monitoring. However on the same page of the report, in Section 3.6.3, it states that no post-construction herpetofauna monitoring is recommended, and that pest monitoring will serve as an indicator. Post-release monitoring should be a requirement, given the scale of the project, and the likelihood of At Risk and/or Threatened species being present."*

This has not been addressed, and the rationale for not providing post-release monitoring remains unjustified.

6.6 Information gaps

The review of the draft assessment identified issues with how the EcIA guidelines have been applied for this project, which result in an under-valuation of 'At Risk' lizard species in order to achieve an overall unmitigated effect of 'moderate'.

The Application has attempted to correct this by reassigning a value of 'High' to 'At Risk' species. However, the flow-on of these value reassignments throughout the remainder of the impact assessment framework have not been addressed, and the magnitude and level of effects have not changed. This means that the resulting conclusion of the draft assessment (that once mitigation measures are applied, this will yield a net effect of 'negligible' or even a possible positive impact in the medium to long term) has not been updated to reflect the high ecological values of herpetofauna potentially present within the project footprint.

Until a robust lizard and frog survey of the project footprint has been completed and reported on, the conclusions in the Application remain unsupported by site-based evidence.

7. TERRESTRIAL INVERTEBRATES REVIEW

7.1 Overview

The review of the draft assessment identified that a full seasonal survey of invertebrates of the project area is a major information gap in the project report, and this has been accepted by the Applicant. This review also noted that beetles would be a useful group of invertebrates to survey for rather than the entire invertebrate fauna, and suggested four other groups that would complement beetles in the proposed survey.

Carrying out an invertebrate survey, analysis of the results of the survey and then changing management in line with these results is consistent with the overarching aim of the project "To ensure no net loss of biodiversity values". As the Application correctly states, the purpose of the invertebrate report is to describe the effects of the project on terrestrial invertebrates arising from construction, operation, and maintenance.

This statement about the importance of undertaking an invertebrate survey is still valid as, at this point in time, only anecdotal reports of the project area's invertebrates are available. Without a baseline survey it is impossible to assess the area's indigenous invertebrates in terms of diversity, ecology, significance, and the presence of threatened or rare species, and therefore address measures to avoid key areas supporting the best examples of these or provide adequate mitigation or compensation.

New Zealand is globally renowned for its diverse invertebrate fauna, much of which occupies small discrete areas. In the absence of a survey, it is impossible to know what is present, and therefore what measures are required to avoid, remedy or mitigate conservation values to be affected.

The invertebrate records listed in the report are from diverse sources but not from an organised systematic survey of the project area. The report lists 179 invertebrate species found in the mainly desktop study. This will be a fraction of what is present

and may not accurately represent the biodiversity and importance of the site for indigenous invertebrates.

The desktop study reports that Mount Messenger is Type Locality for ten indigenous invertebrate species. These are species described from specimens collected from there, and the Type Locality 'designation' gives taxonomic importance to the population of that species on Mount Messenger.

7.2 Methods

A thorough desktop assessment process was followed, including consultation with ten invertebrate taxonomists. The desktop assessment has used an adequate approach to assess what is known of the invertebrates of the project area in terms of published information on those species and their ecology, and specimens in collections.

No structured seasonal surveys of invertebrates have been carried out due to "seasonal constraints". This is unsatisfactory as even by the report's date (December 2017), nearly half a summer of emergence time for invertebrates has passed and the opportunity lost to survey them. At the least a targeted survey could have been carried out between September and early December to gauge the importance of the fauna in the areas of indigenous vegetation to be lost (44.4 hectares).

Additionally, a targeted survey for the forest ringlet butterfly (*Dodonidia helmsii*) could have been carried out in areas where the sedge *Gahnia* occurs, the larval host plant, to gauge the presence/ density/ importance of the population present. The report noted that forest ringlet butterfly, one of New Zealand's most threatened, had been found in the project area.

Additionally, Wildland Consultants compiled a small list of Lepidoptera (butterflies and moths), based on a brief site visit by Dr Tim Martin on 18 September 2017.

7.3 Assessment of effects

The Application correctly states that the assessment of effects is limited due to a baseline survey of the indigenous invertebrates having not been carried out. Despite this, the report has assessed the community value of terrestrial invertebrates as being High, based on a precautionary approach.

The statement in the Executive Summary that the invertebrate fauna of the project area is "typical" of that occupying the native forests of the southern North Island and northern South Island, is not supported by records from the site. Additionally to state that "any effects of the Project on invertebrates are likely to be negligible in the medium term" is not backed up by evidence from the desktop study or any other analysis.

The report states that forest ringlet butterfly, a threatened species is possibly present. Additionally, the report correctly states that due to "limited studies" no other threatened species were identified from the project area, but states that they may be present. Without an entomological survey being carried out by suitably experienced

entomologists at the appropriate time of year, informative invertebrate species including threatened and rare species will not be found.

The report assesses the unmitigated "magnitude of effects" as Low to Moderate. While we do not concur with this assessment, it nevertheless correlates to an overall 'High' level of unmitigated effects when combined with the "value" assessment of High.

The Application (Section 5) states that there "will ultimately be no net loss (and most likely a net benefit) for terrestrial invertebrates affected by this project". This is an unsupported statement, considering there has been no baseline entomological survey. It is accepted that the Applicant's ecological specialists have provided advice on various aspects of the project, but until a baseline entomological survey is completed and analysed, the present invertebrate fauna at the site is largely unknown. Consequently, it is not possible to propose appropriate measures to avoid, mitigate, or remedy the effects of the proposal on invertebrate fauna.

7.4 Information gaps

As no structured or targeted invertebrate surveys have been carried out, significant information gaps remain.

The desktop survey clearly shows that the project area is important for indigenous invertebrates. Ten species were first described from specimens collected there, and one of New Zealand's most threatened butterflies has been recorded in the vicinity.

This project will result in the loss of over 40 hectares of indigenous vegetation, and will also undermine the integrity of many indigenous communities by creating edge effects and fragmentation to considerably more indigenous vegetation. It is fundamental that the ecology, specifically the invertebrate-plant relationships of these communities, is investigated by a thorough survey of what is present, the ecological relationships present, and the distribution and conservation status of the invertebrate fauna. This is needed before informed decisions can be made.

8. AQUATIC HABITATS REVIEW

8.1 Overview

Several issues were identified in our initial review of the draft assessment, most of which were minor. However, there are two important matters that have not been addressed in the Application (Technical Report 7b), as discussed in the sections below.

8.2 Methods

Estimates of Stream Width for Sites not Accessed

In the draft assessment we requested further clarification on how the stream widths listed in Tables AC.2 and AC.3 were determined, given that some sample sites were

not able to be visited, e.g., Sites Ea3, Ea4, Ea5, Ea6, Ea7, Ea8 and Ea9 (landowner permission not granted) and Sites Ea14 and Ea15 (access restricted due to steep terrain). Details on how widths were estimated for these sites do not appear to have been included in the Application (Technical Report 7b). Accurate measurements of stream width are critical for calculating the amount of stream restoration works required to offset the loss of aquatic habitat. A description of how estimates of stream width were determined should be included in Methods section.

8.3 Assessment of effects

Timing of Key Works

In the draft assessment, Table 4.1 listed key works should be timed 'to avoid peak migration of most species', e.g. banded kōkopu, eels, and kōaro. It was noted in our review that this recommendation was not included in the subsequent summary of mitigation (Section 4.4.1). In the Application (Technical Report 7b), the recommendation to avoid peak migration of fish species has been removed from Table 4.1. The author should provide an explanation as to why this recommendation has been done.

