IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a joint Hearing for Resource Consent

Applications by McPherson Resources Ltd

STATEMENT OF EVIDENCE OF Dr. PAUL EDWARD DUTTON

For the Waikato Regional Council

DATED 23 November 2020

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1 Introduction

1.1 My name is Paul Dutton. I am a Terrestrial Ecologist, in the Science section, at the Waikato Regional Council. I have been in this role since October 2016.

1.2 I hold a Bachelor of Conservation and Ecology from Lincoln University, Master of Biology/International Nature Conservation from Georg-August-Universität Göttingen/Lincoln University and a Doctorate in Ecology from the University of Canterbury.

1.3 My evidence is given on behalf of Waikato Regional Council (Science and Strategy Directorate). My role within that Directorate has been as a member of the Geothermal & Air, Land Ecology & Contamination Team which involves mapping ecosystem types, mapping vegetation clearance, providing input into national guidelines for monitoring, working with other regional councils to maintain consistency in application of monitoring methods and to provide technical expertise for consents and incident response.

1.4 I have six years ecological experience in regional/central government, universities, and consultancies. I am part of the Biodiversity Working Group (BDWG) monitoring and prioritisation sub-group. I am also a member of New Zealand Ecological Society and New Zealand Entomological Society. I have also published, and peer reviewed in numerous international journals.

1.5 I confirm that I am familiar with the Code of Conduct for Expert Witnesses as set out in the Environment Court Practice Note 2014. I have read and agree to comply with the Code. Except where I state that I am relying upon the specified evidence or advice of another person, my evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

2 Scope of Evidence

2.1 Waikato Regional Council made submissions to Waikato District Council land use consent LUC0123/19 on 30 June, 2020.

2.2 Waikato Regional Council's submission highlighted two main areas of concern. My evidence focusses on the loss of 2.08 ha of kanuka dominated forest within the SNA and measures to mitigate/offset adverse effects on terrestrial ecology.

2.3 My evidence reinforces the Waikato Regional Council submission and reflects my professional opinions as a Terrestrial Ecologist.

2.4 I have read the relevant sections and appendices of the s42A reports prepared by Waikato District Council and Waikato Regional Council concerning ecology. I have read the Ecological Impact Assessments and Ecological Management Plan prepared by Ecology New Zealand and the Vegetation Assessment prepared by WSP-OPUS.

3 Robust methodology

3.1 Vegetation is incorrectly identified at the most basic level (for example kanuka has been identified as manuka) in the McPherson Quarry vegetation assessment report prepared by WSP-OPUS, 2018. This vegetation referred to as "mature manuka" in the WSP-OPUS, 2018 report has been established for ~70yrs (refer to maps in Appendix 1) and in my opinion is currently VS2.1 - Advanced regenerating podocarp with kanuka. Kanuka can remain a dominant canopy species in an ecosystem for hundreds of years and in this case (due to the proximity of surrounding forest/seed source) it is at a successional stage where podocarps are starting to outcompete the Kanuka. In my opinion, without clearance this is destined to become WF11.2 – Kauri, podocarp, tawa forest.

3.2 As the Ecological Impact Assessment report prepared by Ecology New Zealand, 2018, is *to be read as supplementary information to the McPherson Quarry vegetation assessment report*, this leads me to believe there could be inaccuracies within and inconsistencies among these reports. If this is the case how can any assessment of ecosystem value be produced from inaccurate data?

3.3 The various ecological reports do not provide detailed methodology on survey efforts, and there are inconsistencies among reports, For example:

EcIA- Ecology New Zealand- 2.1.1 *Avifauna – A record of all bird species encountered (heard and/or seen) across the site, and within the immediate vicinity of the site, was documented during each site visit*. I do not consider this a robust method to ascertain avifauna presence – What time of day were the observations undertaken? What was the observation duration? How many observers were there? Were they stationary or mobile observers? What does "immediate vicinity" refer to e.g. 200m buffer? Were five-minute bird counts undertaken in the proposed vegetation clearance sites?

EMP – Ecology New Zealand – 4.1 Pest Animal Control – *No significant signs of pest animals were observed during the site visit*. There was no attempt to provide any methodology in the EcIA- 3.1.4 – Pest Animals. Were pellet counts, spotlight searches, direct observation used? What time of day were the observations undertaken? What was the observation duration? How many observers were there? What was the scale of the search (i.e. ground covered). Has the survey effort been identified and reported anywhere? I am unsure what "*No significant signs*" in relation to pest animals means without provision of any analysis of data collected. In my opinion, a robust method for surveying pest animals/plants is required to produce a baseline whereby the continued monitoring can indicate outcomes of the pest control operations proposed.

