Bioresearches
A Babbage Company

Sunfield Baseline Ecological Assessment

for: Sunfield Developments Limited

Job No: 65507
Version: Draft A
Date of Issue: 2 December 2024

DOCUMENT APPROVAL AND REVISION HISTORY

Document title	Sunfield Baseline Ecological Assessment
Prepared for	Sunfield Developments Limited
Version	Draft A
Date	2 December 2024
Filename	65507 Rev1.2 Sunfield Baseline Ecological Assessment

Author(s)		
	Laura Drummond	
	Ecologist	
Reviewer(s)		
	Treff Barnett	Kate Feickert
	Senior Ecologist	Senior Ecologist

Rev. no.	Date	Version	Author(s)	Reviewer
1	2 December 2024	Draft A	LD	TB & KF

Reference: Bioresearches (2024). Sunfield Baseline Ecological Assessment. Report for Sunfield Developments Limited. pp 65

Cover Illustration: Aerial view of the Sunfeild area and surrounding landscape

TABLE OF CONTENTS

List of Tables

List of Figures

Capability Statement

Established in 1972, with offices in Auckland and Hamilton, Bioresearches has been providing sustainable solutions for resource use and development throughout New Zealand and the Pacific for over 40 years. We understand environmental legislation and how it applies to coastal, marine, freshwater and terrestrial ecosystems, and all aspects of land development and resource extraction. In 2015 Babbage Consultants merged with Bioresearches adding specialist ecology consultancy services to Babbage's existing offering.

Bioresearches works closely with all Babbage disciplines ensuring ecological issues and procedural requirements are integrated with and inform the engineering design processes at all stages of a project. Technical leaders of each discipline are highly experienced and recognised experts in their fields of practice and have a sound understanding of all relevant legislation, including the Resource Management Act and the Wildlife Act. Bioresearches services include;

- Independent technical review of ecological assessments and plans
- Strategic advice, environmental management plans and mitigation
- Assessments of environmental effects (AEE)
- Freshwater, wetland and marine surveys
- Terrestrial, freshwater and marine monitoring
- Vegetation and habitat assessment and mapping
- Fauna, flora and threatened species surveys
- Expert representation for Hearings, Board of Inquiry and Environment Court
- Biosecurity advice and monitoring

1 INTRODUCTION

Bioresearches were engaged by Sunfield Developments Limited to undertake an assessment of the baseline ecology within multiple properties of land at Ardmore, approximately 2 km north-east of Papakura (Figure 1). The areas have been separated into three blocks, referred to as the "Cosgrave Road", "Sunfield South" and "Sunfield North" within this report.

Sunfield North and Sunfield South are zoned Rural – Mixed Rural and comprised of the following properties;

- NA258/245
- NA631/77
- NA57A/1150
- NA477/75
- NA778/296
- NA636/71
- NA57A/1151
- NA57A/1149
- NA1B/856
- NA128A/553
- NA57A/1152
- Lot 7 Deposited Plan 103787
- NA477/291
- NA1666/17
- NA61A/530
- NA578/1154

Cosgrave Road is zoned Future Urban, and comprised of the following properties;

- 828127
- NA6c/1131
- NA24c/216
- NA6C/1128
- 828128
- NA258/245
- NA18B/646
- 828126

Auckland Council Geomaps overlays indicate multiple overland flow paths to be present within the Sunfield Block, but no terrestrial Significant Ecological Area (SEA) overlays or recognised ecosystem types are present within the site.

This report describes the existing ecological values of the terrestrial and freshwater areas within the site.