Potential Effects of Sedimentation on Swamp Forest Ecosystems

A new issue, not identified in the original review, concerns the swamp forest systems in the Mimi catchment. In Section 4 of the Application (Technical Report 7b) it states that the kahikatea swamp forest is:

> *"buffered from the Project area by a raupō reedland and rautahi swamp, and this reduces the potential effects".*

Based on Figure 3.4 in the Application (Technical Report 7a Vegetation), it is evident that the raupō reedland and rautahi swamp only provides a partial buffering to the northernmost margin of the swamp forest. Most of the northern margin of the kahikatea swamp forest is in fact contiguous with swamp maire forest, which is of equal (if not greater) ecological value to that of the kahikatea swamp forest. The proposed route footprint is very close to the swamp maire forest, and there is little in the way of buffering should sediment and erosion controls fail. It should therefore be acknowledged that the swamp maire component of the overall swamp forest system in the Mimi catchment is the most vulnerable vegetation type to a failure of sediment and erosion control.

8.4 Information gaps

There are no critical information gaps.

9. MARINE ECOLOGY REVIEW

9.1 Methods

Marine ecology has been addressed in Technical Report 7g and 7h.

The assessment was undertaken as a desktop review exercise, with discussions with five named parties.

9.2 Assessment of effects

The following key marine ecological values were identified:

- Estuarine habitat
- Intertidal habitat
- Subtidal reef habitat in Parininihi Marine Reserve
- Subtidal soft sediment habitat
- Marine mammals, including the Threatened Maui's and Hector's dolphins
- Fishery resources, including commercial fisheries, and protected great white shark
- Kaimoana
- Seabirds, including At Risk wading species and blue penguins.

The key conclusions are:

> *"In the absence of efforts to avoid, remedy or mitigate adverse ecological effects, the potential effects on marine ecological values would come from indirect, short-term effects during construction relating to sedimentation. Erosion and sedimentation after vegetation clearance and earthworks in the upper reaches of streams could potentially result in suspended sediment travelling down freshwater streams and rivers to the marine coastal environment. Any such sedimentation would only be a relatively very small addition to the sediment that already reaches the marine environment via the streams.*
>
> *The degree to which the marine ecological values might be adversely affected is dependent upon how much, and how far, suspended sediment would travel from the Project. The Project is a significant distance from the coastal marine area (i.e. 9.2 kilometres and 21.5 kilometres stream distance from the Tongaporutu and Mimi estuaries respectively)."*

If best practice sediment control measures are implemented, and in the absence of a major catastrophic storm(s) or tectonic events during the construction phase, adverse effects on the marine environment are unlikely.

Overall, given the distances upstream from the coast, the desktop approach used for this element of project evaluation and reporting is appropriate.

9.3 Information gaps

No information gaps were identified in this review.

10. ECOLOGICAL MITIGATION REVIEW

10.1 Overview

Throughout the mitigation report (Technical Report 7h) there are various assertions made that are not backed up by supporting evidence from the site. These assertions are simply declared to be correct, and adversely affect the professionalism and credibility of the reporting.

In the Executive Summary of the draft assessment it was stated that:

> *"All aspects of the indigenous flora and fauna present in the project area will benefit from the management of pest animals to permanently low densities."*

Benefits to all flora and fauna will not occur. For example, if there is increased growth of palatable plant species, these will exert a competitive effect on unpalatable species. Studies of invertebrate responses to pest control in particular do not always result in positive trends. For example, large beetle abundance unexpectedly declined for six years after pest eradication in the Zealandia ecosanctuary in Wellington (Watts *et al.* 2014), and control of rodents at the Moehau Sanctuary did not benefit invertebrates (Rate 2009). Furthermore, New Zealand forest vegetation has not always recovered after control of herbivores such as deer (Coomes *et al.* 2003; Tanentzap *et al.* 2009). Kohekohe, which was a former canopy dominant but is now only present as scattered saplings, is an example of a palatable species that may not recover quickly.

- In the Application (Technical Report 7h), the statement has been changed to:

  > *"**Many** aspects of the indigenous flora and fauna present in the project area will benefit from the management of pest animals to permanently low densities."*

  The revision acknowledges that not all indigenous biodiversity will benefit from pest control. This change should be reflected in the Applicant's mitigation package, by placing greater emphasis on actions other than pest control, e.g. achievement of no net loss of habitat area.

- In the executive summary of the draft assessment and the Application it also states that *"The project will result in the removal or modification of 34 hectares of predominantly indigenous vegetation and habitat".*

  In Section 3.3.1 of the mitigation report it states that 33.3 hectares of indigenous dominant vegetation is subject to *"removal"*, with an additional 1.37 hectares of sedgeland wetland that is of "significant value". This equates to *"34.7 hectares of removal"*. If the amount of indigenous habitat subject to *modification* is also added to this extent, the extent of *"removal or modification"* is much greater than 34 hectares, primarily due to the extent of edge effects. Edge effects have been estimated by the Applicant to extend five metres from the edge of clearance, but 50-100 metres is better supported by literature. If 50 metres was conservatively used as the extent of edge effects, the extent of indigenous vegetation subject to

removal or modification could increase by a further 54 hectares (six kilometres of road multiplied by the additional 45 metres multiplied by two for both sides of the road). This would place the total extent of removal or modification, including edge effects, at approximately 87 hectares.

This under-reporting of vegetation loss was raised in the review of the draft assessment and has not been corrected in the Application.

- The executive summary of the draft assessment and the Application states that the proposed mitigation will greatly improve the connectedness of the forested areas, and this was questioned in the review of the draft assessment. As the forest through which the road passes is largely continuous and intact, and the project will result in a permanent new major road barrier through this forest, it is very difficult to see how any connectivity benefits will occur. When considering connectivity, it is always important to determine which specific biota would benefit from improved connectivity. For example, forest birds are unlikely to have any connectivity limitations in the project area, whereas herpetofauna and flightless invertebrates are likely to experience nearly complete severance of populations due to road construction. This claim has no basis and has not been revised.

10.2 Vegetation

Section 3.3.2.1 of the draft assessment and the Application describes actions undertaken to mitigate the adverse effects of vegetation clearance. These include the planting of nine hectares of secondary scrub vegetation, mostly along the floor of the Mangapekepeke Valley. This vegetation to be cleared comprises mānuka scrub and mānuka-tree fern communities, and it is proposed to replace these on a 1:1 basis. This is certain to result in a net loss, as the affected mānuka forest associations in the Mangapekepeke Valley are 25-50 years old and some include pole-sized trees of rewarewa, kahikatea, and rimu. To acknowledge that plantings do not replace vegetation loss until similar maturity is reached, ratios for vegetation loss and planting extent usually consider the time lag between planting and when ecological equivalency is reached. For mānuka scrub with pole-sized rewarewa, kahikatea, and rimu, a ratio of 1:2 would be more appropriate.

In Section 3.3.2.2 of the draft assessment and the Application, it is proposed that 200 trees are planted as compensation for each significant tree felled. Unfortunately, planting of 200 seedlings will not compensate for the loss of a single significant large tree. This is because large trees are likely to be centuries old, have large canopies that support epiphytes, have cavities suitable for hole-nesting birds, provide habitat for indigenous lizards, provide roosts for bats, and provide significant sources or fruit and or nectar. None of these resources are available in seedlings or young trees. It is almost impossible to offset the loss of large trees through planting due to the very long period of time required for planted trees to grow large enough to provide similar habitat and resources. No details are provided regarding where the plantings to compensate for significant tree loss will occur. These planting areas will need to encompass a similar range of soils and landforms to the proposed project footprint.

In Section 3.3.3 of the draft assessment and the Application, the monitoring proposals are very vague and do not include any detail on methods. They are therefore unverifiable and little weight can be given to them.

10.3 Lizards

In Section 3.6.1 of the Application (Technical Report 7h) it states that:

> *"no lizards or frogs were found in the initial surveys"*

and:

> *"if herpetofauna species are present, potential ecological effects include habitat loss, habitat fragmentation, vehicle strikes"*

In contrast, Section 1.3 of the Application states that mature forest habitat in the wider Project areas is habitat for eight indigenous lizard species. If additional herpetofauna surveys were carried out since the draft assessment, the Application has not been updated to consider the results of these. It is very unlikely that indigenous herpetofauna are absent, and in the absence of survey data the Application should at least acknowledge the likely presence of the eight species listed in Section 1.3 of the Application.