The WSP-OPUS vegetation assessment does not provide detailed results on species abundances or assessment methods. It does not provide an independent species list for the proposed clearance sites. Furthermore, threatened species lists have been updated since the WSP-OPUS report and require incorporation into ecological assessments when valuing clearance sites.

Inconsistencies between the EMP (4.1.6. Rabbits pg11) and EcIA (3.1.4. Pest Animals pg15) regarding the observation of rabbits and their presence. The EcIA states "*Pest animals observed onsite included both hedgehogs (Erinaceus europaeus occidentalis) and mice (Mus musculus)*. The EMP states "*Rabbits were observed onsite during surveys*".

EcIA (V4 pg39) and EMP (V2 pg29) – Ecology New Zealand – APPENDIX A – Report limitations, state the following:

ii) The scope and the period of ENZL's services are as described in ENZL's proposal and are subject to restrictions and limitations. ENZL did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Report/Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by ENZL in regards to it.

iii) Conditions may exist which were undetectable given the limited nature of the enquiry ENZL was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been

taken into account in the Report/Document. Accordingly, if information in addition to that contained in this report is sought, additional studies and actions may be required.

3.4 EcIA (V5 pg9) 2.2.2 Waterbody and Wetland Assessment - …*This methodology was used in the absence of any official guidelines for assessing ponds or wetlands in New Zealand*. The National Policy Statement for Freshwater Management (NPS-FM) has been released (3rd September 2020) since this report was produced, which provides guidance on assessing these ecosystems.

3.5 Without robust methodology supporting these reports it is very difficult to draw conclusions from incomplete assessments and the limited nature of the enquiry. For these reasons I find it extremely difficult to assess the adequacy of any ecological mitigation/offset/compensation measures that have been calculated based on the data presented.

4 Mitigation/Offsetting/Compensation

4.1 The revised EcIA (v5 pg26, 4.1.1. Avoidance and Mapping Revisions) has provided some avoidance measures for Stages 1 and 3 of the proposal. However the largest proportion of SNA to be lost and the most ecologically functional/valuable proposed clearance area in Stage 1 of the proposal has not been considered. Other than the above, there has been no demonstration to adhere to the mitigation hierarchy. Offsetting was originally proposed/described in the WSP-OPUS 2018 report, but subsequent reports refer to an environmental compensation package. Compensatory measures do not in my view meet any of the biodiversity offset principles and are very subjective. Biodiversity offsetting is always preferred over environmental compensation, which has the highest risk to biodiversity and the least certainty of outcomes (Maseyk et al 2018).

4.2 I am unsure of the rationale for why a 2:1 compensation ratio been calculated for the proposed northern corridor given that any ratio needs to account for the significant time lag of the new planting having any ecological equivalence with ~70yr old established ecosystem. In my view a ratio of 2:1 (including associated management) is not sufficient to compensate for ecological losses.

4.3 The ecological values of the vegetation proposed to be cleared (i.e. 70yr old, advanced regenerating podocarp with kanuka) and the planted vegetation corridor is not ecologically equivalent (i.e. not like-for-like) and will either never be ecologically equivalent or not be ecologically equivalent for decades. As the planted corridor will

not immediately provide the same ecological functions as that of the proposed cleared established ecosystem (e.g. seed source, food sources, pollination, etc), there needs to be offsetting proposed that incorporates these functions. The compensation package described in the EMP is not appropriate in my view, as it would produce a net loss to biodiversity.

4.4 The ecological functions that the vegetation from the proposed clearance site currently provides (in terms of buffering) to the adjacent WF11.2 forest (kauri, podocarp, tawa forest) has not been appropriately addressed, in my view. If the clearance is approved there will be an edge effect (vegetation and other taxa) on the WF11.2 forest, which also requires offsetting.

4.5 The time lag period between proposed vegetation clearance and establishment of the corridor has not been addressed. This lag period will continue to promote biodiversity net loss, loss of ecological function and loss of ecological value to the site for many years. Relying on passive regeneration from surrounding seed sources to support the planted corridor has many implications that have not been addressed. Bird-dispersed seeds would rely on birds utilising the corridor (something that has not been demonstrated as discussed in section 4.9), furthermore the wind dispersed seed of kanuka may be constrained by lack of appropriate mycorrhizal fungi at the offset site.

4.6 Cumulative impacts of the quarry operation on adjacent indigenous ecosystems have not been assessed or addressed. Soil erosion on the eastern edge of stage one into WF11.2 is expected, as well as edge effects for many taxa. Noise, vibration and air quality effects on the surrounding forest has also not been addressed or how this would impact on the resident taxa.

