BEFORE INDEPENDENT HEARING COMMISSIONERS
APPOINTED BY THE HAMILTON CITY COUNCIL

IN THE MATTER	of the Resource Management Act 1991 (**Act**)
AND	
IN THE MATTER	of an application for subdivision and land use consent for the Amberfield development pursuant to the Act.
APPLICANT	Weston Lea Limited
CONSENT AUTHORITY	Hamilton City Council

EVIDENCE-IN-REPLY OF STUART PARSONS FOR WESTON LEA LIMITED

Dated: 12 May 2019

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SUMMARY OF EVIDENCE

1. My name is Stuart Parsons. My qualifications and experience are set out in my evidence in chief (12 April 2019). I summarise my evidence, according to the key headings in this statement, as follows:

Incident and Ambient Lighting Effects

a. Incident and ambient lighting may have a negative effect on bat use of the development site. I recommend that light levels be monitored, and adaptive management implemented if levels exceed a predetermined threshold in sensitive sites (0.5 lux is recommended).

Provision of High-Quality Native Forest

b. Long-tailed bats are flexible in their use of forest type for roosting, commuting and foraging. There is also a requirement for fast-growing vegetation to provide suitable habitat and buffering in a timely way. The current planting plan takes these factors into account.

Utilisation of Amberfield Site by Bats

c. Data presented by the applicant provides a detailed picture of bat use of the development site. This data has allowed relevant experts to draw conclusions on the significance of the site and the effects of the development should they remain unmitigated.

d. Data presented by the applicant agrees with published accounts of long-tailed bat behaviour and ecology.

e. I caution the use of broad home ranges for the interpretation of habitat use by long-tailed bats at the development site and more broadly across the Hamilton region. Data on core areas combined with acoustic surveys provide a more refined picture of how the bats are using the landscape.

The Importance of Loss of Pasture Habitat

f. Pasture is not an important habitat type for long-tailed bats.

Use of Urban Landscapes by Bats

g. While published evidence exists of some negative impacts of urbanisation on long-tailed bats, this species also demonstrates a level of flexibility in its ability to exploit this highly modified environment.

h. Results from several studies in Hamilton have shown bats commuting, roosting and foraging within the urban matrix. The bats are also not restricted to the gullies and Waikato River corridor.

Adaptive Management

i. Data available supports the use of adaptive management for bats at the development site. Further baseline surveys within the Amberfield site footprint, and key reference sites, will be designed and implemented as outlined under Annexure “C”. These surveys will form the basis for defining appropriate thresholds for triggering adaptive management measures.

INTRODUCTION

2. My name is Stuart Parsons. My qualifications, experience and involvement in the project are outlined in my evidence-in-chief dated 12 April 2019.

3. In this statement of evidence-in-reply (**EIR**), I respond to issues raised in the evidence of Moira Pryde, Kerry Borkin, Andrea Graves and Rebecca Stirnemann with respect to:

   a. Incident and ambient lighting effects;

   b. The provision of high-quality native forest;

   c. Utilisation of the Amberfield site by bats;

   d. The importance of loss of pasture habitat;

   e. Use of urban landscapes by bats;

   f. Adaptive Management.

INCIDENT AND AMBIENT LIGHTING EFFECTS

4. In her evidence, Ms Pryde states that light emitted by road and path lighting may have a significant negative impact on the use of the Amberfield site by long-tailed bats (paragraphs 2.7, 7.1, 7.2d and e, and 7.11 – 7.13). This opinion is reiterated in the evidence of Dr Borkin (paragraphs 66-73) who also makes several recommendations for mitigating these impacts (paragraphs 65 and 72).

5. I agree with their assessment of potential effects, but point out that these affects have been mitigated. All but one of Dr Borkin's recommendations ("*Turning off lights when the area is not in use*") have been proposed by the applicants (see Annexure "A") and will result in no light spill beyond approximately 12m.

6. Dr Borkin also notes (paragraph 66) the potential impact of a "likely total increase in light, including by individual home owners, against which to determine the likelihood of mitigation being successful" and suggests that ambient levels be maintained below 0.1 lux.

7. I agree with Dr Borkin regarding the potential effects on long-tailed bats of an increase in the total amount of incident and ambient night-time light emitted by the development, but disagree with her recommendation that levels be kept below 0.1 lux.

8. In her evidence, Ms Cummings recommends that average light levels adjacent to key features not exceed 0.5 lux as a potential trigger for adaptive management (when used in combination with acoustic monitoring that demonstrates a significant decrease in bat activity). She justifies this using local studies within the Hamilton area that focus specifically on long-tailed bats. I agree with Ms Cummings' assessment of light and changes in bat activity as a trigger for adaptive management, and the selection of 0.5 lux on the basis that it is location and species specific.

9. I agree with the recommendation of Dr Borkin and Ms Pryde that incident and ambient night-time light levels be monitored in sensitive parts of the site and surrounds, and used to trigger adaptive management.

10. I understand that constraints associated with infrastructure upgrades necessitate staging of development from North to South. However, the Applicant's team of ecologists and engineers have collaboratively reviewed the staging, and have proposed an alternative staging arrangement in the northern half of the site. An outline of the indicative staging plan and associated timing is attached to my EIR (see Annexure "B").

11. Development of lots on the western side of the development first will allow incident and ambient light levels associated with initial development stages to be monitored prior to development proceeding in parts of the site that are close to sensitive habitats. Roads and streetlights adjacent to these areas will be installed in advance of housing construction, enabling street lighting arrays to be tested and modified to conform to specified light levels.

12. The indicative construction timeframe (Annexure "B") provides an interval to monitor and review our impact assessment and adapt mitigation measures as necessary, prior to impact on key bat habitat. Annexure "C" attached to my EIR outlines proposed monitoring parameters, reference sites, baselines, and opportunities for adaptive management to ensure mitigation measures are effective.

13. It is my opinion that ambient night-time light levels should not exceed 0.5 lux within the buffered corridors provided for bats. Should 0.5 lux be exceeded, adaptive management measures should be implemented. As outlined in Annexure "C", options include modification of the street lighting array, modification to residential berm planting to provide additional screening, modifications to buffer planting (such as infilling with large specimens) and installation of artificial light buffers.

14. If artificial light buffers are required, ambient night-time light levels should be monitored in the lee of the buffers after installation to ensure they maintain light levels below the 0.5 lux threshold. These artificial light buffers should remain in place until vegetation is sufficiently tall and dense to maintain light levels below the 0.5 lux threshold.

PROVISION OF HIGH-QUALITY NATIVE FOREST

15. Dr Stirnemann and Ms Graves have discussed that restoration planting at the development site should seek to replicate the forest present, and its structure, at Hammond Bush.

16. I disagree with these statements, and agree with the opinions of Ms Cummings as stated in her memo "Points of agreement and disagreement in evidence provided by RESI" (see Annexure "D").

17. Many submitters have pointed out the need for provision of vegetation buffers in a timely way, and this has been a focus of the Applicant's mitigation package. The forest type present at Hammond Bush is a native remnant and would take 50-100 years (at least) to replicate.

18. The vegetation plan also seeks to establish a number of edge habitats through alternate planting of low and tall stature trees.

19. Long-tailed bats also demonstrate considerable flexibility in the forest types they exploit, for roosting, foraging and commuting. Results from the AECOM radio-tracking study and extensive acoustic surveys across the Auckland region clearly show the bats use a mosaic of habitat types, not just native remnant forest (see Annexure "E" and Ms Cummings memorandum).

20. Roost sites located by Dekrout[1] and AECOM[2] also show long-tailed bats roosting in native and non-native trees, as well as artificial roost boxes in Sandford Park (see Annexure "E").

UTILISATION OF AMBERFIELD SITE BY BATS

21. I disagree with the statements of Ms Pryde (paragraph 6.2) and Dr Stirnemann (paragraph 12) that data available on bats' use of the development site are insufficient for identifying patterns of use and key habitats. Indeed, the quality and quantity of data available on bats for the Amberfield development prior to the hearing is the strongest I have seen as a consultant.

22. The two rounds of acoustic surveys covered habitat types within the development site, and targeted habitat known to be favoured by long-tailed bats. The techniques (including the timing of the surveys) used are industry standards. In my opinion, the data was collated and presented appropriately.

23. The outcomes of these two acoustic surveys demonstrated the hierarchy of habitat selection by the bats and clearly identified key areas for bats. The data was sufficient for experts to assess the significance of the site for bats.

24. The data collected also agrees with other acoustic surveys carried out in the Hamilton[1] area and across New Zealand[3] (considering differences in habitat). The surveys demonstrated the importance of the riparian strip (including the north-east terrace) as well as vegetation edges, including the east-west shelterbelt. It showed that pasture areas have low levels of bat activity compared with other habitat types (and Dekrout demonstrated that long-tailed bats statistically avoid this habitat type – see section below *"The Importance of Loss of Pasture Habitat"*). Finally, the surveys demonstrated areas where bats were attempting to feed.

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1 Dekrout, A. (2009). Monitoring New Zealand long-tailed bats (*Chalinolobus tuberculatus*) in urban habitats: ecology, physiology and genetics. PhD thesis, University of Auckland.