One of the key potential effects on lizards is mortality due to vegetation clearance and earthworks. The Application lists habitat loss, habitat fragmentation, and vehicle strikes, but not mortality during construction. The effect of fragmentation is also at odds with the Application's statement, in the Executive Summary, that the proposed works will greatly increase connectivity of forest areas.

Benefits of pest control proposed for these lizards are also very questionable, and it cannot be assumed that these benefits will occur, as the mitigation report simply declares (Section 3.6.2.2) without any supporting evidence. As one of the key threats to herpetofauna is predation by rodents (rats and mice) any prescribed pest control, proposed as mitigation for effects on herpetofauna, should include methods that target rats and mice. This is not the case as the proposed control methods (Section 4.4.2) will not effectively control mice, and will only have some limited effect on rat numbers and densities.

10.4 Invertebrates

Similarly for arboreal lizards, the Application simply assumes that invertebrates will benefit from pest control and thus does not consider that any monitoring is necessary. As noted above, there is evidence that invertebrates do not benefit from pest control, so the unsupported contrary assertions in the mitigation report carry no weight.

10.5 Bats

In the draft assessment for bats (Section 5.4.2) and herpetofauna (Section 5.3.2), the Applicant correctly recognises that planting is needed, with the aim to reflect the vegetation communities to be removed, but that loss of mature forest cannot be

recreated in the short to medium term. This time lag is normally addressed by the use of a compensation ratio that factors in this time delay, e.g. a ratio of 1:5 or more for area lost to area planted. No basis is provided for the "up to *8* hectares" of plantings (swamp forest) proposed in the light of total potential loss (34 hectares), excluding losses due to edge effects. The most extensive forest type being lost is tawa-dominated (tawa-rewarewa-kamahi forest (6.5 hectares) and tawa nīkau treefern forest (8.7 hectares)). If the planting proposed is eight hectares of swamp forest, this will result in a net loss of forest extent for the site of about19 hectares (excluding edge effects), and the revegetation plantings are not like-for-like (swamp-forest focused when this comprises <1.3 hectares of forest loss within the footprint (0.186 hectares plus 1.045 hectares).

If the rationale for planting swamp forest, ahead of hillslope forest types, is that it is a habitat type that is significantly reduced in extent at a national scale, then the Applicant should ensure that 1) this is provided *as part of a planting package* that will result in *no net loss of forest area*, and 2) the Applicant should provide further details as to the suitability of the proposed planting site for swamp forest species, as these species have very specific soil and hydrology requirements.

Contrary to recommendations in the Application reports in relation to bats and herpetofauna, the plantings will not reflect the vegetation communities to be removed. This has not been addressed in the Application.

10.6 Freshwater

The Application (Technical Report 7h) states that habitat loss is considered to have the greatest effect on the freshwater ecology of the Project footprint. Approximately 3,825 metres of stream habitat in the Mangapepeke and Mimi catchments will be diverted, culverted, or substantially altered as a result of the Project. In order to offset the residual effects it is proposed to restore the margins of 8,724 m^2 of stream channel equating to approximately nine kilometres of stream length. It is proposed to plant ten metre margins on each side of the stream.

Key concerns with regards to the proposed offset approach are as follows:

- Although restoring stream margins will improve the associated terrestrial and aquatic values, it is acknowledged that there will still be a significant and permanent net loss of aquatic habitat. That is to say, the proposed restoration approach is not offsetting the stream loss by creating additional aquatic habitat (e.g. through day-lighting); rather, it relies on the enhancement of existing stream habitat.

- The compensation streams have not been confirmed, and it is possible that some landowners will refuse to offer their watercourses for restoration purposes. As such, works should only proceed once appropriate compensation streams have been identified. Furthermore, the final quantum of mitigation cannot be determined until these streams have been confirmed. It is possible that more than nine kilometres of stream length will be required for mitigation purposes. If compensation streams cannot be found, contingency measures need to be provided.

10.7 Avifauna

None of the issues identified in our initial review have been adequately addressed in the Application (Technical Report 7e), as follows:

- Predator control must be adjacent to existing predator control to be effective mitigation.
- Core area of proposed predator control is very small and of minimal benefit to most species.
- Effects of proposed predator control on wetland birds cannot be assessed without information on species presence, population status, and spatial distribution.

If the proposed predator control is intended to be a standalone core of 222 hectares (not adjacent to Parininihi), any benefits to avifauna will be extremely minimal, if at all (as outlined in Wildland Consultants 2017). The majority of forest birds require intensive rodent control (at <10% tracking rates) over areas of at least 500 hectares (preferably 1,000 hectares) before significant benefits would be expected (we are assuming that intensive rodent control to this standard is intended to be limited to the 222 hectares core). Under this scenario, this area would also be too small to be of benefit to the kiwi population.

If the proposed predator control will be adjacent to Parininihi, this will provide some small benefit to avifauna, by providing an additional 222 hectares of safe habitat for most forest birds (again, assuming intensive rodent control is limited to the core), and arguably an additional 560 hectares of safe habitat for kiwi (assuming intensive stoat control in both the core and the buffer).

Regardless, the benefits to avifauna as proposed are questionable and at best minimal. To maximise benefits to avifauna, we would recommend that the **core** area be at least 500 hectares, preferably 1,000 hectares, and that this area is adjacent to Parininihi. The proposed core area of 222 hectares appears to have been selected solely based on mitigation requirements for vegetation, rather than wildlife values:

> *"The application of the Model has led to the conclusion that there is sufficient available offset vegetation to enable net biodiversity gain to be achieved within 15 years for all vegetation communities except one, and that 222 hectares of intensive, multi-species pest management is required to achieve this (Table 4.1 and 4.2)"* (Section 4.3 of Technical Report 7h, December 2017).

As outlined previously, it is not possible to assess potential benefits to wetland avifauna without robust information on species presence, population status, and spatial distribution within the proposed predator control area. This remains a significant information gap as outlined in Section 6.

10.8 Pest management strategy

Section 4.4.2 of the draft assessment describes the pest management strategy and indicates that monitoring of pest animal densities will be used as a surrogate for

biodiversity outcomes. It would, however, provide much more assistance in verifying the claimed positive benefits of pest control if quantitative information on biodiversity outcomes was collected as an element of the monitoring. In Section 4.10 of the mitigation report it is suggested that avifauna, palatable plant regeneration, and forest canopy health will be monitored to assess biodiversity outcomes. As there is no information on the design or methods of this proposed monitoring, its effectiveness cannot be assessed. In the Application these sections have not been revised and the issues identified remain unaddressed.

The Application (Section 4.4.3) proposes a 255 hectare area of forest as a Core Pest Management Area with a buffer area (Section 4.4.2) "around the Core Pest Management Area", where it adjoins "habitat suitable for forest-occupying pest animals". The Application states that "mobile pest species, notably feral goats, feral pigs, possums, mustelids and feral cats, will move over large distances to reach feeding areas, and that pest management buffers are required to fully protect core areas from regular pest incursion" (Section 4.4.2).