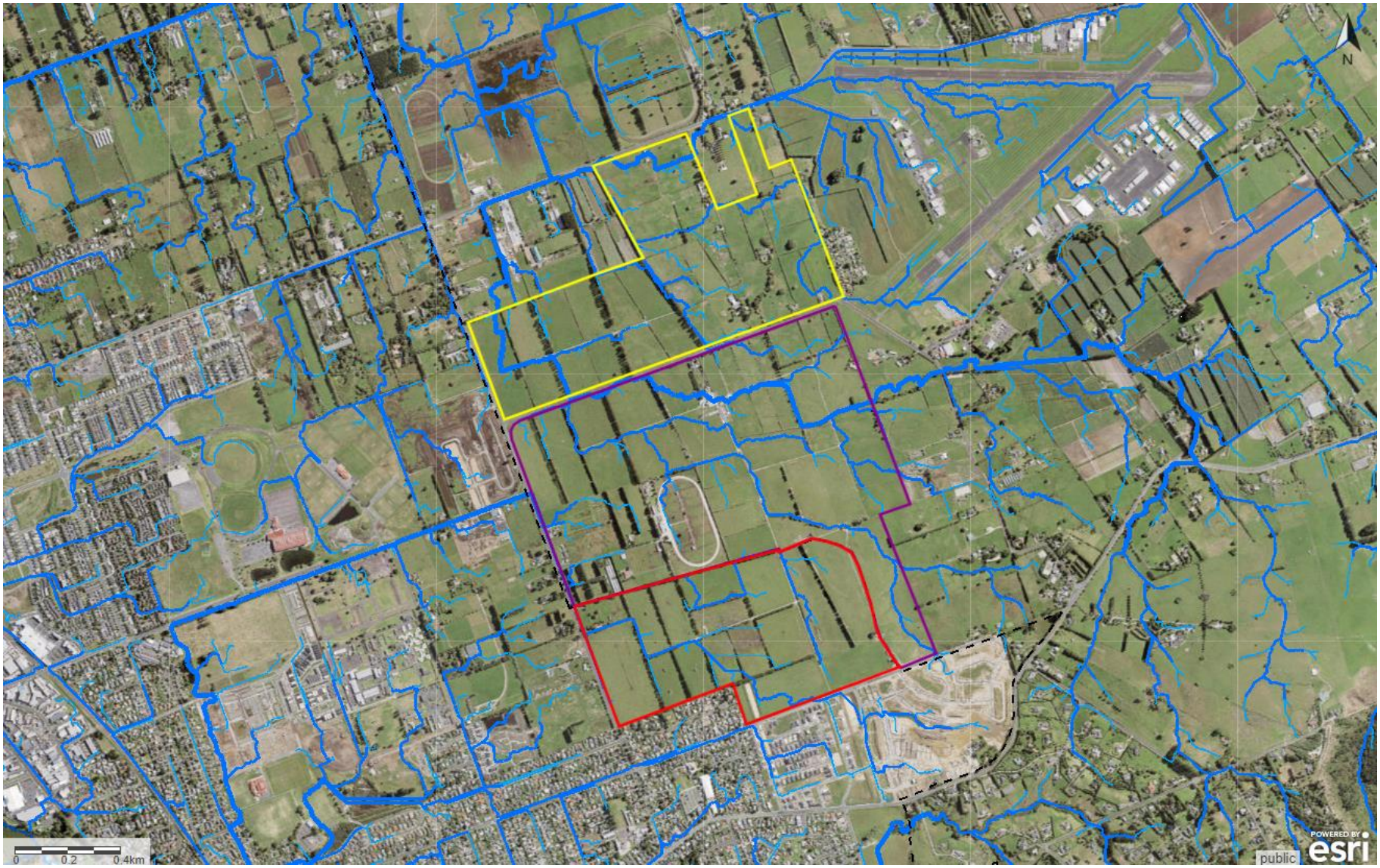

Figure 1. Map of the site showing Sunfield North (yellow). Sunfield South (purple) and Cosgrave Road (red), and the overland flow paths predicted to flow through the area. Data sourced from Auckland Council Geomaps GIS viewer.

2 STATUTORY CONTEXT

This section summarises the legislation, policy, plans and strategies relevant to the protection, conservation and enhancement of nature conservation interests associated with the site. The ecological values described in this report allow significant ecological issues and adverse effects to be identified as they relate to the Resource Management Act 1991 (RMA). The identification of significant values and subsequent management recommendations to mitigate adverse effects are consistent with standards and objectives of the following legislative, policy statement and regional plan documents.

2.1 Legislation

2.1.1 Resource Management Act 1991 (RMA)

The purpose of the RMA is to achieve sustainable management. Important elements of this are the maintenance of indigenous biodiversity and protection of significant indigenous vegetation and habitats. The RMA requires that any adverse effects of development be avoided in the first instance, and where avoidance is not reasonably practicable, impacts should be minimised, remedied, or mitigated. These elements are given effect in Sections 5, 6 and 7, and Schedule 4 sets out the requirements for effects assessments.

2.1.2 Wildlife Act 1953

The Wildlife Act (WA, 1953) provides legal protection to listed species classed as wildlife. It controls how people interact with Wildlife, including all native birds, bats, frogs and lizards and some invertebrates. Note is does not cover plants or freshwater fish.

2.1.3 National Environmental Standards for Freshwater (NES-F, 2020)

The National Environmental Standards for Freshwater 2020 (NES-F) set requirements for carrying out certain activities that pose risks to freshwater and freshwater ecosystems.

2.2 National Policy Statements

2.2.1 Freshwater Management

The National Policy Statement for Freshwater Management 2020 (NPS-FM) provides direction under the RMA, to local authorities on managing activities that affect the health of freshwater, and provides protections to freshwater bodies, including natural inland wetlands, includes provisions for monitoring and reporting on freshwater quality and quantity, and for addressing the impacts of land use activities on freshwater resources.

2.2.2 National Policy Statement for Indigenous Biodiversity (NPS-IB)

The NPS-IB provides direction to councils to protect, maintain and restore indigenous biodiversity in the terrestrial environment, requiring at least no further reduction nationally. It is considered relevant to the proposal because the site is in the terrestrial environment, and it contains indigenous biodiversity as defined in Section 1.6 (Interpretation) of the NPS-IB.

The NPS-IB requires that indigenous biodiversity that is not protected by an SNA (or SEA for the purpose of this assessment):

a. Is managed by applying the effects management hierarchy (avoid, minimise, remedy, offset, compensate), where those effects are significant.

b. is managed to give effect to its Objective and Policies, where those effects are not significant (Section 3.16 (2)).

The terrestrial vegetation within the site is not subject to a SEA and therefore the proposed works would need to be consistent with Policy 8 (NPSIB), which addresses maintaining indigenous biodiversity outside of SNAs, and Section 3.16, which requires that significant adverse effects be managed by applying the management hierarchy (avoid, minimise, remedy, offset, compensate).

Tangata Whenua as Partners

The NPS-IB recognises tangata whenua as kaitiaki of, and partners, in the management of indigenous biodiversity (NPSIB, Policy 2). At the time of preparation of this report, no acknowledged taonga species have been identified in the public domain.

2.3 Regional plans and policies

The Auckland Unitary Plan (AUP) is the principal statutory planning document for Auckland. It was prepared by Auckland Council for the purpose of giving effect to the RMA as a regional council and as a territorial authority.

3 METHODOLOGY

The overarching approach of this analysis and reporting is to ascertain the existing ecological values on the site: species, communities and systems; as per the EIANZ Ecological Impact Assessment guidelines (EcIAGs) for use in New Zealand (Roper-Lindsay *et al*. 2018).

Using the EIANZ EcIAG framework, a simple ranking system is used to assign value to species as well as other matters of ecological importance such as species assemblages and levels of organisation.

The overall ecological value is then determined on a scale of 'Negligible' to 'Very High'. In addition to this assessment, all identified ecological values were assessed for significance against the Auckland Unitary Plan criteria to test ecological significant (where not already an SEA).

Table 1. Factors to be considered in assigning value to species (Roper-Lindsay et al. 2018).

Determining factors	Value
Nationally threatened species, found in the ZOI[1] either permanently or seasonally	Very High
Species listed as 'At-Risk' – declining, found in the ZOI, either permanently or seasonally	High
Species listed as any other category of 'At-Risk' found in the ZOI either permanently or seasonally	Moderate
Locally (ED) uncommon or distinctive species	Moderate
Nationally and locally common indigenous species	Low
Exotic species, including pests, species having recreational value	Negligible

Table 2: Attributes to be considered when assigning ecological value or importance to a site or area of vegetation / habitat / community (Roper-Lindsay et al. 2018).