4.7 The EMP (pg6 para2) notes that "*The linkage will facilitate higher levels of connectivity for local fauna metapopulations*." There has been no demonstration to the understanding of appropriate width of corridor and utilisation by any taxa. These reports do not provide adequate understanding of ecological corridor types, edge effects associated with different taxa, flight initiation distance, zone of influence, etc. There has been no summary as to the advantages and disadvantages of this ecological corridor design on residing taxa in adjacent forest or whether the corridor is designed to transit or inhabit. Is the width of the corridor large enough to facilitate the ecological function it is designed for? What species are expected to use the corridor? Has the effect of disturbance (mining and farming) on transiting/resident taxa been identified?

All of these questions have not been addressed in the ecological reports and therefore I can only assume that they have not followed any robust methodology in the design of the proposed ecological corridor.

5 Indigenous Vegetation Clearance – SNA Context

5.1 The indigenous vegetation clearance proposed in Stage 1 is part of SNA (ID 2030) and was assessed by Kessels Ecology in 2017 and last updated by Tonkin and Taylor in 2018 as triggering criterion 9:

It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because:
- *its structure, composition, and ecological processes are largely intact; and*
- *- if protected from the adverse effects of plant and animal pests and of adjacent land and water use (e.g. stock, discharges, erosion, sediment disturbance), can maintain its **ecological sustainability** over time.*

Due to changes in threat status of many taxa since assessment, Criterion 3 may also be triggered, however as inaccurate data has been provided and robust methods not followed we are unaware if threatened species are present in the proposed clearance site. Criterion 3 states:

It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:
- *classed as threatened or at risk, or*
- *endemic to the Waikato region, or*
- *at the limit of their natural range.*

5.2 The EcIA (v5 pg26 4.1.3. Assessment of Values) also adds to the descriptive fauna value of the proposed vegetation clearance site in Stage 1 by stating: *The kānuka-dominant forest block on the east of the site provided the highest valued habitat for native herpetofauna within areas proposed for impact. This habitat was specifically suitable for arboreal geckos, although none were observed during nocturnal spotlighting efforts. This habitat type also provides high value habitat for native avifauna, specifically because it is part of a large tract of contiguous bush to the east and west*.

5.3 Historical vegetation clearances can be seen in the maps presented in Appendix 1. The first map from 1942-1954 puts the site into context regarding the size of what has now been cleared. By 1988 the ecological connection between the forests had been lost. Between 1988 and 2012 isolated remaining indigenous vegetation patches within the quarry are cleared. Between 2012 and 2017 approximately 2.0 ha on the eastern edge of the quarry was cleared. From 2017 until 2020 Kanuka scrub/forest (0.5ha) and mixed native/exotic shrublands have been cleared in the centre of the quarry along with recontouring of access roading in the east of the quarry causing further losses.

6 Key Steps in Biodiversity offset design (Appendix 5)

6.1 In my view too much uncertainty still exists around delivering sound outcomes for biodiversity. This can be overcome by strict adherence to the key steps and information needs for biodiversity offset design process being applied to the compensation package proposed. Below I go through those key steps and expected outputs and assess the adequacy of the proposed ecological compensation package against them.

6.2 A schedule of biodiversity that may be directly or indirectly affected – the reports (EcIA's, EMP and the Vegetation Assessment) do not completely demonstrate what taxa are currently present on the site that will be affected by the proposed works. These reports indicate the presence of some taxa that have been observed via varying methods. However, in my opinion some of these methods are not scientifically robust and fail to provide a complete ecological baseline dataset to develop and report on outcome monitoring.

6.3 An explanation of how adverse effects are avoided, remedied or mitigated – As indicated in the vegetation assessment report produced by WSP-OPUS: *If the expansion of the quarry precludes avoidance of this vegetation then mitigation will be required to compensate for the loss of the vegetation. This is likely to be most effectively achieved by offset planting of vegetation of a similar character to the vegetation lost.* This demonstrates that the mitigation hierarchy has not been followed as we have gone from avoidance to offset planting. Furthermore, the assigning of ecological value was not assessed, but assumed, by WSP-OPUS, based on none ground-truthed data from the SNA database (which clearly identifies "site visit needed"). SNA's and EcIA do not follow the same set of guidelines and an independent ecological assessment should have been completed.

6.4 An assessment of residual effects against ecological significance criteria to determine the need for offsetting or compensation actions – Residual effects against ecological significance criteria have not been presented in detail, however a summary table has been presented in the WPS-OPUS report. The EIANZ guideline for assessing significance is provided in Appendix 3.

6.5 As stated in the EIANZ guideline, the level of impact management could be - *the Options in the 'High and Moderate adverse' category represent a level of effect that requires careful assessment and analysis of the individual case. Such an effect could be managed through avoidance, design, or extensive offset or compensation actions. Wherever adverse effects cannot be avoided, no net loss of biodiversity values would be appropriate* (EIANZ, 2018). I do not believe that careful assessment and analysis has been presented in the WPS-OPUS report

and in my view the ecological management plan does not provide extensive offset or compensation actions.