The preferred pest management area proposed by the Applicant does not achieve this. The core area of 222 hectares adjoins farmland, on which no pest control occurs, for approximately 600 metres of its western boundary, and 850 metres of its eastern boundary (Figure 4.1). In addition to this, an arm of farmland extends into the core area in the southeast, creating a further boundary with farmland of approximately 1500 metres in length. The Applicant states that open farmland will protect the core area from reinvasion "to a reasonable extent". This is not the case, and the adjacent areas of farmland, without pest control, will significantly reduce the size of the effective core area. Farmland is suitable habitat for many "forest-occupying" pest species and therefore doesn't provide a barrier to pest species movement. Farmland is noted as suitable habitat for possums, Norway rats, ship rats, stoats, weasels, ferrets, feral goats, red deer, feral pigs and feral cats (King 2005). Possums can be present in high densities in open farmland where small refuges of vegetation are present (Brockie *et al*. 1997). Feral goats will readily commute across pastureland. Rats, stoats, weasels and feral cats use a wide range of habitats and are present wherever prey and cover (e.g. rank grass or low lying scrub) is available. Pigs require some level of forest, scrub or shelterbelt as refuge but can persist in, and cross farmland provided that sufficient cover is present. The use of farmland as a buffer to the core pest management area is a critical flaw in the Application, as the biodiversity offsetting model was used to calculate a minimum core area of 222 hectares, and pest control is regarded by the Applicant as the key component of mitigation for the project.

Potential effects of road construction on pest animal abundance are not addressed in the draft assessment or the Application. Construction and operation of the road has the potential to affect mice, stoats, ship rats, and hares. While poorly understood, the effect of roads on the dispersal of alien species is an important consideration in New Zealand (Spellerberg and Morrison 1998). In Pureora Forest Park, mice were found to be more abundant in road edge cut over forest than in unlogged indigenous forest (King *et al.* 1996a, King *et al*. 1996b). Ship rats were also detected in high numbers along the road edge (King *et al.* 1996a), but were also noted to be widespread throughout indigenous forest. In Fiordland National Park, the Eglinton Road affected the behaviour of stoats, with females avoiding it and males showing a preference for it

(Murphy and Dowding 1994). Male stoats were observed to scavenge road kill, and may also have been using the road as a linear feature for travel. Hares are not typically found in forest, but will inhabit roads and road margins. Hares can affect indigenous vegetation through browsing and also provide an additional food source for stoats (Smith *et al.* 2008). The potential increases in the abundance of mice, rats, stoats, and hares that could be caused by road construction should be addressed in the pest management strategy.

The impacts of mice on indigenous biodiversity are detailed in Section 4.4.1 of the Application, however, the proposed pest management strategy excludes mice, as it will "focus on all animal pests down to the size of rats" (Section 4.4.4).

In Section 4.4.2 of the Application, it states that:

> *"A network grid with bait stations no further apart 100 metres is necessary to achieve effective and sustained possum and rat control (Smith at al 2009; Speedy et al. 2007). Feral cats and mustelids (ferrets, stoats and weasels) can be controlled to low levels by secondary poisoning and periodic trap sets along the networks".*

A distance of 100 metres between bait stations will not effectively control mice. Moreover, with a reduction in ship rats and mustelids, it is likely that mouse numbers would significantly increase throughout the project area, resulting in adverse effects on invertebrates, lizards, seeds, and fruit. A much closer density of bait stations - a minimum of 25 metres (MacKay *et al.* 2007) - would be required to achieve low densities of mice. In saying that, the feasibility of establishing and servicing a 100 metre (or less) bait station grid would be difficult given the challenging terrain within the project area. There is also the possibility of interference by feral pigs, i.e. destroying or tampering with bait stations.

It would be more effective to carry out aerial control operations on a three-year cycle in order to achieve and maintain low predator densities, in addition to intensive ground-based control of feral ungulates.

11. BIODIVERSITY OFFSETTING APPROACH

11.1 Overview

The biodiversity offsetting approach used by the Applicant in both the draft assessment and in the Application does not represent good practice and cannot be relied on to support the conclusions of no net loss and net gain.

Major problems with the offsetting approach are its limited selection of attributes and reliance on subjective information at most stages of the process. For example, only broad ecological units (vegetation types) were used at the most resolved level (attributes) of the offsetting currency, and parameters of the offset calculation were mostly scored subjectively. The first problem means that the calculation does not 'capture what we care about' (for example habitat requirements of indigenous fauna, emergent trees, rare or distinctive plant species) and many important ecological values

are therefore not included in the loss-gain calculation. The second problem means that there is no factual basis underlying the choice of parameter values, thus they are not verifiable and are unsupported by ecological data from the site. A third problem is the way that condition is scored, which conceals the identity of forest tree species and the size of individual trees. Thus a successful outcome of the model could occur at a stage of very young forest of limited diversity that does not in any way resemble the mature forest that is cleared. The point at which no net loss is reached was obtained simply by declaring different parameter values for the condition of the impact, offset, and benchmark sites.

These problems, caused by a failure to use good practice, are additional to the limitations of the condition-area currency used in the approach. In this currency, the condition of the offset site is traded-off against its area, thus if there is relatively low improvement in condition, a larger offset site can still reach no net loss. Also, the currency assumes that biodiversity gain scales evenly with area, but this is not likely to be the case, as natural areas tend to incorporate additional habitats as they increase in size.

Furthermore, the accounting model itself has major limitations in its treatment of uncertainty. The values entered into the model are all associated with uncertainty, but these uncertainties are not allowed to be entered into or multiplied through the model. For example, there are uncertainties in the baseline condition of impacted attributes, the condition of benchmark attributes, the condition of baseline offset site attributes, and the estimates of gain for each attribute. The model has only a single step where confidence in the information can be entered, but this simply represents a declaration by the user, rather than error associated with real ecological data.

The biodiversity offsetting approach used in the Application is affected by all of the above factors, and as such cannot be relied on. These and other factors are described more fully below.

11.2 Choice of biodiversity offsetting approach

The offsetting report considers a biodiversity offsetting condition-area currency appropriate for use in the project because it is consistent with the New Zealand Government's best practice guidance. The ecological appropriateness of the condition-area currency has not been assessed. The Mt Messenger site supports complex indigenous forest and wetland vegetation that contains old growth trees and provides habitat for indigenous bats, birds, lizards, fish, and invertebrates. We are not aware of any case in New Zealand where a biodiversity offsetting approach has been used successfully to address significant adverse effects on complex ecosystems such as this. In such cases biodiversity offsetting often provides a veneer of objectivity that is not substantiated by more detailed assessment.

The biodiversity offsetting accounting model used in the Application is described by the authors of the framework as a "non-prescriptive, flexible 'empty shell' that the user populates by entering biodiversity measures, estimates, and discount rates" (Maseyk *et al.* 2015). Thus the quality of the outcome of the accounting model very much depends on the quality of the information entered, and the outcome can be easily manipulated by the values that the user enters.

Maseyk *et al.* (2015) note that four standards should be adhered to if condition-area currencies are to account for complex biodiversity offset situations:

- Selected biodiversity attributes are inclusive of a meaningful range of biodiversity components that represent biodiversity types.
- Biodiversity attributes are selected to capture important biological states, e.g. different stages and/or ages of species.
- Parameters and values are empirically informed wherever possible and the use of unverifiable parameters of values is avoided.
- The currency is disaggregated, thereby ensuring trade-offs between dissimilar biodiversity.
- Currency limitations are understood and rules that address concealed loss are set outside of the model.

11.3 Choice of biodiversity attributes

Choice of components, types, and attributes is critical in biodiversity offsetting approaches, because if important ecological features are not included as attributes, they will not be accounted for in the loss-gain transaction, and may suffer net loss even though the outcome of the approach is no net loss or net gain. The offsetting approach in the Application selects only vegetation types as the biodiversity attributes in the model, and does not include all vegetation types, for example cliff vegetation. This is not consistent with good practice guidance, which requires a meaningful range of biodiversity components to be assessed. The mitigation report shows that, in addition to effects on vegetation types, there will also be residual adverse effects on significant large trees, 'At Risk' and regionally distinctive plant species, bats, birds, lizards, fish, and invertebrates. Attributes for each of these biodiversity components should have been included in the offsetting model. The good practice definition of no net loss requires that no high value indigenous components should be substituted for other components.