2 Davidson-Watts Ecology (Pacific) Ltd. (2018). Long-tailed bat trapping and radio tracking baseline report: Southern Links, Hamilton. Prepared for AECOM.

3 O'Donnell, C.F.J, Christie, J.E., Simpson, W. (2006). Habitat use and nocturnal activity of lesser short-tailed bats (*Mystacina tuberculata*) in comparison with long-tailed bats (*Chalinolobus tuberculatus*) in temperate rainforest, New Zealand Journal of Zoology, 33:2, 113-124.

25. The provision of radio-tracking data has further strengthened knowledge of bat ecology and behaviour within the development footprint and wider landscape.

26. Home ranges (often represented as minimum convex polygons - MCP) are calculated by connecting (using lines) the outermost radio-telemetry fixes for an individual. Because bats tend to favour specific habitats within the broader home range, the area within the MCP often misrepresents the actual habitat used by a bat. This is clearly demonstrated by comparing core areas (those most often used by the bats) with the broader home range.

27. Large areas within the home range of a bat may never actually be used by the bat. Thus, the inclusion of the development site within the home ranges of bats has little meaning.

28. Radio-telemetry fixes and core areas are a far better representation of where the bats are actually found. This data shows that the majority of the Amberfield site was not used by any radio-tracked bats. These are a far more accurate measure of the use of the site than the much broader home-ranges.

29. Only two male bats had core areas encompassing any part of the development site, and one male was found to be roosting on site. The core areas were both in the north-east terrace, adjacent to Hammond Bush.

30. Importantly, the radio-tracking study found no evidence of female bats roosting on site – an indicator of the potential for maternity (breeding) roosts to be present.

31. In my opinion, the loss of a roost occupied by a male is not important for the maintenance of the existing population. Male long-tailed bats appear to be less selective of their roosts than females. Borkin and Parsons (2011)[4] state that "*Males may be less selective with their roost locations than females, as*

[4] Borkin, K., Parsons, S. (2011). Sex-specific roost selection by bats in clearfell harvested plantation forest: improved knowledge advises management. ACTA Chiroperologica, 13(2): 373-383.

they roosted further from water sources. This could allow persistence of male bats in marginal habitat."

32. The use of roosts in urban environments is very episodic, especially for solitary males. The use of roost removal protocols as recommended by the applicant will ensure that no potential roosts are occupied when removed.

33. As stated by Dr Stirnemann when presenting her evidence, radio-telemetry is a poor tool for determining movement patterns of bats. However, when combined with acoustic monitoring it does allow for such patterns to be inferred.

34. In my opinion, the acoustic data and radio-telemetry data, combined with the proposed tree-felling protocol, mean that the risk of damaging actual maternity roosts has been appropriately assessed and minimised. The provision of artificial roosts further mitigates the loss of potential roost trees.

THE IMPORTANCE OF LOSS OF PASTURE HABITAT

35. Dr Stirnemann states that *"Pasture is a productive area for insects (e.g. Smith et al. 2002, Collier et al. 1997). This productive area will be lost as feeding habitat as soon as development begins."* (paragraph 12). I disagree with Dr Stirnemann's assessment that pasture is valuable feeding habitat for long-tailed bats.

36. Studies of long-tailed bats in Hamilton and other parts of New Zealand clearly show that they (statistically) avoid open areas, specifically pasture. Andrea Dekrout[1] showed that the bats' core areas are statistically over-represented (preferred) in gullies and along the river, but underrepresented (avoided) in pasture (see Annexure F). Richard Griffiths[5] also showed that 5 female bats radio-tracked in South Canterbury avoided farmland. Studies of long-tailed bats in pine forest (and surrounding habitats) also showed that

[5] Griffiths, R.W. (2007). Activity patterns of long-tailed bats (*Chalinolobus tuberculatus*) in a rural landscape, South Canterbury, New Zealand, New Zealand Journal of Zoology, 34:3, 247-258,

bat activity (through acoustic monitoring) was lowest in pasture[6]. This pattern of acoustic activity is mirrored in the development site.

37. Many species of bat, including long-tailed bats[7], are thought to prefer vegetation edges due to the high-density of insects present[8]. The edges also buffer the bats from wind and provide cover from predators. Gullies provide similar opportunities and protections for bats while riparian edges provide the additional advantage of prey in the form of emergent insects. The mitigation offered by the applicant includes the creation of multiple edge habitats (e.g. multiple internal and external edges along the north-east terrace) and restoration of the southern gully.

USE OF URBAN LANDSCAPES BY LONG-TAILED BATS

38. I disagree with Dr Borkin's statement that *"Little bat activity appears to occur within parts of Hamilton which are highly urbanised .."* (paragraph 39), and Ms Pryde's statement (paragraph 7.12) that *"The Hamilton bat studies, highlighted a negative relationship between increasing artificial light intensity, roading and housing density and long-tailed bat activity"*.

39. While I agree that some studies have shown that aspects of urbanisation negatively impact long-tailed bat activity, within the Hamilton region bats have also been shown to use areas with high housing density and areas immediately adjacent to urban areas.

40. Nine core areas (determined by radio-tracking) used by long-tailed bats contain highly urbanised areas, including dense housing[9]. As stated above, cores represent areas where the bats spend the majority of their time. This agrees with the work of Dekrout[1] who showed that Housing Density and Streetlight Density were not significant habitat features for predicting bat acoustic activity.

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6 Borkin, K. (2010). Ecology of New Zealand's Long-tailed bat (*Chalinolobus tuberculatus*) in exotic plantation forest. PhD Thesis, University of Auckland.

7 Borkin, K., and Parsons, S. (2011). Home range and habitat selection by a threatened bat in exotic plantation forest. Forest Ecology and Management, 262: 845-852.

8 Chen, J., Franklin, J.F., Spies, T.A., 1995. Growing-season microclimatic gradients from clearcut edges into old-growth douglas-fir forests. Ecological Applications, 5: 74-86

9 Davidson-Watts Ecology (Pacific) Ltd. (2018). Long-tailed bat trapping and radio tracking baseline report: Southern Links, Hamilton. Prepared for AECOM.

41. Ms Pryde's statement above is incorrect, due to its broad nature. As stated above, Dekrout[1] found no negative influence of Housing or Streetlight Density. However, a later study[10], which was restricted to river / riparian areas, did find a negative relationship. Effectively, this later study showed a correlation between the number of bat passes (detected using acoustic monitors) with increases in streetlight and housing density. At present, the cause of this different pattern is unknown.

42. Results from the AECOM radio-tracking study[7] also show the importance of a number of urban parks within southern Hamilton. These include Te Anau, Fitzroy and Sandford Parks (see Annexure "G"). Within Sandford Park, two maternity colonies occupy artificial roost boxes. Although all three parks are connected with the Mangakotukutuku Gully, all are also surrounded by urban development. Nearby to Sandford Park bats have been observed flying close to housing, outside of the nearby incised Mangakotukutuku Gully (see photo P6 in Annexure "E").

43. Although several studies have shown that long-tailed bats associate closely with gullies and the Waikato River, data also clearly shows they use other aspects of the landscape for commuting and feeding. Data presented by the applicant clearly shows the Amberfield site being used as an important movement corridor (between the river and likely the Mangakotukutuku Gully).

44. Thus, published evidence and reports suggest that long-tailed bats are able to tolerate some level of urbanisation, including while roosting, and moving through the landscape using features other than the Waikato River and gully systems.

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10 Dekrout, A.S., Clarkson, B.D., Parsons, S. (2014). Temporal and spatial distribution and habitat associations of an urban population of New Zealand long-tailed bats (*Chalinolobus tuberculatus)* New Zealand Journal of Ecology 41: 285-295.

ADAPTIVE MANAGEMENT

45. Adaptive management comprises four stages:

    a. establishment of a robust baseline;

    b. defining thresholds;

    c. monitoring the effects; and

    d. remedying effects before they become irreversible.

46. An outline of the proposed adaptive management initiatives are attached in Annexure “C”. A detailed adaptive management plan will include guidelines for implementation of these measures should monitoring detect exceedances of specific thresholds, or a statistically significant relationship between measured parameters and decreased bat activity in sensitive areas.

47. As I have previously explained, existing baseline data available is of high quality, and, in my opinion, supports the use of adaptive management as an appropriate means of addressing effects of the proposed development on bats. Specifically, I consider that existing data on bat activity within the site and wider landscape demonstrates:

    a. the extent and gravity of immediate risk to bats from initial stages of the development is low;

    b. the proposed development offers likely benefits to the local bat population from long term habitat protection and enhancement;

    c. the areas of uncertainty around effects of development primarily relate to lighting effects, and are specific and manageable; and

    d. specified adaptive management measures are available to directly address risks associated with light spill that are the primary source of uncertainty.

48. The baseline information required to judge the appropriateness of an adaptive management as a strategy is different to the baseline monitoring

data required for the proposed monitoring programme. As per condition 95 of Mr Serjeant's EIR, further baseline surveys within the footprint and key reference sites will be designed and implemented as outlined under Annexure "C". These will form the basis for defining appropriate thresholds for triggering adaptive management measures.