6.6 A schedule of biodiversity that could be offset and that which cannot – Not all effects associated with the proposed works have been identified or understood. There is no list presented identifying all effects and what will be avoided, remedied, mitigated, offset or compensated.

6.7 A description of management actions and assurance of outcome – The EMP provides descriptions of proposed management actions but provides no assurances of outcome (see section 7 above). There are also no assurances that compensatory measures meet offset principles (Appendix 4). What was the rationale for a 2:1 ratio offset and how was it calculated?

6.8 No-net-loss calculations and description of offset site – No evidence has been presented to confirm that there will not be no-net-loss of biodiversity values. No calculations of biodiversity offset gains have been measured using robust methodology. An offset location and management actions have been proposed based on connecting larger forest fragments which is a good step, however the design of these actions are not based on any robust data and/or not supported by any literature.

6.9 Ecological Enhancement and Monitoring Plan – An Ecological Management Plan has been developed based on poorly designed (non-replicable) methods, producing data that may not provide accurate representation of taxa present on site. As this may be the case, how can an offset be proposed?

In my view this is a critical aspect of ensuring that the proposed ecological compensation actions actually deliver the ecological outcomes on the ground. To this end I support the proposed condition 39 of the WRC S42A Report (subject to amendments below) and am unsure as to why the applicant has suggested that this condition be removed.

6.10 Compliance monitoring report/Adaptive management plan – The EMP - Appendix B provides some evidence on reporting for annual revegetation monitoring and pest control (for the purpose of planting success). This however provides no indication or reporting framework for outcome monitoring or compliance monitoring. An adaptive management plan should be required that will ensure management actions actually achieve the ecological outcomes sought. There is potential for proposed condition 40 of the WRC S42A report to address these key matters, alternatively an additional consent condition should be developed which

provides for ecological outcome compliance monitoring reporting and adaptive management plans.

7 Consent conditions

7.1 In addition to stricter adherence to the biodiversity offset principles and key steps for offset design outlined above, to ensure certainty of outcome for biodiversity additional and amended consent conditions are required to ensure no net loss of biodiversity occurs.

7.2 Proposed condition 24 (WDC S42A report Appendix L) *Within two months of the commencement of this consent, the consent holder shall submit an EMMP*…..All management plans should be submitted prior to any vegetation clearance, to provide a baseline of biodiversity value of the impact site that needs to be offset as part of the proposed ecological corridor package.

7.3 I have already outlined above that proposed conditions 39 & 40 (WRC S42A report) are critical to ensure actions result in ecological outcomes on the ground. However, they need to be amended as follows:

39. The Consent Holder shall provide a Habitat Monitoring Plan to determine if physical habitat values that develop in new or restored channels, wetland and mitigation areas are ~~similar~~ equal in ecological value and diversity or better than those present in the original channel or SNA impact site including:

a) Methods for pre and post works monitoring of aquatic stream habitat for a minimum of 3 years;

b) Identification of suitable sampling sites and sampling regimes.

c) Matauranga Maori Monitoring

d) Methods for pre and post works monitoring of ecological corridor terrestrial habitat continue until ecological equivalence is determined by WRC ecologists. Key ecological outcomes to be delivered would include, but not be limited to: fauna and flora abundances and diversity, establishment of key ecological functions such as pollination, seed dispersal, natural regeneration/emergence of understory species, etc.

40. Each year for the life of the consent ~~a minimum of five years, and every fifth year thereafter after the consent is granted~~ the consent holder shall prepare an Ecological Mitigation Monitoring Report which outlines the details of any ecological mitigation and associated monitoring works required under the EMMP which have been undertaken within the preceding 12 month period. The plan shall include, but will not be limited to, the following items:

a) Details of any planting or plant maintenance works including the outcomes of any maintenance inspections of established plantings;

b) Details and outcomes of any terrestrial and aquatic monitoring;

c) Details and outcomes of any plant or animal pest control works including any follow up monitoring of pest