A review of attribute selection in New Zealand offsetting models (Wildland Consultants 2012) concluded with the following guidance for selection of biodiversity types, components, and attributes:

- Selection of biodiversity types, components, and attributes should cover a meaningful range of biodiversity features, including, if present, the following impacted elements:

  <u>Types and Components</u>

  - Originally rare ecosystem types (Williams *et al.* 2007);
  - Indigenous vegetation on wetlands and sand dunes;
  - Indigenous vegetation types;
  - Important fauna habitats;
  - Threatened, At Risk, and locally uncommon species; and

- Indigenous vertebrate fauna guilds, including each trophic level (herbivore, predator), feeding guilds of avifauna (insectivore, frugivore, nectivore, carnivore), and indigenous fish.

Attributes

- Important plant species within a biodiversity type (e.g. those that attain at least 5% of the total tier cover, basal area, or count), and their size structure;
- Ecologically important plant species (e.g. those that provide important habitat value for indigenous fauna) within a type, if they are present at lower abundance;
- Indicator species, such as pollution-sensitive aquatic invertebrates which indicate stream condition, and palatable plant species that indicate the presence of herbivores;
- All Threatened, At Risk, and locally uncommon species;
- Species with large populations or congregations at the site;
- Iconic species, including those valued by local stakeholders;
- Important indigenous pollinators (e.g. tui, bellbird);
- Important indigenous seed dispersers (e.g. kereru); and
- Species richness within a biodiversity type (this can be measured both as alpha (within-sample) richness and beta (between-sample or whole site) richness.

- Counts or measures of individuals should be utilised wherever practical, e.g. counts of individuals, estimation of fauna population size or number of breeding pairs, measures of tree stem diameters. This will enable objective modelling of future biodiversity gains. Predictions based on objective counts and measures are also attractive in that they are verifiable over time. This is particularly important given the heavy reliance on subjective assessments in current offsetting approaches. Where this generates significant uncertainty, contingency strategies could be associated with time-predictions for achievement of offsetting milestones.

- Attributes should capture differences in the sizes and/or ages of individuals of species that vary strongly in these parameters, particularly where the size and/or age of individuals is strongly related to their ecological function. For example, trees, saplings, and seedlings of a long-lived tree species should be represented as different attributes.

Choice of biodiversity attributes in the offsetting approach in the Application is not consistent with best practice guidance (Maseyk *et al.* 2015), nor with the attribute selection guidance described in Wildland Consultants (2012).

11.4 Determining condition

Condition scores for attributes have largely been declared and are not based on quantitative counts or measures of biodiversity from the site. These declared condition scores are unverifiable and contrary to good practice, which requires that objective, verifiable, counts and measures are to be used whenever possible.

The condition scores are based on 'ecological integrity' where this is defined by multiplying 'current state' and 'habitat condition'. Both seem to be indices of condition, which is unusual. Values for weed cover aspects of these condition scores were obtained from unbounded recce plots, which are not suited to quantitative measures, but otherwise they were subjectively estimated.

A significant problem with the way ecological integrity has been calculated for forest vegetation is that it is not based on species, individuals, or the size of individuals. Thus increase in condition does not capture the identity of the indigenous species that the offset vegetation contains, nor the sizes that individuals of the species reach. Valued species may not be present in the offset sites, and relatively young vegetation could achieve high condition values, yet still be far from the condition of benchmark vegetation based on structure and composition. Measurement of stem diameters in fixed size vegetation plots is a practical and efficient way to collect high quality information on forest tree structure and composition, and ideal as an objectively measured attribute in offsetting models addressing impacts on indigenous forest (Wildland Consultants 2011).

11.5 Offset site condition

The condition of the forested offset sites ranges from 39-44, which seems artificially low given the concluding opinions of the offset report which state that these forests have higher abundance of significant trees and populations of threatened species, and are therefore in better condition than the impact sites.

In Section 4.2.2 of the Application Biodiversity Offsetting Report (Technical 7h), the following statement, which included in the draft assessment, has been deleted:

> *"the land identified currently receives very limited ecological management. For this reason, the offset proposal will generate additional biodiversity gains which otherwise would not have occurred."*

Removal of this sentence from the Application implies that the biodiversity offsetting site may currently receive ecological management, therefore undermining its suitability, and whether the key component of the mitigation package will result in the ecological gains that are claimed by the Applicant.

11.6 Estimated gains

Integrated pest management has been selected as the main biodiversity offsetting action and is predicted to improve recovery and regeneration of palatable plants, especially palatable canopy dominants, and recovery of vulnerable fauna. Estimates of gain are purely subjective. Some of these estimates of gain are ecologically unachievable. For example, planting of kahikatea-swamp maire forest in areas currently covered by wet pasture is expected to move from a near-zero ecological integrity value to a 50% ecological integrity value in 35 years. This implies that the planted vegetation will be two thirds of the way to benchmark condition in 35 years, which is ecologically implausible given the relatively slow growth rates of the species that would be planted in such forest. For example, the vegetation report describes the existing stands of pole kahikatea forest as young stands from 50-80 years old, and

these pole stands would be far from benchmark condition in terms of their structure and composition.

Similarly, it is proposed to plant 200 seedlings of each significant tree that is cleared. Adverse effects on significant rewarewa, tawa, and kamahi trees are not addressed, and it needs to be acknowledged that the planting of seedlings may have a relatively low success rate. Even if all of these seedlings survived and grew they could not replace the ecological functions of the lost canopy trees for hundreds of years.

Thus the offsetting actions will not result in ecologically-meaningful offsetting outcomes.

12. INCONSISTENCIES BETWEEN APPLICANT'S REPORTS

The review of the draft assessment identified significant inconsistencies in the reporting to date, both within individual specialist reports, and between specialists. This is a barrier to understanding what is proposed, and what the likely effects of the road will be, once the proposed mitigation package has been considered. The separation of disciplines, without a document that draws findings into a cohesive whole, is also likely to have resulted in the understatement of ecological values for some components. Inconsistencies that have not been addressed in the Application are listed below:

- Literature supporting the extent of edge effects to be 50-100 metres from a road edge, and the use of five metres of edge effects for the biodiversity offset calculations.
- The importance of 'like-for-like' when replacing habitats, which is then not reflected in the proposed mitigation plantings.
- Mitigation plantings proposed within areas of existing indigenous vegetation beyond the project footprint (Figures 4.3 and 4.4)
- The assessment of some habitat types as being of 'Low' ecological value, based on vegetation and flora values, when other disciplines assess that same habitat type as of 'High' value, based on its value as fauna habitat (e.g. mānuka-dominant scrub).
- The likely impacts of mice on ecological features and habitat values of the route, and the importance of intensive pest management to offset adverse effects, followed by the omission of mice from the list of pest animals to be targeted.

A summary of inconsistencies for the Application is provided in Table 2. This is largely unchanged from the inconsistencies noted in the review of the draft technical reports.

Table 2: Summary of inconsistencies between ecological reports provided by the Applicant.