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 habitats:* • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type

[1] ZOI (Zone of Influence) in Roper-Lindsay *et al.* (2018) defines the Zone of Influence as "*the areas/resources that may be affected by the biophysical changes caused by the proposed project and associated activities.*"

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 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 environment conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystems 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

Table 3. Assigning value to areas (Roper-Lindsay et al. 2018)

Value	Determining Factors
Very High	Area rates 'High' for at least three of the assessment matters of Representativeness, Rarity/distinctiveness, Diversity and Pattern, and Ecological Context. Likely to be nationally important and recognised as such.
High	Area rates 'High' for two of the assessment matters, and 'Moderate' and 'Low' for the remainder OR area rates 'High' for one of the assessment matters and 'Moderate' for the remainder. Likely to be regionally significant and recognised as such.
Moderate	Area rates 'High' for one of the assessment matters, 'Moderate' or 'Low' for the remainder OR area rates as 'Moderate' for at least two of the assessment matters and 'Low' or 'Very Low' for the remainder. Likely to be important at the level of the Ecological District.
Low	Area rates 'Low' or 'Very Low' for majority of assessment matters, and 'Moderate' for one. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Area rates 'Very Low' for three assessment matters and 'Moderate', 'Low' or 'Very Low' for the remainder.

3.1 Terrestrial Ecology

A desktop review of terrestrial characteristics was undertaken of the site, which included reviews of aerial imagery and consideration of the extent of vegetation present. Potential fauna habitats were assessed qualitatively, in conjunction with database reviews (e.g., Department of Conservation's BIOWEB database, Auckland Council's Herpetofauna database, and online eBird and iNaturalist citizen science databases) of historical lizard, bird, and bat records. Databases were used to determine likely presence lizards, birds, and bats.

3.2 Freshwater Ecology

Watercourses were classified under the Auckland Unitary Plan Operative in Part (AUP) to determine, in accordance with the definitions in these plans, the ephemeral, intermittent or permanent status of these watercourses. During the site assessments, the presence and extent of water was noted, reference photos were taken and freshwater habitats were marked using a handheld GPS unit. The quality of the aquatic habitat was assessed, noting ecological aspects such as channel modification, hydrological heterogeneity, riparian vegetation extent, substrate type and any fish or macroinvertebrate habitat observed. Riparian and catchment information was also reviewed.

Potential wetlands were assessed following the Ministry for the Environment's (MfE) wetland delineation protocols (Ministry for the Environment, 2020), including vegetation assessments and wetland hydrology to determine whether areas met the definition of a 'natural inland wetland' under the NPS-FM.

Vegetation was assessed based on the dominance and prevalence of:

- Obligate wetland vegetation (OBL) – almost always in wetlands, rarely in uplands;
- Facultative wetland (FACW) – usually occurs in wetlands but occasionally found in uplands;
- Facultative (FAC) – commonly occurs in either wetlands or uplands;
- Facultative upland (FACU) – occasionally occurs in wetlands but usually in uplands; and
- Upland (UPL) – rarely occurs in wetlands, almost always in uplands.

Where the dominance and/or prevalence tests showed unclear results, hydric soils and hydrology tests were undertaken in accordance with the associated protocols (Fraser *et al*., 2018; Ministry for the Environment., 2021).

4 SUNFIELD NORTH

4.1 Background and Ecosystem Classification

Historically (pre-human), the site would have comprised of the ecosystem extent 'bog/fen mosaic'. These fen mosaic ecosystems are characteristic of the Manukau ecological district, which is characterised by low altitude topography near the Manukau Harbour with a warm humid climate, with poorly drained and gleyed alluvial soils and peats on river flats and swamps.

Historic aerial images show the site has been devoid of vegetation for approximately 60 years, with the only vegetation observed in aerials from 1960 consisting of pasture and shelter belts (Figure 2). The site, and much of surrounding landscape, has consisted of agricultural farmland until present day, with the Ardmore Airfield directly adjacent to the east of the site. Currently, the site consists of rural land utilised for grazing, with exotic and indigenous shelter belts and livestock shade trees (Figure 3). A small kahikatea stand is established within a north-eastern paddock and has been present within the property for at least 60 years.

Due to the historical and current intensive agricultural and pastoral land use activities, the site contains predominantly pasture, with very limited shrub/tree vegetation. The key terrestrial ecological values of the site are associated with the shelter belts, riparian yards and isolated kahikatea stands (Figure 3). The site does not support a Significant Ecological Area (SEA), recognised ecosystem type, or notable tree overlay.

Figure 2. Historic aerial image of Sunfield North from 1960. Image sourced from Retrolens.