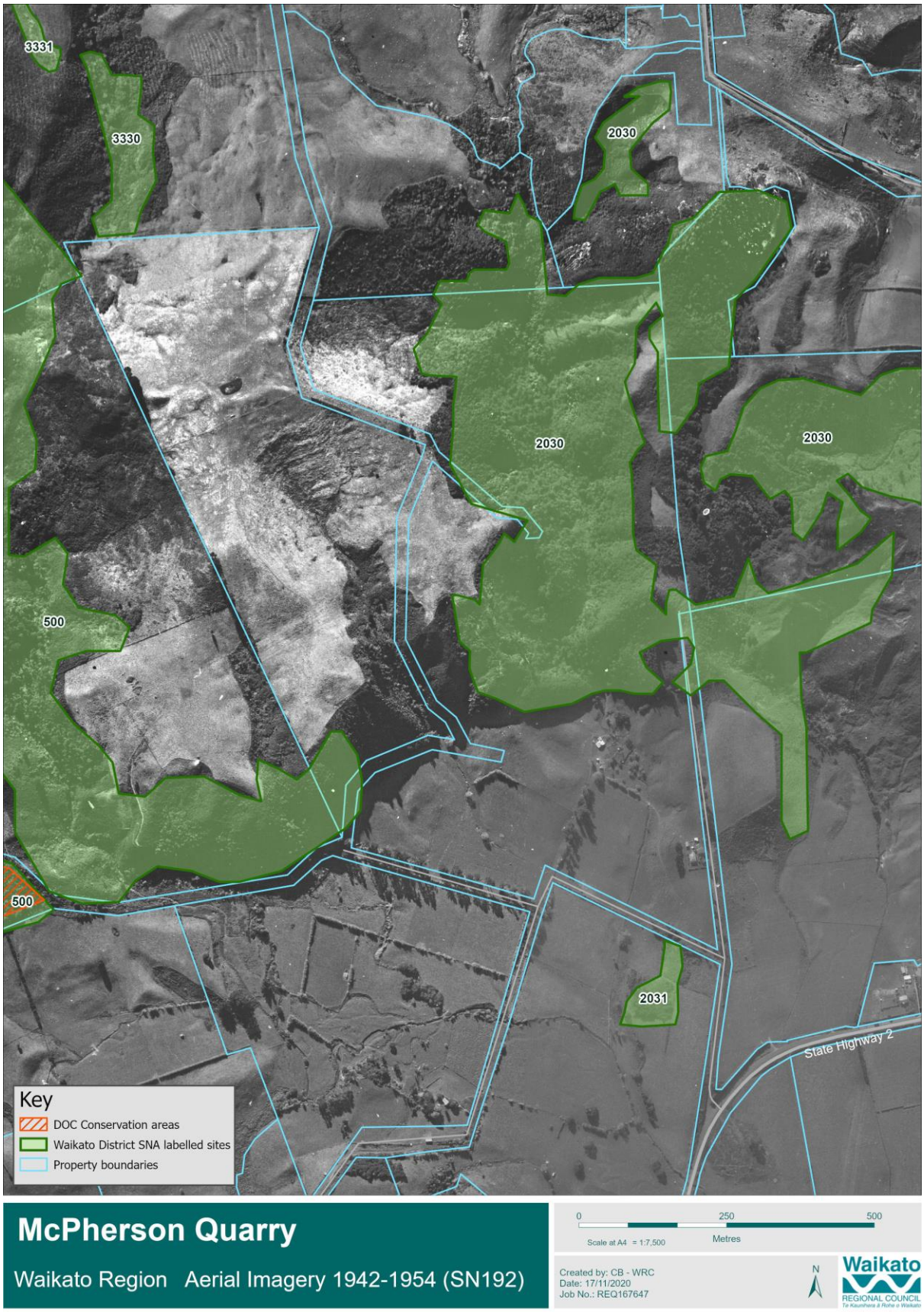
The monitoring report shall be forwarded to the Resource Use Directorate of WRC by 31 July each year. ~~for the first 5 years and by the same date every fifth year thereafter.~~