Issue	Vegetation Report	Other Specialist Reports	Mitigation Report	Outcome
Ecological equivalence of mitigation	16 indigenous vegetation communities within footprint (Table 3.1), including 19 hectares of tawa kohekohe rewarewa hinau podocarp forest (Table 4.4). Restoration planting of secondary scrub habitats (9 ha), swamp forest (6 ha, if available), and sedgeland wetland (1.37 ha).	Mitigation plantings would ideally reflect the vegetation communities removed (Bat report Section 5.3.5).	Preference for replacement of "like for like" (Section 2.1.2) Cut and fill areas alongside road not suitable for restoration of forest types removed (Section 4.2). Between two and six hectares of land is suitable for swamp forest plantings, pending site survey (Section 4.5.2).	Plantings only undertaken to compensate for loss of swamp forest (Section 4.2). No plantings to compensate for the loss of 19 hectares of tawa dominated forest. 19 hectare net loss in the extent of forest and scrub (34 hectares lost, 15 hectares planted). What is the solution if less than six hectares of land is suitable for swamp forest plantings (including the additional 2.3 hectares at Mimi Stream)?
Plan for existing SH3 route	-	Removal of existing SH3 route reduces vehicle collisions (Herpetofauna, Section 4.2). Construction of road creates a hard barrier that cannot be traversed (Herpetofauna, Section 4.2.2) Barrier effect of existing road may be less due to reduced use (Herpetofauna, Section 4.2.2) Existing road in effect decommissioned due to reduced vehicle movements (Bats, Section 4.2.3) Construction will shift existing road to the east, and pose less of a barrier due to tunnel and a bridge (Bats, Section 4.2.3).	-	Applicant refers to both the removal and retention of SH3. Applicant refers to roads being inaccessible to lizards, but also mortality due to vehicle collisions. Applicant states that the road is shifted to the east but existing road is kept, with an additional road built to east (Bats, Section 4.2.3).
Extent of edge effects	50-100 metres noted as supported by literature (Section 4.3.3). Five metres of edge effects included in calculations as a habitat loss equivalent.	Estimated at five metres.	Calculated using a five metre margin.	Edge effects significantly underestimated.
Ecological value of mānuka scrub, and the 1:1 ratio for replacement	Assessed as "Low".	Assessed as "High" or "Moderate" habitat suitability for nine lizard species, including three 'At Risk' gecko species (Herpetofauna, Section 3.1.3). Mitigation planting will not replace herpetofauna habitat within 10 years.	Applicant notes that in New Zealand, to account for time lag of restored habitat that multipliers of 1:1 to 1:150 have been applied. A 1:1 ratio is justified on the basis that habitat 'replanted immediately' (Section 2.1.3). However, Applicant recognises that this vegetation also includes pole regeneration of podocarps.	Net loss, as habitat equivalency won't be reached for "many decades" (Mitigation, Section 4.2). A ratio of 1:1 is not appropriate.
Existing habitats within areas to be planted as mitigation	Vegetation communities within proposed swamp forest planting areas include "pukatea treefern fernland", "sedgeland" and "kahikatea forest" which are outside of the ancillary works area (Figure 3.3, crossmatched with Figures 4-6 of mitigation report).		Proposed swamp forest plantings (Figures 4-5) include areas beyond the ancillary works area that are already indigenous vegetation.	Plantings only contribute to mitigation if they are currently not indigenous habitats. Applicant needs to clearly show that these planted areas are not currently indigenous vegetation (e.g. pasture) and will result in a gain in the extent of indigenous vegetation.
Plantings of swamp forest species	Kahikatea, swamp maire, and pukatea are the key swamp forest species (Table 3.1).		Initial plantings to include whaririki. Swamp forest species to be planted once shrub layer well established.	Whaririki (mountain flax; *Phormium cookianum*) inappropriate for swamp forest plantings and will likely fail. Kahikatea is a light demanding pioneer species and is unlikely to establish if not planted at outset.
Health of forest to the east of SH3	Tawa, kohekohe, rewarewa, hīnau, podocarp forest (WF13) to the east of SH3, at the southern end of the route, is described in the report as being in "a high ecological condition" considered "within the top 10% remaining" in the Taranaki Region (Section 4.2.3). The ecological condition of forest to the east of SH3 is poorer (Section 1.5.2).		The ecological condition of habitats in the project footprint has been "greatly diminished over many decades by the largely uncontrolled impacts of browsing, grazing, and predatory animal pests and unfenced cattle.	The Applicant repeatedly notes the reduced impact of the proposed road due to its route through more modified habitats to the east of SH3. However, from the Applicant's own reporting it is clear that this justification only applies to the northern section of the route. It is unclear how this may have influenced biodiversity offset calculations.
Age of podocarps within project footprint	Likely to be greater than 500 years old (Section 3.8).		Several hundred years old. Planting to recreate habitat equivalent to that lost will take "many decades" (Section 4.2).	Understatement of tree ages. Unclear what age (if any) has been considered in biodiversity offset calculations. If plantings are successful, replacement of equivalent habitats will take centuries, not decades.

Issue	Vegetation Report	Other Specialist Reports	Mitigation Report	Outcome
Control of mice		Occupancy of mammalian predators is higher in edge habitats (Herpetofauna, Section 2.3.2).	"Targeted and enduring pest control has repeatedly shown substantial improvements in the survival and recruitment of… lizards". Mice will feed on invertebrates and seed in the forest and have been shown to greatly reduce lizard numbers (Section 4.4.1). Bait stations no further than 100 metres apart to achieve possum and rat control (Section 4.4.2).	The predation of lizards by mice is well established (Newman 1994). Fencing of habitats to exclude cattle can also causing proliferation of mice populations, with subsequent increases in predation by mice, and stoat numbers. The omission of mice control is not justified, may have unforeseen adverse effects, and cannot be effectively achieved by bait stations at 100 metre spacing.

13. SUMMARY OF KEY ISSUES WITH THE APPLICATION

13.1 Overview

Most of the key issues in the Application were identified in the review of the draft assessment (Wildland Consultants 2017). These are largely repeated here as they have not been addressed.

13.2 Location of survey effort in relation to the project site

A key commonality between the specialist reports that comprise the Application (with the exception of the aquatic assessment) is the argument that the eastern block is of lower ecological value due to the relative lack of animal pest control to the east of SH3 (relative to the Parininihi block, to the west of SH3, that has had 15 years of pest control). Whilst this difference in pest control history may be an appropriate generalisation for the route as a whole, it is problematic for the Application for the following reasons:

- The lack of evidence presented regarding the relative forest health of the tracts to the east and west of SH3. Field observations (on 19 September 2017) indicated that at least northern rata to the east of SH3 (a browse-sensitive species) are in good health. The Applicant also notes that at least one area within the project area to the east of SH3 is in high ecological condition and of high ecological value, but this is not acknowledged in the generalisation. The Applicant also recognised in the draft assessment that further field work is needed to determine baseline forest condition (Vegetation report, Section 5.6). Quantitative data on differences in forest health between the eastern and western sides of SH3 has still not been provided.

- The temporal nature of the assessment, given that the health of the forest to the east of SH3, if it is notably degraded, could be rapidly improved within 5-10 years if a pest control plan was implemented. The considerable weight that is applied to differences in forest health, as assessment criteria, is therefore questionable.

- The transfer of survey results (so far focused on forest to the west of SH3) to the relatively unstudied forests to the east of SH3 (e.g. the terrestrial invertebrate and herpetofauna reports are largely based on habitat assessments and or surveys of areas to the west of SH3). Currently, the Applicant argues for both the transferability of ecological knowledge between "similar habitats" to the east and west of SH3, whilst also basing the assessment of ecological effects on the habitats to the east of SH3 being of lower value.

The Applicant acknowledges the need for further surveys to investigate herpetofauna, invertebrates, and bats to the east of SH3, but has nevertheless proceeded with their reporting and assessment of ecological effects. No additional survey data is included in the Application, which is surprising given the additional time that has passed, including suitable survey weather in late 2017. The Applicant also noted that the suitability of proposed mitigation sites needs further investigation (e.g. field surveys to determine extent of land available for swamp forest plantings), and this work has either not yet been undertaken or has not been reported on. As such, the Applicant

should qualify or temper their conclusions, as using the Applicant's own words they are based on "limited information", "extrapolation", "assumptions", and a "level of uncertainty" (Application Technical Report 7d, Section 4.3.2). Firm conclusions regarding the potential effects of the road, and the proposed mitigation, cannot be made until a considerable amount of survey work has been completed. This is likely to require revisions to the existing reporting by the Applicant.

13.3 Lack of consistency within and between the Applicant's specialist reports

As discussed in Section 12 above, there are significant inconsistencies in the reporting provided to date. These need to be addressed by the Applicant to ensure that the ecological values assigned to habitats are accurate as an appraisal of the habitat as a whole (e.g. collectively considering vegetation, flora, and fauna values of each habitat type), and to ensure that the proposed mitigation package is likely to achieve no net loss of biodiversity values.