Dated 12 May 2019

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Stuart Parsons

ANNEXURES TO STUART PARSONS EVIDENCE IN REPLY

12 MAY, 2019

Annexure "A"

Summary of bat mitigation strategies

See diagram "A17134_087_Bat_Mitigation_Strategies".

KEY

1. *Riparian Vegetation (to be Retained)*

2. Lots to be Deferred

3. Proposed Indigenous Forest Restoration

4. East - West Shelterbelt

5. Buffered Corridors.
- Amenity and Buffer Planting
- Naturalised Meadow
- Shelterbelt / Specimen Tree Planting
- Stormwater Infrastructure Planting

6. Proposed Reserves

7. Proposed Residential Berm Screen Planting

8. Additional Screen Planting if Required for Adaptive Management

9. Grassed Amenity Areas

PEACOCKES ROAD

WAIKATO RIVER

Boffa Miskell

www.boffamiskell.co.nz

N

0 200m

1:6,000 @ A3

Data Sources:

Projection:

AMBERFIELD, PEACOCKE STRUCTURE PLAN

Bat Mitigation Strategies

| Date: 11 May 2019 | Revision: A |

Plan prepared for Weston Lea Limited by Boffa Miskell Limited

Project Manager: **Rachel.deLambert@boffamiskell.co.nz** | *Drawn:* BCI | *Checked:* SFI

ANNEXURE "B"

Revisions to Proposed staging of works

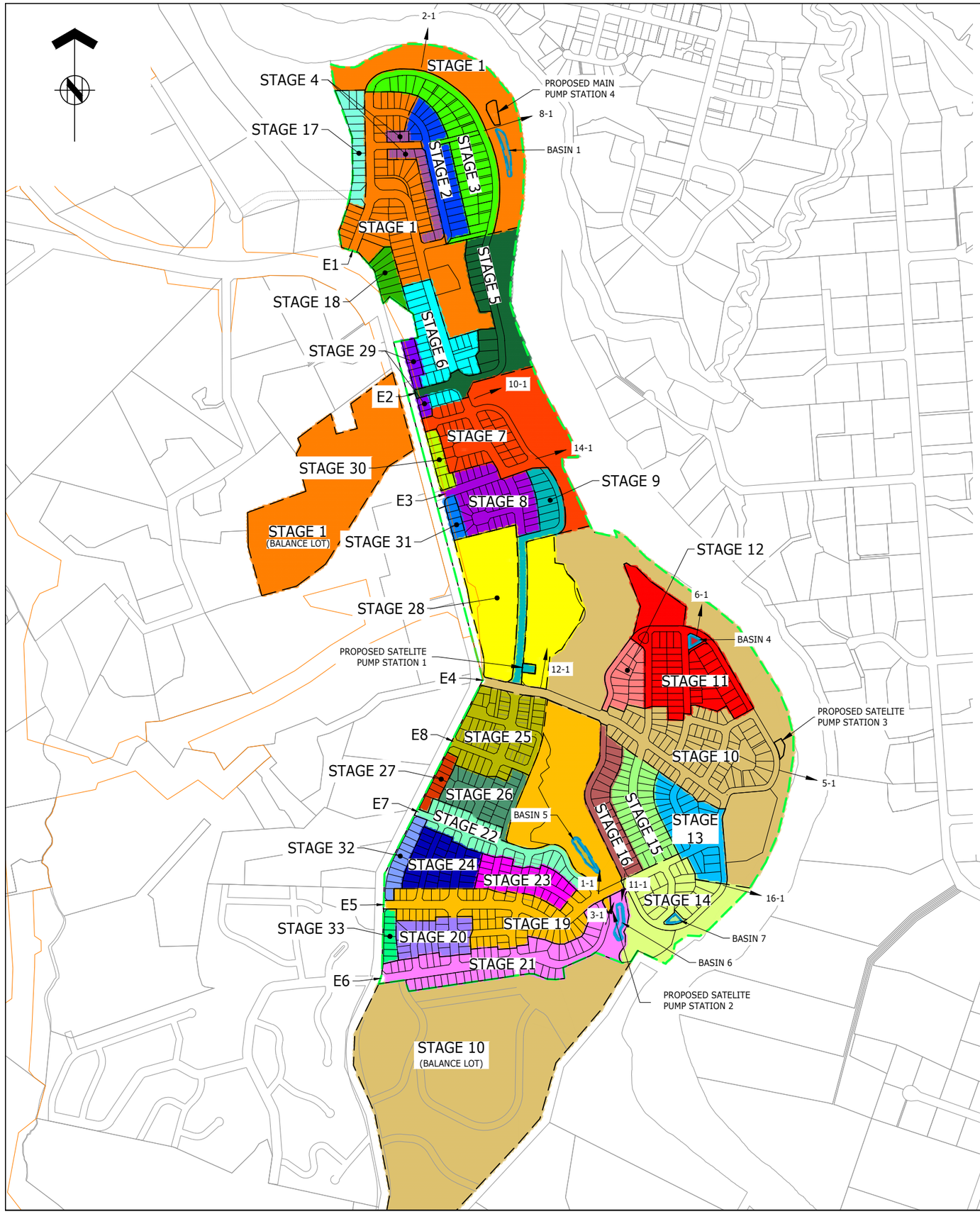
The Applicant's project team have collaboratively reviewed the staging to enable clarification of timing as it relates to ecological matters, and to identify opportunities to extend the time available for the establishment of buffer planting before development adjacent to sensitive parts of the site is completed.

The staging map provided with the application (Drawing 141842-1046) is for the development of residential lots. As shown in earthworks staging plans, in the erosion and sediment control plan (Drawings 141842-1011-1106), bulk earthworks will extend across multiple stages to enable cut-to-fill balances to be achieved and efficient installation of roading and services infrastructure. Therefore, earthworks across some stages will be undertaken well in advance of housing construction, and sites will be grassed in the meantime.

Timeframes for construction are indicative, but assuming earthworks commence in September – October 2020, release of titles and housing construction for the first few stages would commence in 2022/ 2023, with occupation in 2023/ 2024. Development of later stages would follow a similar timeframe, allowing a period of a few years of partial occupancy across the site.

The Applicant proposes an alternative staging arrangement in the northern half of the site, whereby lots along the western side of the site (i.e., in Stages 1, 2, 4, 6, 7, 8, excluding deferred lots) are developed in advance of eastern lots (in Stages 3, 5). In addition, the row of lots closest to the river in stages 7 & 9 would also be deferred. This approach postpones construction and occupation of houses on these lots and in stages 3 & 5, which are in the vicinity of sensitive habitats until at least mid-2025.

In addition, the applicant proposes to bring forward the commencement of all indigenous forest restoration works, outside the earthwork's footprint, across the site to within the first three years following resource consent (allowing for ecosourcing and propagation of plant material). This will provide a longer interval for habitat improvement in advance of development in the southern portion of the site, and enable confirmation of performance measures (canopy closure, survivorship, enrichment planting) within the timeframe of the proposed development.



NEW LOT STAGING (RESIDENTIAL)		SERVICE			
STAGE NUMBER	NUMBER OF LOTS	WWPS	SW OUTLET	SW BASIN	ENTRANCE
1	51	4*	8-1* + 2-1*	P - BASIN 1*	E1*
2	23	4	8-1	F - BASIN 1	E1
3	40	4	8-1 + 2-1	P - BASIN 1	E1
4	16	4	8-1	F - BASIN 1	E1
5	13	4	8-1 + 10-1*	P - BASIN 1	E2*
6	33	4	8-1 + 10-1	P - BASIN 1	E2
7	35	4	10-1 + 14-1*	D - DIRECT	E2
8	38	4	10-1 + 14-1	D - DIRECT	E3*
9	8	1*	14-1	D - DIRECT	E3
10	77	3*	5-1*	D - DIRECT	E4*
11	43	3	6-1* + 5-1	P - BASIN 4*	E4
12	15	3	6-1	D - DIRECT	E4
13	31	3	16-1*	D - DIRECT	E4
14	20	3	16-1	P - BASIN 7*	E4
15	33	3	16-1	F - BASIN 7	E4
16	19	3	11-1*	F - BASIN 6*	E4
17	14	4	2-1	D - DIRECT	E1
18	7	4	8-1	D - DIRECT	N/A
19	57	2*	1-1*	F - BASIN 5*	E5*
20	19	2	1-1	F - BASIN 5	E5
21	48	2	3-1*	F - BASIN 6	E6*
22	25	2	1-1	F - BASIN 5	E7*
23	24	2	1-1	F - BASIN 5	E5 OR E7
24	29	2	1-1	F - BASIN 5	E5 OR E7
25	41	1	12-1*	D - DIRECT	E4 OR E8*
26	25	1	1-1	F - BASIN 5	E7 OR E8
27	8	2	1-1	F - BASIN 5	N/A
29	9	4	10-1	D - DIRECT	N/A
30	8	4	10-1	D - DIRECT	N/A
31	6	4	14-1	D - DIRECT	N/A
32	12	2	1-1	F - BASIN 5	N/A
33	8	2	1-1	F - BASIN 5	N/A
TOTAL LOTS (RESIDENTIAL)	835	**KEY:**			
NEW LOT STAGING (OTHER)		* = STAGE IN WHICH INFRASTRUCTURE CONSTRUCTED			
STAGE NUMBER	NUMBER OF LOTS	P = PART OF STAGE TO SW BASIN			
1	1 CAFE	F = FULL STAGE TO SW BASIN			
28	2 TOWN CENTRE SUPER LOTS	D= DIRECT OUTFALL			
TOTAL LOTS (ALL)	838	NOTE: DURING DETAILED DESIGN MAY BE POSSIBLE TO OMIT PS1 AND DRAIN TO PS4 AND OMIT PS2 AND DRAIN TO PS3			