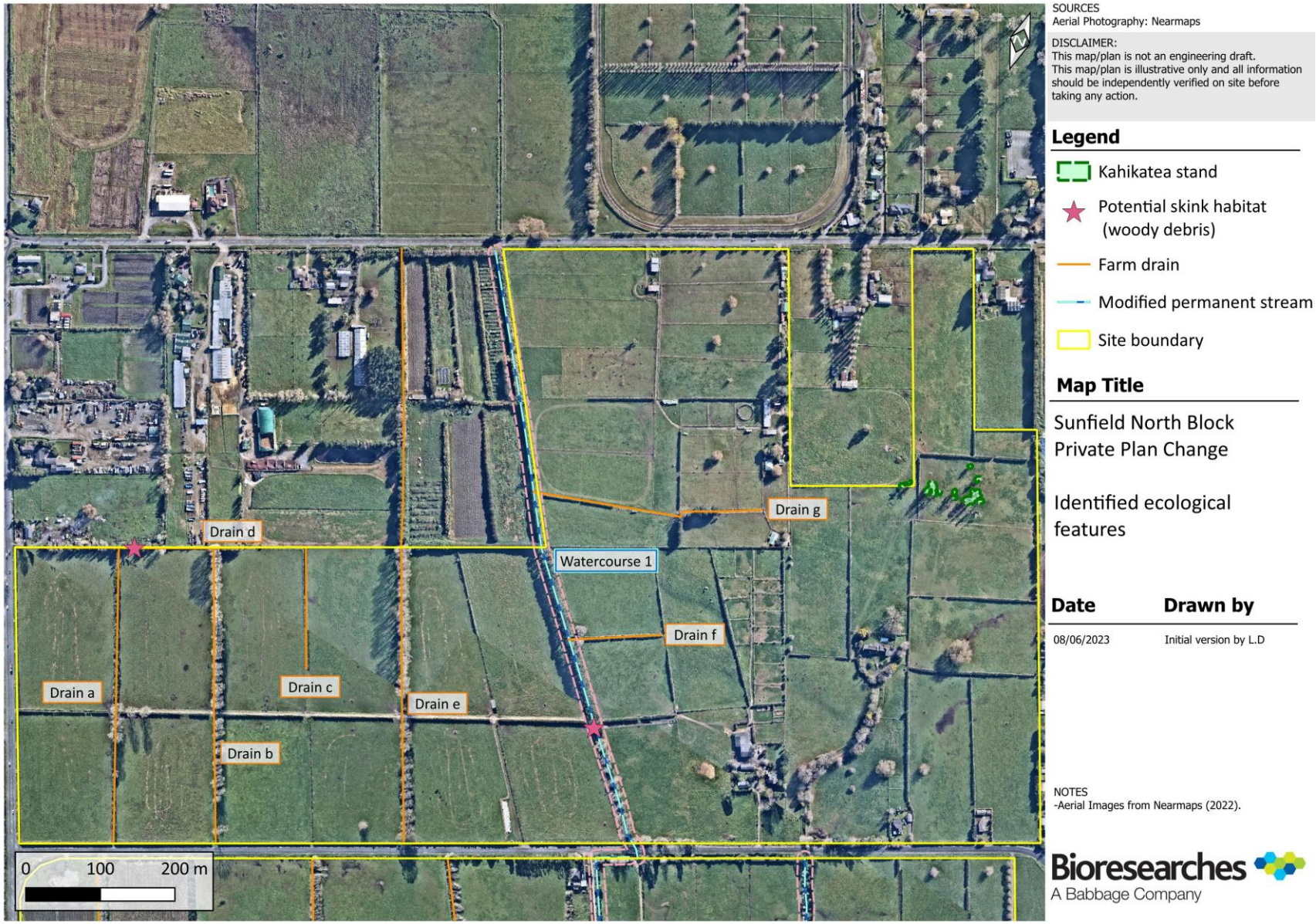

Figure 3. Identified ecological features within the Sunfield North Block.

4.2 Terrestrial Ecology

4.2.1 Vegetation

The overall ecological value of the vegetation was assessed to be **Low.**

The majority of the vegetation present within the site is exotic and consists of pastoral grazing land (Photo 1 and Photo 2). Woody vegetation and indigneous trees throughout the area consisted of trees within the shelter belts and riparian margins, stock shade trees, amenity planting and a stand of kahikatea (*Dacrycarpus dacrydioides*) within a northern paddock.

The riparian yards and shelter belts consisted of mixed exotic and native vegetation with exotic vegetation including barberry (*Berberis glaucocarpa*) poplars (*Populus deltoides*), Japanese cedar (*Cryptomeria japonica*), pine (*Pinus* sp.), immature tree privet (*Ligustrum lucidum*) and woolly nightshade (*Solanum mauritianum*) (Photo 3 and Photo 4). Lianes such as ivy (*Hedera helix*), moth plant (*Araujia hortorum*) and Japanese honeysuckle (*Lonicera japonica*) were overgrowing the woody vegetation. The understory vegetation throughout included sedges (*Carex* sp.), rank long grasses, and blackberry (*Rubus fruticosus*).

Photo 1. View of pasture grasses with deciduous shelter belt.

Photo 2. Pasture grasses with exotic shelter belts throughout the site.

Photo 3. Exotic woody trees were present in the riparian yard and shelter belts

Photo 4. Barberry shrubs were utilised as shelter belts

Native vegetation within the site was largely limited to the riparian yards and shelter belts, which contained tōtara (*Podocarpus totara*) and lemonwood (*Pittosporum eugenioides*) (Photo 5 and Photo 6). The kahikatea stands were fragmented, between 30 m^2 to 330 m^2 in size, and isolated from the remaining native vegetation within the site. The area within the stands had been impacted by stock; with pugging throughout the area, there was a lack of functional understory and groundcover tiers, and there was minor damage to the bark and trunk of the kahikatea (Photo 7 and Photo 8).

Photo 5. Small native shrubs within the shelter belt of Drain a

Photo 6. Drain a contained tōtara dense riparian yard and shelter belt.

Photo 7. Kahikatea stands on the northern side of the site.

Photo 8. The understory was bare and pugged with some bark damage on the lower trunk.

4.2.2 Connectivity and Ecological Function

The terrestrial vegetation, as it pertains to ecological connectivity and function, was considered to be of **Low** ecological value**.**

Connectivity between areas of vegetation is important to facilitate ecological function. Edge communities are heavily influenced by increased exposure to light, drying winds and competitive weeds. This 'edge effect' restricts some native flora and fauna to forest interiors. Patch fragmentation increases the edge effect and decreases the availability of habitat for interior species. Loss of ecological connectivity can also impair reproductive function in both flora and fauna.

All exotic and native vegetation within the site is isolated within the surrounding environment and there is no direct connectivity to significant terrestrial habitat. The nearest extensive area of vegetation is located

more than 2 km to the south-east of the site. The vegetation within Sunfield North is limited to isolated, narrow strips such as shelter belts, riparian yards and the kahikatea stands. The contiguous areas of indigenous vegetation within the Sunfield North site are limited to the tōtara shelter belt lining Drain A, on the western side of the site; and kahikatea stands on the north-eastern side of the site. The vegetation is highly fragmented and is subject to edge effects.

4.2.3 Indigenous Fauna

4.2.3.1 Herpetofauna

Herpetofauna (reptiles and amphibians) comprise a significant component of New Zealand's terrestrial fauna. There are currently 125 terrestrial, endemic herpetofauna taxa recognised in New Zealand (Hitchmough *et al*., 2021), approximately 85% of which are considered 'Threatened' or 'At Risk'. All indigenous reptiles and amphibians are legally protected under the Wildlife Act 1953 and vegetation and landscape features that provide significant habitat for native herpetofauna are protected by the Resource Management Act 1991. Statutory obligations require management of resident reptile and amphibian populations if they are threatened by land disturbance i.e. land development.

No formal herpetofauna surveys were undertaken as part of this assessment. A review of historic lizard records from within 10 km of the project area indicated that copper skink, forest gecko, elegant gecko, and pacific gecko have been recorded within the wider landscape (DOC BIOWEB Herpetofauna and Auckland Council Herpetofauna databases).

Table 4. Herpetofauna that may be present within Sunfield North and/or have been recorded within 10 km of the project footprint (mainland taxa only), including conservation threat status (Hitchmough et al., 2021), and potential occurrence within the site.