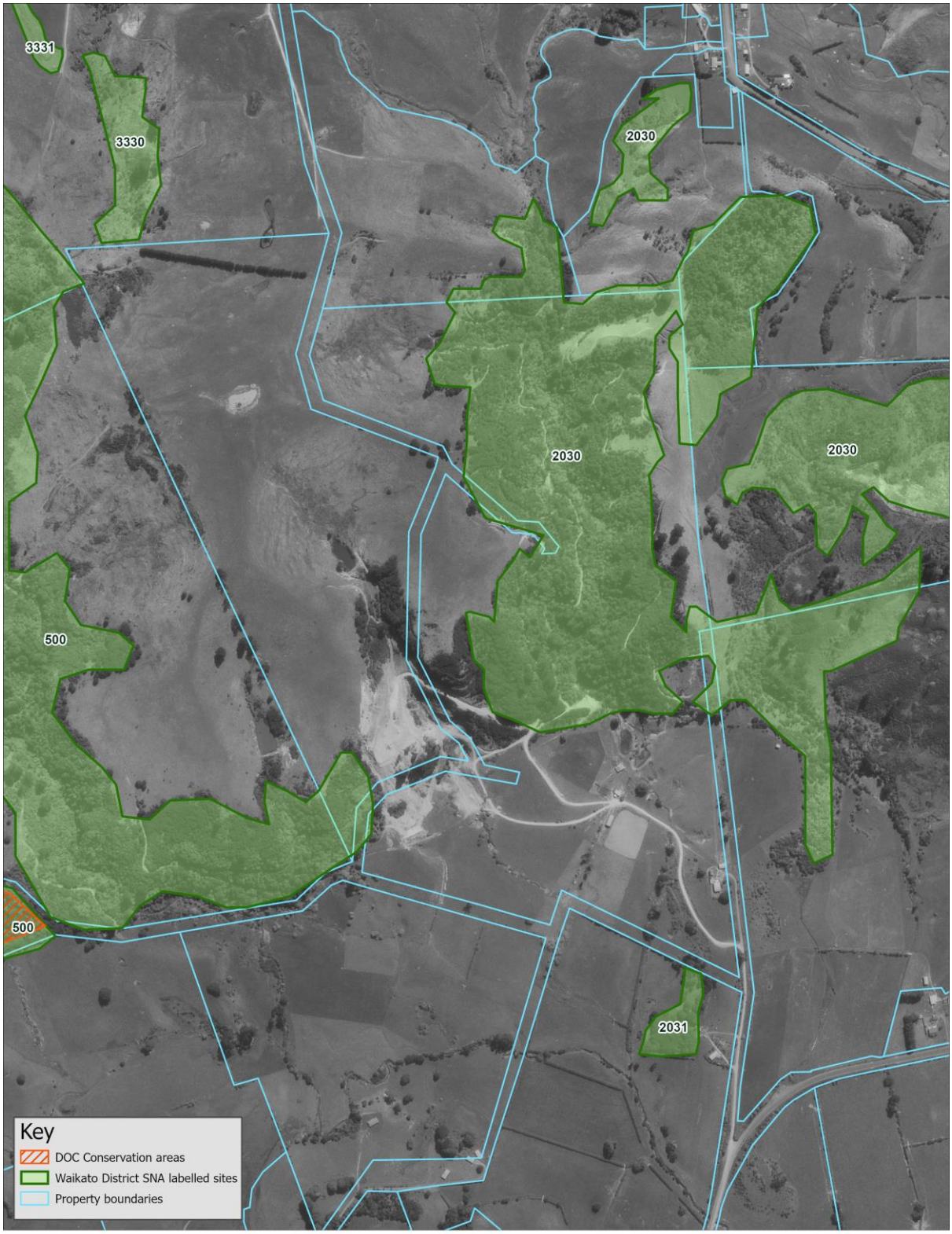
7.4 I also recommend that a new condition be added to provide a compliance monitoring report and an adaptive management plan.

8. Conclusion

8.1 In my view there is too much uncertainty around the proposed compensatory measures and whether the actions will actually achieve outcomes for biodiversity as suggested. Strict adherence to the biodiversity offset guidelines, principles and offset design steps will improve robustness, repeatability, and transparency. The imposition of consent conditions requiring an ecological enhancement and monitoring plan and a compliance monitoring plan and adaptive management plan will provide consistency with the biodiversity offset framework and increase certainty of biodiversity outcome.

APPENDIX 1 – McPherson Quarry maps with varying aerial imagery dates.





McPherson Quarry

Waikato Region Aerial Imagery 1988 (SN8772)

0 250 500

Scale at A4 = 1:7,500 Metres

Created by: CB - WRC
Date: 17/11/2020
Job No.: REQ167647

N

Waikato Regional Council

McPherson Quarry

Waikato Region Aerial Imagery WRAPS 2012

0 250 500

Scale at A4 = 1:7,500 Metres

Created by: CB - WRC
Date: 17/11/2020
Job No.: REQ167647

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Waikato Regional Council

McPherson Quarry

Waikato Region Aerial Imagery WRAPS 2017

0 250 500

Scale at A4 = 1:7,500 Metres

Created by: CB - WRC
Date: 17/11/2020
Job No.: REQ167647

N

Waikato Regional Council
Te Kaunihera ā Rohe o Waikato

McPherson Quarry - Current Vegetation

Source: Biodiversity Inventory project WRC.