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

LEGEND:

- FUTURE BOUNDARY (SHOWN STAGING)
- EXISTING BOUNDARY
- PROPOSED LOT BOUNDARY
- PROPOSED PEACOCKES RD DESIGNATION BOUNDARY
- STAGING BOUNDARY
- EXTENT OF WORKS BOUNDARY

NOTES :

1. `PARENT` LOTS DISPLAYED REFER TO LEGAL SCHEME PLANS ON DRAWINGS 141842-9000-9022 FOR INDICATIVE FUTURE SUB-DIVISIONS.
2. STAGING SHOWN ON DRAWING 141842-1046 IS INDEPENDENT OF EARTHWORKS STAGING REFER TO DRAWING 141842-1011-1106 FOR EARTHWORKS & EROSION CONTROL

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7	UPDATES ISSUED FOR RESOURCE CONSENT	SDK	28.03.19
6	UPDATES ISSUED FOR RESOURCE CONSENT	SDK	27.03.19
5	UPDATES ISSUED FOR RESOURCE CONSENT	SDK	26.03.19
4	UPDATES ISSUED FOR RESOURCE CONSENT	SDK	20.02.19
3	ISSUED FOR RESOURCE CONSENT	KRW	18.05.18
2	ISSUED FOR CONSENT	KRW	27.04.18
1	FOR CLIENT REVIEW	KRW	26.03.18
REF	REVISIONS	BY	DATE

PROJECT:

WESTON LEA LTD
AMBERFIELD
PEACOCKE RD HAMILTON

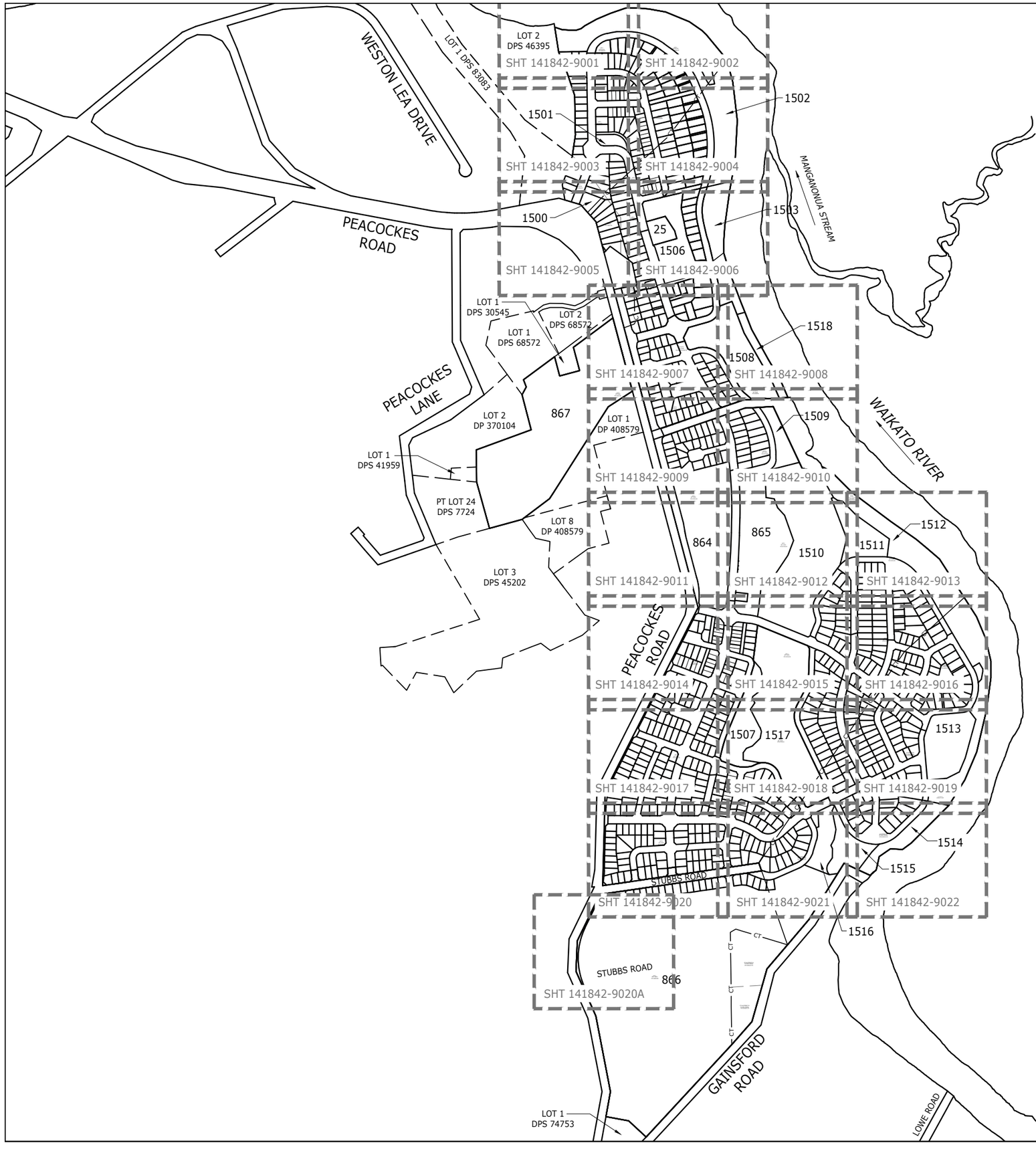
TITLE:

SCHEME PLAN
STAGING PLAN

ORIGINATOR: SWK	DATE: 13.03.18	SIGNED:	PLOT BY: MBT
DRAWN: SWK	DATE: 25.01.18	SIGNED:	PLOT DATE: 28.03.19
CHECKED: KRW	DATE: 23.03.18	SIGNED:	SURVEY BY:
APPROVED: STM	DATE: 17.03.18	SIGNED:	SURVEY DATE:

ISSUE STATUS: FOR RESOURCE CONSENT

PROJECT No: 9820-141842	SCALES: 1:2500 - A1 1:5000 - A3	A1
DRAWING No: 141842-1046		REV 7



ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

NOTES

SUBJECT TO CHANGE PENDING DETAILED ENGINEERING DESIGN AND COUNCIL CONSULTATION.

1. THIS PLAN HAS BEEN PREPARED FOR RESOURCE CONSENT PURPOSES ONLY. NO DETAILED DESIGN SHOULD BE UNDERTAKEN UTILISING THIS DATA.
2. ALL AREAS, EASEMENTS AND DIMENSIONS SHOWN ARE SUBJECT TO A FULL LEGAL SURVEY AND APPROVAL BY LAND INFORMATION NZ.
3. THIS PLAN IS ISSUED FOR A SPECIFIC PROJECT AND MAY NOT BE ALTERED OR USED FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF HARRISON GRIERSON.
4. EXISTING BOUNDARIES SHOWN ON THIS PLAN HAVE BEEN ADOPTED FROM UNDERLYING SURVEY PLANS AND ARE ALSO FROM LAND INFORMATION DCDB (13-04-2018) AND HAVE NOT BEEN SURVEYED. A BOUNDARY DEFINITION SURVEY SHOULD BE CARRIED OUT TO ESTABLISH EXACT BOUNDARY POSITIONS ON SITE.
5. FOR EASEMENT SCHEDULES AND ENCUMBRANCE DETAILS REFER SHEET 141842-9023.
6. FOR EXISTING PARCEL AND TITLE LAYOUT REFER PLAN 141842-9024.
7. THIS PLAN IS TO BE READ IN CONJUNCTION WITH OTHER PLANS IN THE SET 141842-9000 TO 141842-9023 & 141842-9025.
8. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN SET (141842-9000 TO 141842-9023 & 141842-9025).