	Common Name	Species Name	NZ threat status	Distance to nearest record	Habitat potential within site
Indigenou	Copper skink	*Oligosoma aeneum*	At Risk – Declining	< 1 km	✓
	Forest gecko	*Mokopirirakau granulatus*	At Risk - Declining	< 7 km	×
	Elegant gecko	*Naultinus elegans*	At Risk – Declining	< 4 km	×
	Pacific gecko	*Dactylocnemis pacificus*	Not Threatened	< 7 km	×
Exotic	Plague skink	*Lampropholis delicata*	Introduced & naturalised	< 1 km	✓
	Southern bell frog	*Ranoidea raniformis*	Introduced & naturalised	< 6 km	✓
	Green and golden bell frog	*Ranoidea aurea*	Introduced & naturalised	< 5 km	✓

For gecko (pacific, forest and elegant gecko) populations to persist, vegetated areas with good connectivity needs to be relatively stable over time. Due to the lack of established indigenous vegetation and complete lack of connectivity to other suitable habitat, these geckos are not expected to be found within the site. Copper and ornate skinks are generally found in areas supporting dense ground cover (including exotic rank grasses) or under logs or other debris around forest floors or vegetated edge habitats. Copper skinks occur widely throughout the Auckland region. Throughout the site, low quality skink habitat is present in the form of rank long grasses within the shelter belts. Due to the presence of low-quality skink habitat, and recorded observations within 2 km of the site, copper skink may be present within Sunfield North.

4.2.3.2 Avifauna

Due to the isolated nature and high edge effects, the avifauna habitat value within the site was considered to be **Low.**

A formal avifauna survey was not undertaken; however, an opportunistic survey was carried out and all avifauna seen or heard were recorded. During the site assessment, a range of common 'Not Threatened' indigenous birds and exotic birds were seen or recorded including welcome swallow (*Hirundo neoxana*), swamp harrier (*Circus approximans*), pūkeko (*Porphyrio melanotus*), with exotic species consisting of sparrow (*Passer domesticus*), and rosella (*Platycercus eximius*).

Desktop investigations show a range of commonly seen indigenous avifauna are present within the general area of the site, including sacred kingfisher (*Todiramphus sanctus*), waxeye (*Zosterops lateralis*), black-backed gulls (*Larus dominicanus*) and red-billed gulls (*Chroicocephalus novaehollandiae*). No suitable habitat for gulls was considered to be present within the site, however the species may rarely visit the site for resting and scavenging, but it is highly unlikely that 'At Risk' or 'Threatened' species would utilise the site on a permanent basis.

Table 5. Avifauna observed within Sunfield North, and avifauna recorded within close proximity to the site, including conservation status (Robertson et al, 2021).

Species name	Common name	Classification	Observation
Larus dominicanus	Black-backed gull	Not Threatened	eBird
Fringilla coelebs	Chaffinch	Introduced & naturalised	On-site
Gerygone igata	Grey warbler	Not Threatened	eBird
Phasianus colchicus	Pheasant	Introduced & naturalised	On-site
Himantopus himantopus	Pied stilt	Not Threatened	On-site
Vanellus miles	Plover	Not Threatened	On-site
Porphyrio melanotus	Pūkeko	Not Threatened	On-site
Chroicocephalus novaehollandiae	Red-billed gull	At Risk – Declining	eBird
Platycercus eximius	Rosella	Introduced & naturalised	On-site
Todiramphus sanctus	Sacred kingfisher	Not Threatened	eBird
Alauda arvensis	Skylark	Introduced & naturalised	On-site
Passer domesticus	Sparrow	Introduced & naturalised	On-site
Circus approximans	Swamp harrier	Not Threatened	On-site
Zosterops lateralis	Waxeye	Not Threatened	eBird
Hirundo neoxena	Welcome swallow	Not Threatened	On-site
Egretta novaehollandiae	White-faced heron	Not Threatened	eBird

4.2.3.3 Bats

Long-tailed bats (pekapeka; *Chalinolobus tuberculatus*) are classified as 'Nationally Critical' (O'Donnell et al., 2023). No bat surveys have previously been undertaken within the site. There is one bat record within 5 km, situated 4.7 km north of the site. A number of bat passes have been recorded within 25 km of the Site, including (Figure 4):

- A large number of records associated with Hunua Ranges Regional Park, a known stronghold for long-tailed bats
- A large number of records to the south/ south-east of the Site in the Franklin District, which is known to harbour multiple pekapeka colonies
- Two records north of the site, in the rural landscape surrounding Flat Bush

There are a sizeable number of bat surveys with no detections in proximity to the Site, especially near to the higher density housing areas of Papakura.