Waikato Region Aerial Imagery WRAPS 2017

0 250 500

Scale at A4 = 1:7,500 Metres

Created by: CB - WRC
Date: 17/11/2020
Job No.: REQ167647

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Waikato Regional Council

McPherson Quarry 1988 1:2,000

McPherson Quarry 2012 1:2,000

McPherson Quarry 2017 1:2,000

McPherson Quarry 2020 – Google earth

McPherson Quarry 2020 – Google earth expanded view

APPENDIX 2. Significant Natural Area attributes associated with SNA ID 2030

Field	Value
AREA_HA	47.9841
ASSESSMENT_NOTES	<null>
BOUNDARY_SOURCE	<null>
CONFIDENCE_LEVEL	Medium
CRITERION_1	no
CRITERION_10	no
CRITERION_11	no
CRITERION_2	no
CRITERION_3	no
CRITERION_4	no
CRITERION_5	no
CRITERION_6	no
CRITERION_7	no
CRITERION_8	no
CRITERION_9	yes
DEVELOPMENT_ISSUE	Yes
DEVELOPMENT_ISSUE_JST	Mostly surrounded by farmland, quarry on southern boundary
ECOSYSTEM_TYPE	Terrestrial
FIELD_RECORD	Site visit needed
FIELD_RECORD_JST	<null>
GEOMETRY	Polygon
GEOMETRY.STArea()	479840.580078
GEOMETRY.STLength()	9050.647358
ID	28
ISSUE_JUSTIFICATION	Possums/Rats; Tree privet, wattle (Google Street View); Long boundaries in pasture, fencing status unknown for most of it; Mostly surrounded by farmland, quarry on southern boundary;
LAST_EDIT_DATE	18/06/2018
LAST_EDITED_BY	Tonkin and Taylor
LIKELY_FAUNA	<null>
LIKELY_FLORA	<null>
OTHER_FEATURES	<null>
OTHER_ISSUE	No
OTHER_ISSUE_JST	<null>
PEST_ANIMAL_ISSUE	Likely
PEST_ANIMAL_ISSUE_JST	Possums/Rats
PEST_PLANT_ISSUE	Yes
PEST_PLANT_ISSUE_JST	Tree privet, wattle (Google Street View). Gorse
PREVIOUS_KES_NUMBER	<null>
REFERENCES_1	Google Earth, Google Street View
SIGNIFICANCE	Local
SIGNIFICANCE_JUSTIFICATION	The blocks are probably large enough to be self-sustaining, are showing signs of regeneration, and have good seed sources close by. Some boundaries are fenced
SIGNIFICANT_FAUNA	<null>
SIGNIFICANT_FLORA	<null>
SITE_DESCRIPTION	This is a group of moderate-sized second growth remnants in the Bombay Hills south-west of the Hunua ranges. The bulk of the vegetation is kanuka with treeferns in the gullies, but there are patches of more mature forest, probably podocarps and mixed broadl
SITE_NAME	<null>
SITE_NUMBER	2030
STOCK_ISSUE	Likely
STOCK_ISSUE_JST	Long boundaries in pasture. At least partially ringfenced. Some parts are council covenanted

APPENDIX 3: EIANZ guidelines:

Table 4 sets out the matters and attributes based on those described by O'Connor et al. (1990). These attributes are broadly consistent with the majority of significance criteria used by councils, but extend to cover matters not normally considered when just assessing 6(c) significance. In particular, ecological condition /quality are important in ecological impact assessment since they contribute to the way in which an activity might affect a feature. These other attributes include consideration of matters specified in Schedule 4, and a site's intrinsic values (RMA part 2 Section 7(d)). Once each ecological feature (vegetation type, habitat and/or ecosystem) has been identified for assessment, a value is assigned for each of the four matters through considering the relevant attributes. In the simplest form, the values could be high, moderate, low, or very low; in more complex projects a 5 or 6-point scale may be developed.

Table 4 Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community.

Matters	Attributes to be considered
Representativeness	Criteria for representative vegetation and aquatic habitats: • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified Criteria for representative species and species assemblages: • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type
Rarity/distinctiveness	Criteria for rare/distinctive vegetation and habitats: • Naturally uncommon, or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features • National priority for protection Criteria for rare/distinctive species or species assemblages: • Habitat supporting nationally Threatened or At Risk species, or locally[19] uncommon species • Regional or national distribution limits of species or communities • Unusual species or assemblages • Endemism
Diversity and Pattern	• Level of natural diversity, abundance and distribution • Biodiversity reflecting underlying diversity • Biogeographical considerations – pattern, complexity • Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation
Ecological context	• Site history, and local environmental conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from "intrinsic value" as defined in RMA) • Size, shape and buffering • Condition and sensitivity to change • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material • Species role in ecosystem functioning – high level, key species identification, habitat as proxy

Appendix 4 Offsetting Principles: Guidance on biodiversity offsetting in New Zealand

2.2 Principles

Ten principles of biodiversity offsetting have been developed collaboratively by the Advisory Group members of the BBOP (external site). These principles, presented below as described by the BBOP and explained further in this Guidance, essentially define and underpin the concept of biodiversity offsetting in a global context and form the foundation of this New Zealand-specific Guidance.

The BBOP has also developed a Biodiversity Offsetting Standard (external site) which sets out how each of these principals should be met. A major failure in meeting any of the principles would mean that a development project would not be considered by the BBOP or this Guidance to be a biodiversity offset (even though the project may still meet statutory tests in New Zealand).

This Guidance document essentially provides a New Zealand context to the BBOP Standard. As such, while it may be challenging for a project to be consistent with all the aspects of good practice described herein, major deviations may indicate that a BBOP principle has not been met.

1. **Adherence to the mitigation hierarchy:** A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate avoidance, minimisation and on-site rehabilitation measures have been taken according to the mitigation hierarchy.