LEGEND

- PROPOSED LOT BOUNDARY
- EXISTING LOT BOUNDARY
- EASEMENT BOUNDARY
- RESIDENTIAL LOT
- LOCAL PURPOSE RESERVE TO VEST (ESPLANADE)
- LOCAL PURPOSE RESERVE TO VEST (PEDESTRIAN ACCESSWAY)
- LOCAL PURPOSE RESERVE TO VEST (AMENITY)
- RECREATION RESERVE TO VEST
- HISTORIC RESERVE TO VEST
- ROAD TO VEST
- JOINTLY OWNED ACCESS LOT
- UTILITY LOT
- COMMERCIAL LOT
- TOWN CENTRE SUPER LOT
- BALANCE LOT

LOTS 1-867, 1100-1103, 1200-1201, 1250-1265, 1500-1517 AND 2000-2039 BEING A SUBDIVISION OF LOTS 1 & 2 DP 81210 (COMPRISED IN CFR SA66A/99-12.4046 Ha), LOTS 3 & 4 DP 81210 (COMPRISED IN CFR SA66A/100-10.8596 Ha), LOT 1 DP 36935 (COMPRISED IN CFR SA5D/1211-3809m²), PART LOT 6 & LOT 8 DP 34164 (COMPRISED IN CFR SA4B/788-18.6365 Ha), LOT 5 DP 17475 (COMPRISED IN CFR SA718/181-55.3989 Ha), ALLOTMENT 87, PART ALLOTMENTS 93 AND 94 TE RAPA PARISH (COMPRISED IN CFR SA528/20 LTD -22.2527 Ha) AND LOT 1 DP 78023 (COMPRISED IN CFR SA60A/826 -19.3785 Ha)

EXISTING BUILDINGS

1. DWELLINGS AND OTHER BUILDINGS TO BE PROGRESSIVELY REMOVED IN ACCORDANCE WITH INDICATIVE DEVELOPMENT STAGING.
2. DWELLINGS AND OTHER BUILDINGS ON BALANCE LOTS TO REMAIN AND TO COMPLY WITH DISTRICT PLAN BULK AND LOCATION STANDARDS WITH RESPECT TO NEW BOUNDARIES.

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3	UPDATES ISSUED FOR RESOURCE CONSENT	MBT	27.03.19
2	UPDATES ISSUED FOR RESOURCE CONSENT	MBT	26.03.19
1	ISSUED FOR RESOURCE CONSENT	JXG	15.05.18
REF	REVISIONS	BY	DATE

PROJECT:

WESTON LEA LIMITED
AMBERFIELD
HAMILTON

TITLE:

SCHEME PLAN
OVERALL LAYOUT

ORIGINATOR: SWK	DATE: 13.03.18	SIGNED:	PLOT BY: MBT
DRAWN: JXG	DATE: 27.04.18	SIGNED:	PLOT DATE: 27.03.19
CHECKED: AWD	DATE: 15.05.18	SIGNED:	SURVEY BY:
APPROVED: BMI	DATE: 15.05.18	SIGNED:	SURVEY DATE: ----

ISSUE STATUS: FOR RESOURCE CONSENT

PROJECT No: 9820-141842-01	SCALES: 1:5000 - A1 1:10000 - A3	A1
DRAWING No: 141842-9000		REV 3

ANNEXURE "C"

Adaptive management outline

Development staging allows an interval whereby impacts can be monitored and reviewed. The revisions to staging as outlined above improve these opportunities, by providing more time between granting of consent and residential development in close proximity to sensitive areas for assessment and adjustment of management methods.

Key monitoring parameters

Light

- Light (both incident light spill from point sources and increased ambient light levels) is the factor associated with the proposed development that is most likely to influence bat behaviour.

- Incident and ambient light levels will be monitored by a qualified specialist.

- Measurements will be made within buffered corridors, the E-W Shelterbelt, and at distance intervals from occupied residential properties (once constructed).

- Monitoring will be coordinated with bat survey work to enable cross-referencing.

- Changes in light conditions will be measured and compared to baseline conditions within the site and at viewshafts in Hammond Park, and to targets derived from reference sites in urban locations inhabited by bats (for example, Sandford Park) and specified in evidence (0.5 lux in buffered corridors).

- Trigger values will comprise exceedances of targets derived from reference sites and nominated target values (0.5 lux) at specified features.

- Roads and street lights will be installed in advance of housing construction, enabling street lighting arrays to be tested to confirm light spill is within specifications.

Bat activity

- Acoustic monitors will be installed to monitor relative bat activity across the site, targeting sensitive locations (E-W shelterbelt, Waikato River margin), control sites (e.g., along the Waikato River margin to the southeast of the development) and in representative locations across the site, to detect changes in frequency and pattern of usage.

- Comparative monitoring will also be undertaken in Hammond Bush to detect behavioural changes in this population.

- Baseline data will include surveys undertaken to date, pre- earthworks and pre-construction surveys. Data collected onsite will also be compared with that collected from control sites

that are unaffected by anthropogenic activity (e.g. Pukemokemoke Reserve, Pirongia) such as that proposed by the Applicant, and Southern Links.

- Detailed survey design (frequency and timing of sampling, duration, specific sample locations, sample size, statistical analyses, etc) will be developed as part of the Long-Tailed Bat Monitoring and Management Plan (LTBMMP) by qualified bat ecologists with input from a biostatistician.

- Sampling will be coordinated and cross-referenced with Southern Links monitoring and construction works, to provide a landscape-wide context for interpretation of data.

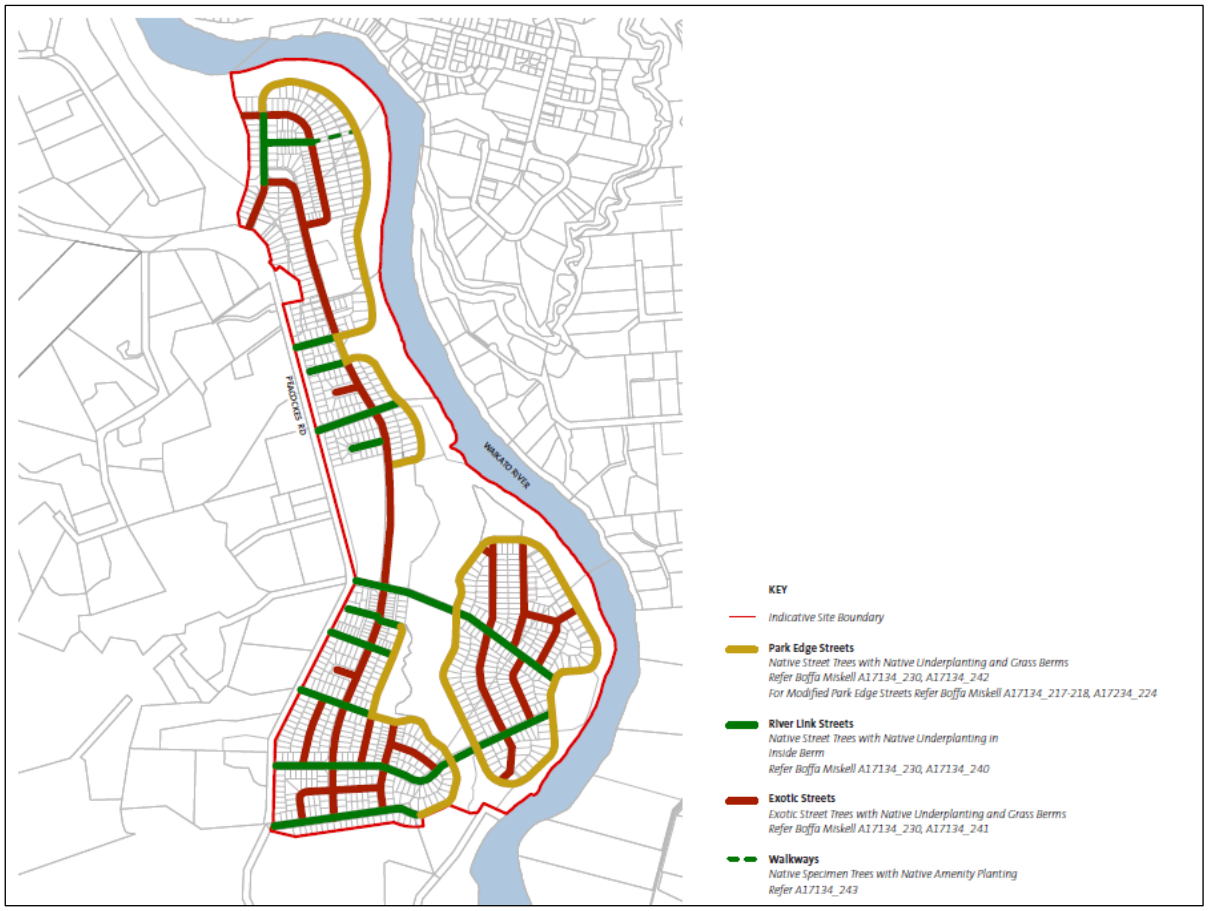
- Specific trials of bat responses to lighting arrays will be conducted using ABM and hand-held monitors once lighting infrastructure is installed. Activity across grassed open sites in the vicinity of houses will also be assessed pre- and post- occupancy. Artificial bat roosts will be periodically inspected for signs of occupancy.

- Trigger values will be determined via statistical analysis of pre-works sample data.

Adaptive responses

Drawing A17134_087_Bat_Mitigation_Plan summarising site features and mitigation provisions that are relevant to management of effects on bat activity within the Project Site is included with this Annexure. Parks and grassed amenity areas are included to highlight patches of open space that will be retained adjacent to sensitive habitats, which will assist with buffering these features.