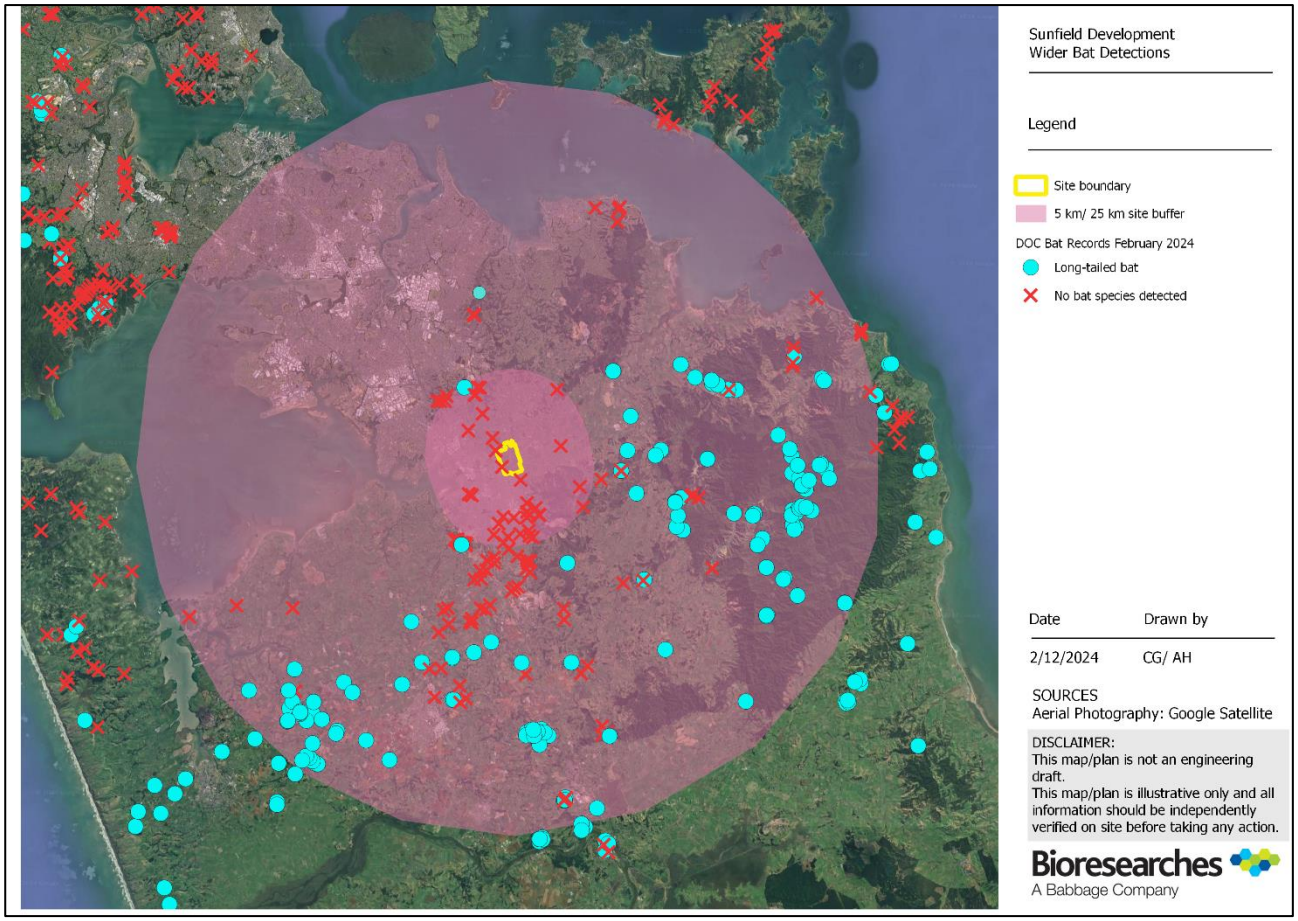

Figure 4. Map of wider bat detections with 5 km buffer (inner pink circle) and 25 km buffer (large pink circle) provided for context

Long-tailed bats typically use linear landscape features such as bush edges, gullies and water courses to transit between roosting and feeding sites (Borkin and Parsons 2009; Griffiths 1996). They also tend to forage in open areas, including clearings (Borkin and Parsons 2009; Griffiths 1996), along forest edges (Alexander 2001), over wetlands, open water, and along rivers and quiet roadways (Borkin and Parsons, 2009; Griffiths, 1996). Long-tailed bats may travel up to 19 km between roost sites and foraging areas (O'Donnell, 2001).

Bats are dependent on roosting cavities with specific microclimates, which are typically rare in anthropogenic landscapes. They require large trees (including exotic and standing dead trees) with cavities (e.g., knot holes, hollows), and from summer, communal roosts are dominated by females and young. However, individual bats may still refuge beneath other suitable features such as within epiphytes, loose bark, hollow tree ferns or under dense tree fern skirts. In other areas of New Zealand, long-tailed bats are known to roost in stands of kahikatea, albeit denser and larger than the stands present within the site (Photo 9).

Photo 9. Kahikatea stand in Rukahia (south Hamilton) which is used for roosting by the local long-tailed bat population. Photo from Google Maps.

A survey using Automatic Bat Monitors (ABMs; DOC AR4s) was conducted with 6 units from 4/4/24 – 19/4/24 across the Sunfield North and South sites, with placement targeting linear features such as tree rows which might be used as flyways and waterways which could support drinking/ foraging habitat for bats (Figure 5). One ABM failed (Unit 6), and no bats were detected with the remaining five units during the total 67 valid survey nights (Table 6).