2. **Limits to what can be offset:** There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected.

3. **Landscape context:** A biodiversity offset should be designed and implemented in a landscape context to achieve the expected measurable conservation outcomes, taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.

4. **No net loss:** A biodiversity offset should be designed and implemented to achieve *in situ*, measurable conservation outcomes that can reasonably be expected to result in no net loss and, preferably, a net gain of biodiversity.

5. **Additional conservation outcomes:** A biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity to other locations.

6. **Stakeholder participation:** In areas affected by the project and by the biodiversity offset, the effective participation of stakeholders should be ensured in decision-making about biodiversity offsets, including their evaluation, selection, design, implementation and monitoring.

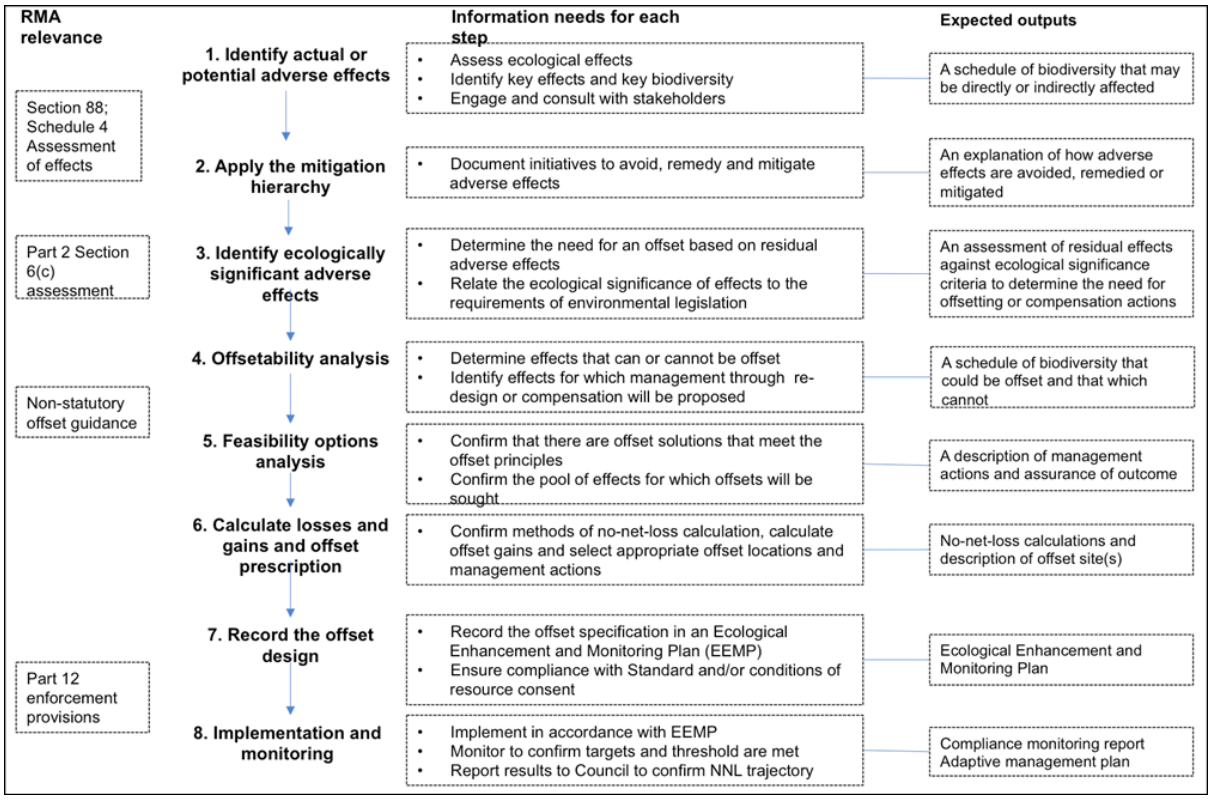
7. **Equity:** A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both internationally and nationally recognised rights of indigenous peoples and local communities.

8. **Long-term outcomes:** The design and implementation of a biodiversity offset should be based on an adaptive management approach, incorporating monitoring and evaluation, with the objective of securing outcomes that last at least as long as the project's impacts and, preferably, in perpetuity.

9. **Transparency:** The design and implementation of a biodiversity offset, and communication of its results to the public, should be undertaken in a transparent and timely manner.

10. **Science and traditional knowledge:** The design and implementation of a biodiversity offset should be a documented process informed by sound science, including an appropriate consideration of traditional knowledge.

Appendix 5:



Key steps and information needs as part of the offset design process. These steps will likely be iterative, particularly where the project footprint is redefined in response to ecological risks or ongoing stakeholder engagement (Maseyk *et al*, 2017: 29).