A further consideration for the management of ambient light effects on the adjacent receiving environment (Hammond Park in particular) is the provision of street trees, as detailed in the Amberfield Open Space Framework report (Boffa Miskell, 2019). An indicative map of street tree plantings (OSF 38) excerpted from this report is provided below.



Opportunities for adaptive management if above trigger values are reached or anticipated include:

- Extension of lot deferrals beyond the anticipated timeframe if vegetated buffers are not sufficiently well-developed;
- Modification to street lighting arrays;
- Modification to species assemblage and/ or plant densities in vegetated buffers;
- Installation of temporary physical barriers (e.g., brush hedging or similar) to supplement vegetated buffers;
- Modification to proposed residential berm screen planting;
- Addition of further screen planting between lots (as indicated);
- Following development of initial house lots in Stage 1, ambient light levels will be measured at distance intervals to assess the likely cumulative effect of increased ambient light on Hammond Bush. Exceedance of predetermined tolerance thresholds, or if exceedance is assessed as likely, will trigger a requirement for permanent outdoor lighting arrays, including security/spot lights and access wall lights, to conform to best practice specifications for zero

upward light spill. This requirement will be implemented by way of a consent notice on remaining lots within Stage one, and in stages 2 and 3. It should be noted that the design specifications for outdoor lighting outlined above will be required from the outset in deferred lots.

- Increased density of street trees (currently proposed at ~12 – 15 m intervals) to further intercept and attenuate ambient light from houses on western terraces facing Hammond Park;

- Installation of artificial bat roosts;

- Adaptation of planting and long-term management specifications within buffered corridors to provide for a long-term transition to habitat dominated by native forest species, and of forest restoration plans to ensure favourable habitat for prey invertebrate species is provided.

ANNEXURE "D"

Points of agreement and disagreement in evidence provided by RESI

Boffa Miskell

Memorandum

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Attention:	Dr Stuart Parsons
Company:	
Date:	12 May 2019
From:	Georgia Cummings
Message Ref:	Points of agreement and disagreement in evidence provided by RESI
Project No:	A17134

Dear Stuart,

I have prepared this short note for you to assist with the preparation of your evidence-in-reply, as I appreciate there are issues that have been raised during the hearing that you will want to consider.

Legal Submissions

- Mr Lang made comments, during his legal submissions, on the potential of the development to impact long-tailed bats using Hammond bush. He also referred the Applicant's ecologists discussing these impacts. I note that Mr Lang was referring to the assessment of potential effects without management and mitigation. I consider that, with the mitigation put forward, offsite impacts will be avoided as stated under paragraph 74 of my Evidence-in-Chief.

Dr Stirnemann

- In Dr Stirnemann's overview of radio-telemetry methodology she discussed the difficultly of confirming movement pathways using radio telemetry due to the speed long-tailed bats fly when dispersing across the landscape between core areas. I agree with Dr Stirnemann. Given the linear shape of the proposed development site and the limited width from east to west, it would be very difficult to confirm east-west movement paths across the site using radio telemetry. However, the combination of radio telemetry and acoustic surveys across the site have allowed for identification of the important features within the site and put this in context of the core habitats for the colony in the wider landscape. I consider that the combination of survey techniques has provided the necessary information for assessing the value of the features on the site for long-tailed bats.

- Dr Stirnemann states that "it is a fact" that flooding an area with light will exclude long-tailed bats but did not adequately define what flooding an area with light entails. I am unsure of her definition of flooding an area with light but note that long-tailed bats are currently foraging around suburban parks in Hamilton and I have personally observed long-tailed bats forging above streetlights.

- Dr Stirnemann discusses that artificial roosts (**ARs**) are experimental and that bats are only using a very small subset of ARs installed around Hamilton. I agree that there are no published studies researching the uptake of ARs by long-tailed bats. Uptake of the Sandford Park roosts has been confirmed through radio-tracking. I am unaware of whether the other artificial roosts around Hamilton are regularly monitored for bats. These may also be used by bats. However, there is no information - one way or the other – as no bats have been radio-tracked to these roosts. I note that because long-tailed bats switch roosts regularly, even if the roosts are being monitored, it would be fortuitous

for a roost to be checked on the same day that it is occupied by a bat. Furthermore, if bats are roosting solitarily it is unlikely that there will be obvious signs of previous occupation in the ARs.

- Alternatively, Dr Stirnemann may be correct and that roosts need to be installed with certain characteristics before long-tailed bats will use them. As there is no published research in this regard, we can only estimate what these characteristics are. In order to maximise the likelihood of ARs being used by bats I recommend the following:

    - A minimum of four ARs will be installed for each roost tree removed;
    - Each of the four ARs will be installed on a different aspect;
    - ARs will be installed along the riparian margin as bats have been confirmed roosting in this area;
    - ARs will be installed at varying heights but a minimum of 4 m above the ground; and
    - Mammalian predators will be excluded using a combination of banding and ensuring that a predator will not be able to access from a neighbouring tree.

- Notwithstanding the above, long-tailed bats have been confirmed using two artificial roosts as maternity roosts in Hamilton. As has been discussed by me and other long-tailed bat experts, maternity roosts have specific thermal properties and are a limited resource in the landscape. It is very encouraging to see artificial roosts being used in this manner.

- As part of the development, the applicant has already proposed the full restoration of the minor gully in addition to other areas of native planting. This will result in many potential future roost trees being planted on the site, far in excess of what is proposed for removal. As noted in paragraph 9 of my Evidence-in-Reply, it is not feasible to protect every mature tree on the site, nor would this necessarily be the best outcome for the bat population. Thus, I consider the provision of artificial roosts is the best mitigation option for the removal of roost trees as their use has been confirmed in Hamilton and their uptake is much quicker compared to planting more trees that will not provide roost habitat for approximately 50 years. The artificial roosts will complement the already proposed plantings which will eventually provide roost habitat.

- Dr Stirnemann gave examples of predation of short-tailed bat roosts. I note that the roosting behaviour of long-tailed bats and short-tailed bats is very different. During the breeding seasons short-tailed bat roosts converge into very large maternal colonies often with thousands of bats roosting in the same tree. Short-tailed bats also roost in the same trees for longer periods of time. Conversely, long-tailed bats form multiple maternal colonies at once and will rarely have more than 50 bats using a tree on any given night. They also move roosts more often. This behaviour makes them less prone to predation as roosts are harder to find and they use smaller cavities which fewer predators can access.

- Dr Stirnemann's conclusion from her presentation that the removal of each single predator is important ignores the fact that there will be constant reinvasion and therefore small-scale predator control will not prevent such impacts.

- Dr Stirnemann and Ms Graves both discussed how the bats are foraging along enclosed paths through Hammond Bush, using these paths as edge habitat. They extrapolate this phenomenon to suggest that mimicking this set-up would be the best outcome for the NE terrace of the Amberfield site. It is my opinion that both Dr Stirnemann and Ms Graves are very focussed on a single site, Hammond Bush, given its importance to the Riverlea community. However, they have not acknowledged the many other core habitats used by the colony across the landscape, most of which either comprise parkland, tree land (e.g. the Narrows), or isolated bush remnants within pasture. All these habitats are characterised by vegetation edges amongst grassland. This is also a habitat type often used in unmodified environments. The assertion that forest restoration is necessary to create bat habitat is unfounded and does not reflect how bats are using the existing environment.

- Creation of such forest habitat will take upwards of 50 – 100 years to become established. Conversely, the habitat type proposed is already present, and being used by bats in the NE terrace. It is my opinion that the currently proposed habitat creation has more certainty of being used in a much shorter timeframe. The applicant's ecologists have assessed an impact on long-tailed bats and designed a response that reinstates habitat similar to what is being removed, in the shortest possible timeframe. The objective here is to manage an effect as is required under the RMA, not to undertake conventional forest restoration.

Ms Graves

- Ms Graves assertion that long-tailed bats will perform better in habitat that the species has evolved in has limited scientific support. The introduction of brushtail possums to New Zealand is a notable example of where Ms Graves' theory does not hold true.

- Long-tailed bats are highly adaptive, and colonies have been recorded within at least 26 pine plantations around New Zealand (Borkin & Parsons, 2010). Conversely, I am unaware of any bat colonies exclusively using young native restorations. This suggests that long-tailed bats are not dependent on certain species of trees or the insect community associated with native assemblages. Instead, they rely on mature forest patches, both native and exotic to roost and forage in.

- Commissioner Knott asked Dr Stirnemann to comment on other urban areas of Hamilton that are used by bats and how this aligns with her evidential position. Dr Stirnemann's response to the question was unclear. In response to Commissioner Knott's question to Dr Stirnemann, Ms Graves states the long-tailed bats are only using urban areas within the gullies as their topography provides protection from light. I agree that bats are using areas that have connectivity to the gully system which provides a dispersal corridor through completely developed areas. However, the bats are also using the open parkland outside of the gullies which often has minimal buffering from the surrounding houses. The photographs labelled Artificial roost A and Artificial roost B, under the document *Habitat usage by long-tailed bats – 3 Sanford Park*, show the location of one of the maternity roosts in Sandford Park which is located above the gully and has minimal buffering from the surrounding residential development. I understand will include the *Habitat usage by long-tailed bats* document under your Evidence-in-Reply as **Annexure "C"**.