13.4 Statements not supported by sufficient evidence

Throughout the Application, statements are made that are not supported by the field investigations or relevant existing records or literature. These are particularly problematic where used to support the Applicant's assessment of effects and likely mitigation outcomes. Key examples include:

- Downgrading of values for habitats in the project footprint to the east of SH3 relative to habitats in the existing pest management area to the west of SH3. As this is a key component of the Applicant's assessment of route options and potential adverse effects of road construction, the relative health of the forest tracts should have been supported by field data, e.g. foliar browse index, seedling ratio index.

- Prediction that pest control over a 560 hectare area will result in a 'halo' effect, with species reaching carrying capacity within the pest controlled area, and subsequently dispersing to and increasing populations in adjacent habitats. Pest control is unlikely to benefit bat populations when undertaken at this small scale, and long-tailed bats are known to return to their natal social group to breed.

- The Applicant uses a five metre allowance for edge effects, with no supporting evidence. Furthermore, the Applicant provides evidence that edge effects in forest commonly extend 50-100 metres.

- The Applicant claims that the existing SH3 will pose less of a barrier to fauna such as lizards, when traffic use declines due to the construction of the new road. No evidence is provided to support this statement.

13.5 Likely success of pest management approach

The Applicant places considerable weight on pest management to address the adverse effects of road construction on vegetation and habitats, herpetofauna, lizards, birds, and invertebrates. Whilst it is agreed that pest management could and should form a key part of the mitigation package, the relatively small scale at which it is proposed is not supportable. Furthermore, the statement made in the draft assessment, that the

biodiversity offsetting area "currently receives very limited ecological management" (Technical Application 7h, Section 4.2.2) has been deleted in the Application without explanation. The Application should provide sufficient evidence that areas to be brought under active management as part of the mitigation package are currently unmanaged, to ensure that the gains are real, and would not have occurred if not for the Project.

The area of pest control proposed, calculated using a biodiversity offsetting accounting model, totals 562 hectares (comprising a core area of intensive pest control for 222 hectares and a buffer of 340 hectares). This falls well short of the pest controlled area likely to result in significant positive benefits for bats (3,000 hectares, as discussed in Section 4.3 of this report), and will only likely result in positive effects for birds as the area would effectively be an extension to control occurring to the west of SH3, in the Parininihi block. As discussed in Section 10.8, the Applicant's assertion that the core area can be buffered by open farmland is not correct. The current design of the proposed pest management area will have a core area, within which pest animals could be maintained at low densities, that is significantly smaller than the 222 hectares proposed by the Applicant.

As noted by the Applicant, mice are also likely to be having adverse effects on biodiversity values. If mice are not controlled, their impacts may be accentuated by a combination of stoat and ship rat control, and habitat changes that arise from cattle exclusion, e.g. growth of rank grassland. The extent and type of pest animal control should therefore be designed on the basis of the predator-controlled area requirements of the indigenous species adversely affected by road construction. This will require a significant increase in the area to be controlled, and, preferably, the inclusion of mice as a target species. It is unlikely that any meaningful control of predators will be achieved without incorporating aerial operations, and without increasing the buffer area to include areas of open farmland where these adjoin the core management area.

No post-construction monitoring is proposed for some components of the ecology of the site (e.g. for bats, lizards, invertebrates) on the basis that the relationship between pest control and benefits to indigenous biodiversity is well-proven. Whilst this is correct in a broad sense, outcomes of pest control will be strongly influenced by site specific variables and the methods used, including extent and timing. Given that most of the mitigation package is dependent on the proposed pest control resulting in ecological benefits, post-construction monitoring should be regarded as essential. Post-release monitoring is recommended in the Application for lizards salvaged during construction (Technical Report 7h, Section 3.6.2.1). Monitoring of planting success is not proposed by the Applicant (Section 3.3.3) but should be regarded as essential. The resource consent conditions should list the required monitoring requirements for each part of the mitigation package.

14. REVIEW OF DRAFT DESIGNATION CONDITIONS

14.1 General comments

Until the project footprint has been fully surveyed, and extent of loss of indigenous habitats has been accurately quantified, the designation conditions should not state the extent of mitigation works required. Instead, ratios should be stated, so that final extent of loss can be offset by the appropriate quantum of mitigation. This would also recognise the Application's inherent uncertainty as the extent of planting area available. As a minimum, the consent conditions should stipulate that the project results in no net loss of indigenous vegetation, on an area basis, and that the plantings to replace vegetation loss that are "like for like". The condition should state that all new plantings should be eco-sourced from the North Taranaki Ecological District.

14.2 Designation Condition 24

With regards to the how the ELMP will address ecological values, (a) vegetation/habitat (including wetlands) should specifically also include Threatened, At Risk or Regionally Significant plants, and indigenous invertebrates.

The designation condition refers to "herpetofauna (lizards)", which therefore excludes frogs. All designation conditions regarding herpetofauna should refer to both lizards and frogs.

The designation condition should stipulate that the ELMP will include all of the mitigation measures proposed in the Application (e.g. Section 3.3.2.1).

14.3 Designation Condition 25

The conditions for the ELMP (25a) state that the mitigation shall include the pest management measures referred to in Condition 28, which refers to a core area of 222 hectares and a buffer area of 340 hectares. However, the Applicant's proposed pest control fails to meet their own stated objectives, as discussed in Section 13.5 of this report, and will not provide benefits for all of the target fauna species. The ELMP should include a pest management plan that will achieve measurable biodiversity gains, with the area of this to be determined by the area requirements of the indigenous fauna that will be adversely affected by the route. Any core area of pest control should be buffered on all sides, or the area of core pest control should be increased to achieve the required core area.

The condition for the ELMP (25b) states that restoration planting should include six hectares of swamp forest and nine hectares with an appropriate mix of plant seedlings. The extent of plantings required should be reassessed once the project footprint has been fully surveyed, and the designation conditions should stipulate that all swamp forest plantings are undertaken in areas that are not currently indigenous forest or wetlands.

The condition for the ELMP (25c) states that 200 seedlings are planted of the same species for each significant tree that is felled. The definition of significant tree should be expanded to include other canopy tree species that are to be felled that are

currently omitted by the Application, and the designation condition should require the successful establishment of these plantings. This should be documented by post-planting monitoring.

14.4 Designation Condition 26

Designation Condition 26 lists only three components of the ecological works to be monitored. The list should be expanded to include all of the monitoring proposed in the Application (Technical Report 7h Section 3.3.3), monitoring of salvaged lizards post-release (recommended in the Application Technical Report 7h Section 3.6.2.1), monitoring of stream diversions (recommended in the Application Technical Report 7h Section 3.7.3), and monitoring of avifauna (recommended in the Application Technical Report 7h Section 3.5.3). Post-construction monitoring of bats should also be included as a designation condition, in line with best practice for major roading projects. Post-construction monitoring is recommended by the recently published NZTA Framework document (Smith *et al.* 2017c) in order to determine the effectiveness of mitigation measures, and the Opus (2017) mitigation-focused report for this project suggests that monitoring will take place: *"to determine if the target outcomes [*of predator control*] are being achieved (Section 4.4.2 Page 36)".*

14.5 Designation Condition 27

The draft consent conditions require planting to occur within three planting seasons of completion of works. The designation conditions should be expanded to require maintenance of these plantings until canopy closure with indigenous species has been achieved. Maintenance should be continued until restoration area targets have been met, and until 200 trees for each significant tree felled have successfully established.

14.6 Designation Condition 28

As discussed in Section 14.3 above, the pest management plan should be redesigned once the ecology of the project footprint, and of the proposed pest control area, have been fully surveyed. The Applicant should confirm the suitability of the pest control area to support the flora and fauna adversely affected by the project. To ensure that the objectives of the pest control have been met (e.g. benefits to herpetofauna and invertebrates), the core area of intensive pest control should include all introduced mammals, including mice (refer to Section 10.8 of this report). This will also reduce the possibility of unforeseen and undesirable effects, such as the control of mustelids and rats leading to a proliferation of mice, which then in turn could increase mustelid numbers.