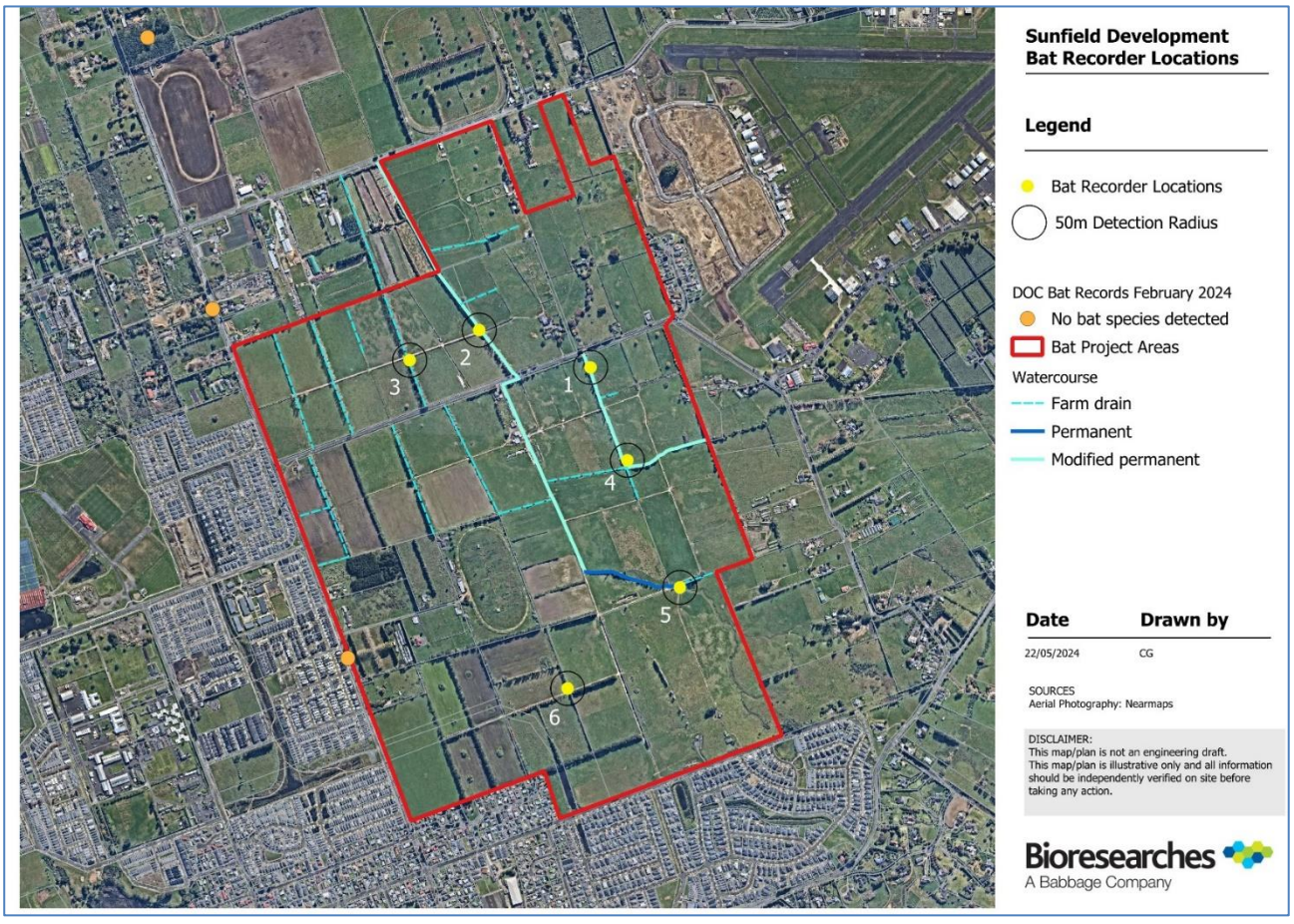

Figure 5. April 2024 bat survey ABM locations

Table 6. Summary of bat survey results

Recorder	Type	Date Set	Date Complete	Valid Survey Nights	Bat passes?
1	AR4	04/04/24	16/04/24	13	N
2	AR4	04/04/24	19/04/24	15	N
3	AR4	04/04/24	17/04/24	14	N
4	AR4	04/04/24	14/04/24	11	N
5	AR4	04/04/24	17/04/24	14	N
6	AR4	04/04/24	Unknown	-	-

While the survey detected no bats at the site, pekapeka are known to alter their habitat use throughout the year based on food availability and differing roost requirements across seasons and life stages. Without multiple surveys to span the breeding season, we cannot make conclusive statements regarding use of the site by long-tailed bats. However, the survey targeted the late-season period where young are volant and moving around the landscape, and breeding females have finished lactating/ care of young and broaden their home ranges (O'Donnell, 2001), likely increasing chance of detection during surveys.

The negative survey combined with the site's limited habitat and proximity to urban areas makes it unlikely the Sunfield site is used with high frequency by bats, but they may intermittently utilise the site for commuting, foraging, or potentially roosting – although it should be noted that the potential roosting habitat present is poor quality due to the sparse, exposed nature of existing tree stands (i.e. cavities would likely have poor thermal stability).

When considering the ecological value of the site for long-tailed bats, considerations were made in regard to to the presence of roost trees (being 'very high' value bat habitat) with an overall low risk of bats being present. Conservatively, the ecological value of bats was considered to be **Moderate.**

The closest records of short-tailed bats (*Mystacina tuberculata* – 'Nationally Vulnerable') are outside the Auckland region (excepting Little Barrier Island), with the nearest records within the Coromandel region. This species has far more specific habitat requirements than long-tailed bats (mature forest tracts with minimal introduced predators). No short-tailed bats were detected in the site survey. Consequently, this species is considered highly unlikely to be present within the Site and has not been considered further.

4.2.4 Terrestrial Ecological Values Overview of Sunfield North

Matter	Score and justification
Representativeness	**Low** Vegetation within the site is not representative of the ecological district, or historic ecosystem extents. Rare kahikatea stands are grazed and lack functional understory and groundcover tiers, with the ecological integrity compromised by browse pressure. Fauna diversity is not high and predominantly consists of exotic or common 'Not Threatened' indigenous fauna.
Rarity/distinctiveness	**Moderate** No naturally uncommon or rare flora species are present within the site. The diversity of indigenous flora is low and includes common 'Not Threatened' flora species. Fauna values generally considered to be low, with the diversity of avifauna typical of common or exotic species. There is the potential presence of 'At Risk' terrestrial fauna species (copper skink), often associated with edge and regenerating ecosystems, and also remaining (low) chance that 'Threatened' long-tailed bats are present at other times of year.
Diversity and pattern	**Low** Floral diversity and pattern are low due to the lack of the expected range and abundances of species within all vegetation tiers. Vegetation within the site is predominantly mixed exotic and native vegetation, with no diversity in structure. Indigenous vegetation is generally of small, isolated fragments providing no connectivity to the wider ecological area. The lack of diversity of fruiting and flowering species that would provide a year-round food source that would attract a wide diversity of native avifauna is low.
Ecological context	**Low** The vegetation is surrounded by residential subdivisions and rural land, and is generally of low botanic quality. The small areas of indigenous vegetation provide important linkages or stepping stone habitat within the local or wider landscape context. None are providing significant or important buffering to indigenous areas of vegetation.
Overall Ecological Value	**Moderate**

4.3 Freshwater Ecology

Auckland Council Geomaps indicate several watercourses to be present throughout the site (Figure 1). These were ground truthed and classified during the site assessment as to their artificial, intermittent or permanent classification. The watercourses within Sunfield North predominantly consisted of modified permanent streams or artificial drainage channels. No natural inland wetlands were observed within the site. (Figure 3).

4.3.1 Watercourse 1

The ecological values of Watercourse 1 were assessed as **Low.**

Watercourse 1 is a **permanent stream** which has been historically modified through straightening and deepening, and potentially diversion (Photo 10). Watercourse 1 is visible on historic aerials from 1960, and it is likely the natural stream channel has been modified for over 80 years. Watercourse 1 was considered to be a modified permanent stream, rather than artificial due to the connectivity to the wider freshwater catchment on the upstream and downstream reaches. Watercourse 1 enters the site through a roadside drain on the southern portion of the site, and flows in a northern direction through an unnaturally straight and deep channel (Photo 11) for approximately 400 m before discharging from the site.

Photo 10. Watercourse 1 consisted of a modified permanent channel.

Photo 11. Watercourse 1 was unnaturally straight and deep.