References

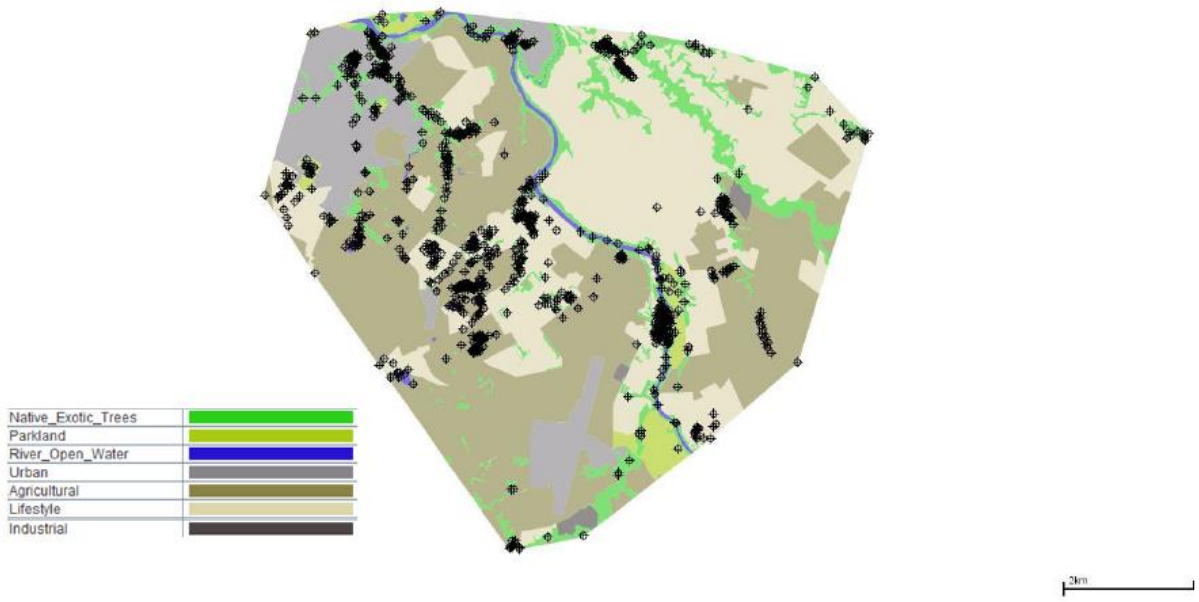
Borkin, K. M., & Parsons, S. (2010). The importance of exotic plantation forest for the New Zealand long-tailed bat (Chalinolobus tuberculatus). *New Zealand Journal of Zoology*, *37*(1), 35–51. https://doi.org/10.1080/03014221003602190

ANNEXURE "E"

Habitat usage by long-tailed bats

1 Recorded bat habitat usage (Appendix F of AECOM bat radio tracking report, 2018 and 2019 data)

F3 - Habitat content of 24 long-tailed bats locations with 50m buffer



04 May 2019 davidson-watts ecology (pacific) ltd

Individual locations collected for each bat rather than core ranges and home ranges. Tagged bats were generally faithful to gully systems and followed linear features.

2 Habitat usage in Auckland Region

A figure summarising results of Auckland Council surveys of long-tailed bats in the Auckland Region is presented with this Annexure. Observations demonstrate the importance of tracts of mature indigenous forest in the Waitakere and Hunua Ranges as core habitats, however the third important colony occurs in Riverhead Forest, which is an area of exotic plantation forest (Pinus radiata).

Other pine forest plantations known to support bat populations include Dome Valley, north of Puhoi, and Whitford forest, between the Hunua Ranges and Waitemata Harbour. In contrast, bats do not appear to much use the comparatively large areas of kanuka-dominated secondary scrub and forest present throughout wider Auckland, or areas of established restoration plantings (G. Cummings, Pers. Obs.)

3 Sandford Park

Sandford Park is a useful comparator for the proposed development as the site is a stand of old pine forest in an urban reserve on relatively gentle topography, in close proximity to residential properties. Bats have taken up occupancy in two artificial roosts installed circa 2012 and are communally roosting.

The following photos provide an overview of Sandford Park's habitat and environs.

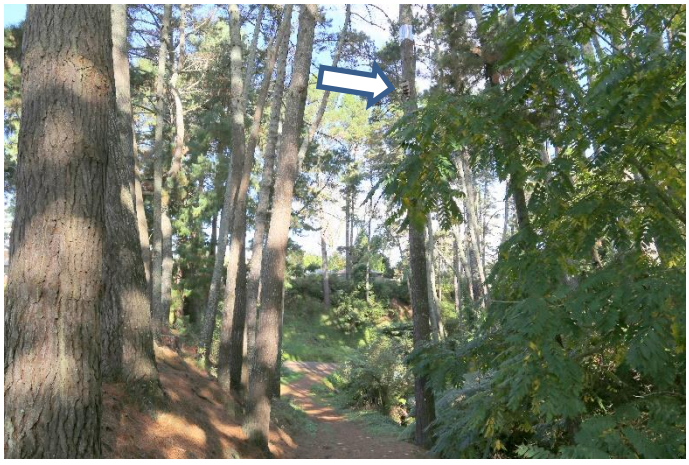
View from Bader Street (P3)

Accessway from Bader Street (P4)

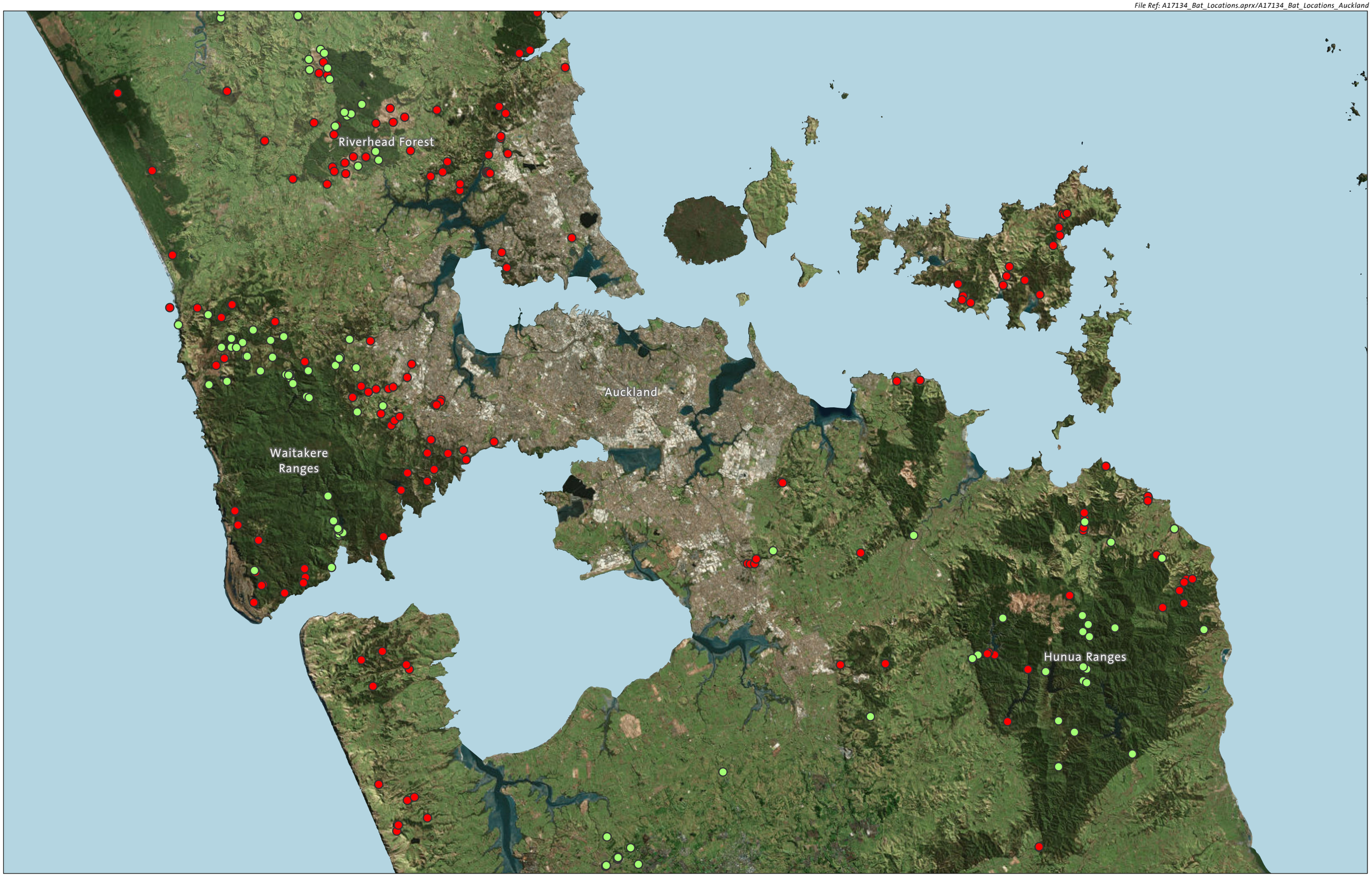
Grassed reserve between houses and trees (P6)

Stand interior (P8)

Artificial roost A (P7)



Artificial roost B (P9)



Boffa Miskell

www.boffamiskell.co.nz

0 1,000 m

1:250,000 @ A3

Data Sources: DOC, LINZ

Projection: NZGD 2000 New Zealand Transverse Mercator

Legend

- Chalinolobus tuberculatus
- No bat species detected

A17134 HAMILTON SOUTH DEVELOPMENT

Bat Locations - Auckland

Date: 10 May 2019 | Revision: 0

Plan prepared by Boffa Miskell Limited

Project Manager: **Rachel.deLambert@boffamiskell.co.nz** | *Drawn:* ATy | *Checked:* GCu

Annexure "F"

Long-tailed bats (statistically) avoid pasture. Note that pasture is (statistically significantly) underused (compared with its availability in the landscape) by bats while gully and river are overused.