What constitutes "control to low densities" should be defined, and stated in the designation conditions. These can be based on the Residual Trap Catch rates for each target species that are known to lead to measurable benefits for indigenous biodiversity.

15. CONCLUSIONS

In general, relatively few changes were made to the Application based on the review of the draft assessment. The majority of the revisions in the Application, compared to the draft, were with regards to formatting and grammar. None of the substantial issues raised by Wildland Consultants (2017) have been addressed.

By the Applicant's own acknowledgement, reporting to date is indicative only and will be subject to refinement and change pending further site investigations. It appears that this has primarily arisen due to a late change in what was predicted to the preferred route and, as a result, most of the ecological surveys undertaken to date have focussed on habitats beyond the project footprint, to the west. Accordingly, many of the conclusions are based on the transfer of knowledge from ecological surveys to the west of SH3, to the project footprint, with associated assumptions and inferences. The one exception is freshwater ecology, where the report author was able to survey a representative range of aquatic habitats within the confirmed route.

Additionally, some components of the biodiversity of the site (e.g. invertebrates) have not yet been surveyed within the project footprint. The Applicant's assessment of ecological effects should be revised following further surveys of the project footprint. These surveys may then result in changes to the mitigation proposed, to ensure that these actions address the ecological effects of the project.

There are significant inconsistencies in the reporting, both within the individual specialist reports, and between disciplines, and these were also identified in the review of the draft assessment. These inconsistencies have not been addressed in the Application. If there were carefully identified and addressed, it would greatly improve the accuracy and robustness of the Applicant's assessments.

The Applicant also needs to provide supporting data and/or references for many of the statements that support the comments and assessments made. Additional research and/or field investigations by the Applicant may lead to significant changes for both the assessment of ecological effects, the mitigation package proposed, and subsequently, the designation conditions.

The biodiversity offsetting approach used in the Application needs to be revised; the approach is poorly designed, inconsistent with best-practice guidance, and cannot be relied on. An accurate assessment of the existing ecological values within the project footprint, based on site surveys of the project footprint by the relevant specialists, is required. This information should then feed into the design of an environmental management plan that is based on best practice. The methods proposed to achieve desired mitigation outcomes should also be based on current state of knowledge (e.g. extent of pest control required to benefit each target species) to ensure that critical parts of the mitigation proposed will achieve the required outcomes.

As it currently stands, the Application provides little assurance that the project will adequately address the major potential adverse ecological effects of the proposed rerouting of SH3 at Mount Messenger.

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SITE PHOTOGRAPHS

SEPTEMBER 2017

Plate 1: Tawa-kamahi forest with emergent podocarps in the upper Mangapekepeke Stream valley. The rerouting of SH3 to the north of Mount Messenger will pass along the lower slopes of this valley. 19 September 2017.

Plate 2: Northern rata with a fully-foliaged crown on an upper hillslope to the east of the existing route of SH3, Mount Messenger. 19 September 2017.

Plate 3: Southern end of proposed tunnel entrance (nīkau stand, photograph centre) for the proposed rerouting of SH3, Mount Messenger. 19 September 2017.

INVERTEBRATES FROM MOUNT MESSENGER

Based on collections by Tim Martin, 19 September 2017
and identifications by Brian Patrick 21-22 September 2017.

Collembola (springtails)
An unidentified springtail species was common in the leaf litter sample from under tawa forest at the southern end of the proposed route. It appears to be a widespread species characteristic of deep leaf litter. Springtails are an ancient group of insect-like animals with six legs together with a forked spring under their tail. They feed on dead leaves. Most of our 400 species are endemic.

Blattodea (cockroaches)

Blattidae
Platyzostera novaeseelandiae (black cockroach)
The black cockroach was in the leaf litter from under tawa forest at the southern end of the proposed route. This species is distributed from the northern part of the South Island and throughout the North Island and can be locally common in damp areas of mature forest in leaf litter and under bark.

Coleoptera (beetles)

Chrysomelidae
A small unidentified species was present in the samples from the Mount Messenger Saddle. The larvae and adults feed on foliage of various trees and shrubs. Most of New Zealand's 150 species are endemic.

Curculionidae (weevils)
Supplejack appeared to have the damage of the adults of a medium-sized weevil species. The sample was from tawa forest at the southern end of the proposed route. This large family of New Zealand beetles has several thousand species, most of which are endemic.

Diptera (flies)

Tipulidae
An unidentified species was found in the in tawa forest at southern end of proposed route. Over 600 species of this family of flies are found in New Zealand with the majority endemic. The larvae feed in rotting vegetation or logs where they play a key role in decomposition.

Lepidoptera (moths & butterflies)

Nepticulidae
Stigmella hakekeae
Leaf mines of this tiny moth species were found on *Olearia rani* - a new host record (Donner and Wilkinson 1989) - on Mount Messenger Saddle. This moth species has a large

distribution from the Bay of Plenty southwards to Stewart Island in lowland and montane forests.

Gracillariidae

Acrocercops zorionella
Larvae were mining the leaves of *Coprosma robusta* in tawa forest at southern end of proposed route and . This colourful and distinctive species is widespread in New Zealand forests and a specialist leaf miner on larger-leaved *Coprosma* species.

Oecophoridae

Gymnobathra sarcoxantha
Larval cases were found in the leaf litter sample from under tawa forest at the southern end of the proposed route. It is a widespread species of mature forest where its larvae feed on damp leaf litter.

Tortricidae

Philocryptica polypodii
Characteristic larval leaf mines were found on the epiphytic fern *Pyrrosia elaegnifolia* on the Mount Messenger Saddle. It is a distinctive moth found in forests nationwide wherever its larval host plant thrives.
Unidentified species
Leaf-roller damage on *Gaultheria*

Geometridae

Cleora scriptaria
Larval defoliation on *Hedycarya arborea* and *Alseuosmia macrophylla* was evident on the Mount Messenger Saddle. This is a widespread and often common larger moth of forested areas. It is dark-coloured with variable markings. The larvae feed on a wide range of forest tree species.

Declana junctilinea
The foliage of both *Metrosideros fulgens* and *Rubus cissoides* had the distinctive damage of this geometrid moth, which feeds nationwide on a wide range of tree and shrub species. The medium-sized adults are distinctive and colourful in appearance. Here it was found on the Mount Messenger Saddle and in tawa forest on the southern end of the proposed route above swamp forest.

Epiphyrne verriculata (cabbage tree moth)
Larvae of cabbage tree moth on *Cordyline banksia* on Mount Messenger Saddle. It is a well-known and widespread geometrid moth that is a specialist defoliator on all the cabbage tree species.

Ischalis gallaria
Larvae on *Parablechnum novae-zelandiae* on the Mount Messenger Saddle. Although a widespread forest moth species, it is never common.

Pseudocoremia rudisata
Much larval damage to the leaves of *Olearia rani* in tawa forest at southern end of proposed route. It is a widespread and often common moth of forest and shrubland nationwide where its larvae feed on many of the larger-leaved *Olearia* species.

Sarisa muriferata
Characteristic foliage defoliation of the fern *Pyrrosia elaegnifolia* was present on the Mount Messenger Saddle. Like its host plant, this colourful moth is widespread in forested areas and can be locally common.

Xyridacma veronicae
Larval feeding was obvious on the foliage of *Hebe stricta* on the Mount Messenger Saddle. This moth is a specialist foliage feeding moth on many of our *Hebe* species from coastal to low alpine areas nationwide.

Noctuidae

Feredayia graminosa
Characteristic feeding damage of the foliage of *Melicytus ramiflorus* on the Mount Messenger Saddle was found of this attractive green moth. This moth is widespread on this host plant, nationwide.

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