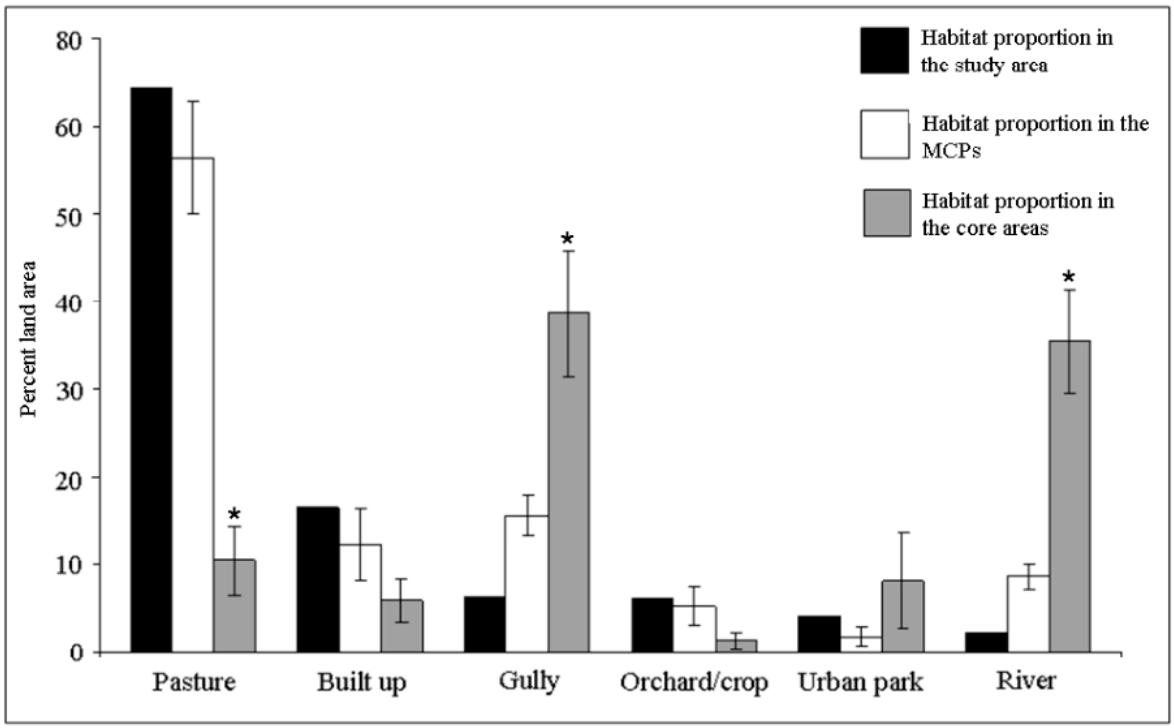


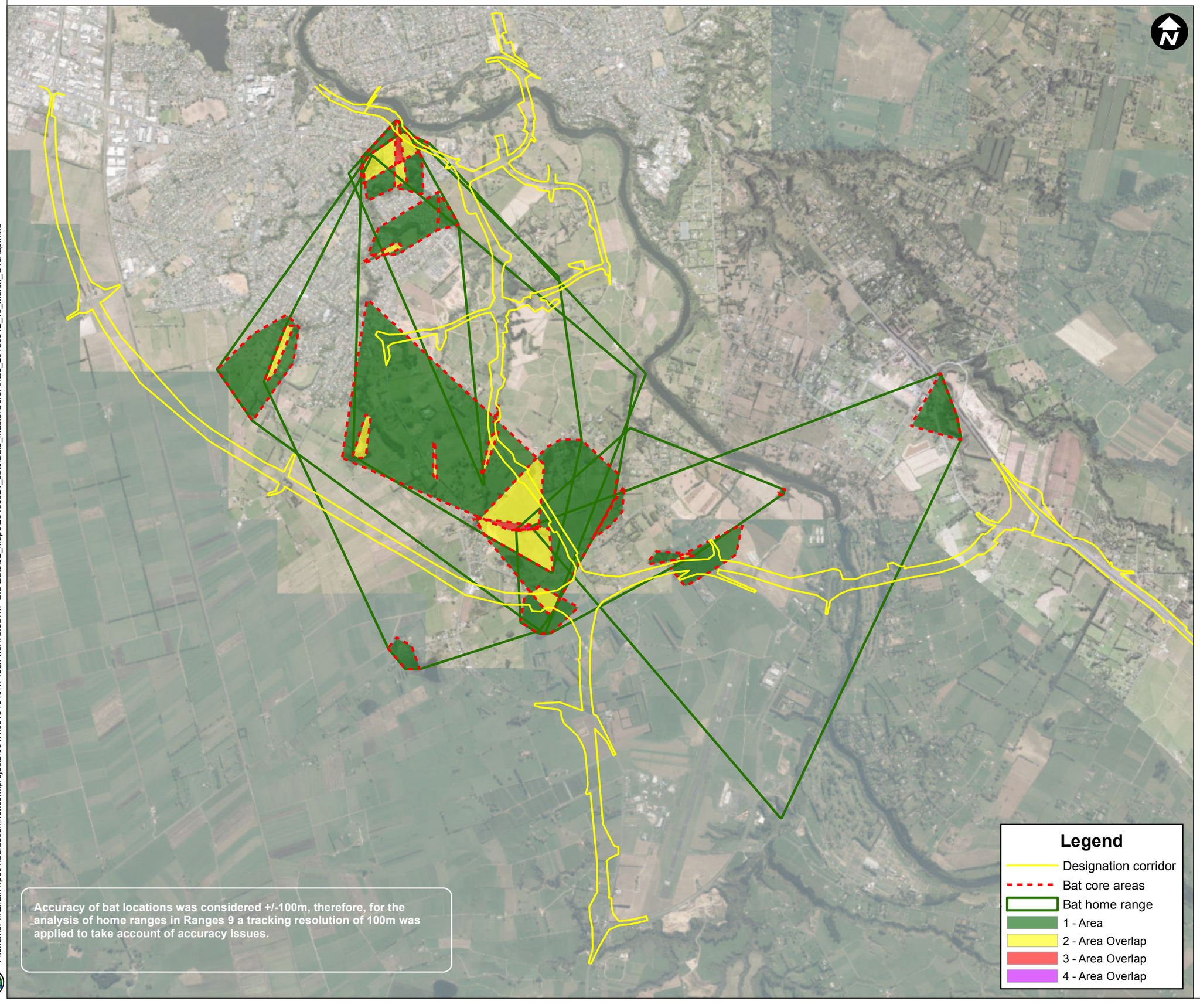
Figure 3.4 Proportions of pasture, built up, gully, orchard/crop, urban park and river habitats in the study area and their mean proportions ± SEM in C. *tuberculatus* 95% minimum convex polygons and 50% core areas. Core area bars labelled with * show a habitat proportion significantly different in *C. tuberculatus*' 50% cores when compared to minimum convex polygons (Wilcoxon matched pairs (Z), $P < 0.05$). Gully and river habitat are over represented in core areas and pasture habitats are under represented.

Annexure "G"

Core home ranges for bats tracked in March 2018 from the AECOM Southern Links Study. Sanford, Fitzroy and Te Anau parks are located under the overlapping core areas in the north-west.

See diagram "Bats_MasterCoreFinals_20180612_A3_March_Overlap"

ISO A3 297mm x 420mm



Last saved by: KLAPD (2018-06-15) Last Plotted: 2016-04-14
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AECOM

PROJECT

Southern Links

CLIENT

Hamilton City Council, New Zealand Transport Agency and Department of Conservation.

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SPATIAL REFERENCE

Scale: 1:35,000 (A3 size)

500 250 0 500 1,000 1,500
Meters

Map features depicted in terms of NZTM 2000 projection.

Data Sources:
Cadastral Boundaries – LINZ NZ Cadastral Dataset 2016

PROJECT MANAGEMENT

Approved		Date	
Checked		Date	
Designed		Date	
Drawn		Date	

ISSUE/REVISION

Rev	Date	Description
A	14.05.18	Draft

KEY PLAN

PROJECT NUMBER

60164546

SHEET TITLE

Core Areas and Home Ranges of Bats - March 2018

MAP NUMBER

3