Watercourse 1 was wide and deep, with the channel approximately one metre in width and surface water approximately 0.5 m deep. An embedded culvert is present in the stream channel resulting in a drop-in stream bed levels by approximately 0.3 m (*Photo 12*). The channel banks were incised and steep, approximately 0.6 m, restricting connectivity to the floodplain. Substrate throughout Watercourse 1 was predominantly soft with the channel bed consisting of compacted earth and a layer of fine sediments (*Photo 13*). A high degree of organic matter is present within the stream channel with leaf litter and woody debris established throughout. Hydrological variation within the stream reach is low, with the channel predominantly consisting of a straight run and shallow pools, however some woody debris dams have resulted in minor riffle habitat.

Photo 12. An embedded culvert is present within the stream channel

Photo 13. Watercourse 1 contained incised banks and soft substrates.

Riparian vegetation throughout Watercourse 1 was variable, with shade higher on the downstream reach, with more riparian vegetation present on the stream bank. Vegetation observed included Japanese cedar, tree privet, tōtara, and deciduous trees. On the downstream reach, the proportion of indigenous vegetation increased with tōtara, and flax (*Phormium tenax*) more abundant (*Photo 14*). Ground cover throughout the riparian yard was low, and largely consisted of bare ground, leaf litter, and grasses, lacking complexity. Although the band of trees and shrubs in the riparian yard was very narrow ranging from 0.4 m to 1 m in width and provided an overall moderate degree of shading. Bank stability and filtration low due to the sparse ground cover with evidence of bank incision and collapse present.

Photo 14. Native vegetation established on the downstream reach.

Photo 15. Aquatic habitat was low and limited to runs and occasional pools.

There was a low degree of aquatic habitat and diversity throughout the reach, with available habitat consisting of runs, occasional pools and debris (including rubbish and wood) (*Photo 15*). An embedded culvert is present within Watercourse 1, with the culvert pipe below the stream bed resulting in a “drop” which likely acts as a partial barrier to fish passage. Shortfin eel and banded kōkopu have been recorded within 2 km of the site, within similar freshwater environments (i.e. highly modified farm drains and artificial channels), and are likely to access and reside within Watercourse 1.

4.3.2 Artificial channels

The artificial drainage channels were considered to be of **Low** ecological value.

Within the Sunfield North site, multiple farm drains were present, intersecting the edges of the paddocks. The drains were classified as **artificial watercourses**, as they are not present on historic aerials from 1960, and no natural overland flow paths are present in the area which may have been modified to form the farm drains (Figure 2). The farm drains on the western side of the site (Drain a, b, c; Figure 3, *Photo 16* - *Photo 18*) transport water in a northern direction and discharge to Drain d on the northern side of the site (*Photo 19*). Drain e bisects the length of the western portion of the site and enters the neighbouring property on the northern boundary (*Photo 20*), discharging into a roadside drain on Airfield Road. Drains f and g flow in a western direction and discharge into Watercourse 1 (*Photo 21*). The drainage channels pass under the farm tracks via culverts, with undersized culverts observed within the lower reaches of Drain c and Drain e.

Photo 16. Drain a

Photo 17. Drain b

Artificial Drain a, b, d and e were relatively uniform in stream morphology and shape, with the channels straight, approximately one metre in width and water depth between 0.2 m to 0.6 m. Drain c, f and g were narrower, approximately 0.5 m wide and were either dry or contained shallow (<0.1 m depth) standing water. Each drain consisted of a single run and occasional scour pools, with soft substrates and macrophytes such as willow weed (*Persicaria maculosa*) and starwort (*Callitriche stagnalis*) growing within the drain channel. Long filamentous brown algae dominated Drain d with a sulphuric smell present. Water clarity was variable throughout the drains with Drain a, d, and e, containing clear, but tannin coloured water while Drains b, c, f and g were opaque indicating a high degree of turbidity present.

Photo 18. Drain c

Photo 19. Drain d

Photo 20. Drain e

Photo 21. Drain f

Riparian vegetation lining the artificial drains consisted of shelter belts, with the vegetation observed mixed exotic and native. The dominant vegetation included poplars, Japanese cedar, barberry, and poplar, with rank grasses and occasional sedges forming the ground cover. The riparian yards of each drain was fenced and consisted of a narrow (0.5 m to 1 m) band of shrubs and trees before reverting to pasture grasses. The lower portion of Drain a, the shelter belt/riparian yard was formed by tōtara with juvenile lemonwoods, and exotic groundcover vegetation throughout.

Aquatic habitat within the drainage channels was low and restricted to single runs and occasional areas of woody debris. Due to the degraded state, indigenous aquatic fauna which would access and reside within the drainage channels would be restricted to robust species such as shortfin eel, and potentially banded kōkopu.

4.3.3 Freshwater Ecological Values Overview of Sunfield North

Matter	Score and justification
Representativeness	**Low** The permanent stream is highly modified through straightening and deepening to form a drainage channel for the surrounding landscape. The stream reach and artificial drainage channels are soft bottomed with fine sediments present throughout with reduced water quality and increased turbidity. Riparian vegetation narrow (<2 m) and consisting of mixed exotic and native vegetation which lacks functional understory and ground cover, consists of weedy shrubs, rank grasses and/or bare ground. Macrophyte species consist of exotic specimens, with no native species. Indigenous aquatic fauna that would be present within freshwater ecosystems consist of locally common, robust species and exotic species.
Rarity/distinctiveness	**Low** Watercourses are modified or artificially constructed with low aquatic habitat and riparian yard functions. Watercourses are unlikely to provide habitat to 'At Risk' species such as longfin eel due to highly degraded habitats. Contains low diversity in aquatic habitat which is limited to runs and occasional shallow pools.
Diversity and pattern	**Low** Low natural diversity in stream morphologies with the watercourses consisting of uniform channels due to modification and construction. Low natural diversity of aquatic fauna due to the degraded state of the watercourses, and lack of aquatic habitat variation Macroinvertebrate communities expected to consist of pollutant tolerant species. Low complexity in in-stream habitats, stream morphology and riparian yards.
Ecological context	**Low** Highly modified or constructed watercourses to facilitate farm drainage providing poor instream habitat, consisting of turbid, nutrient enriched waters with soft sediments and uniform channel shape and morphology. Riparian margins are narrow (>2 m), and consist of exotic and native shelter belt trees, lacking complex understory or groundcover with an overall low degree of overhanging vegetation. Watercourses within the site provide a low connectivity to the wider catchment
Overall Ecological Value	**Low**

5 SUNFIELD SOUTH

5.1 Background and Ecosystem Classification

Historically (pre-human), the site would have comprised of a mixture of bog/fen mosaic, pūriri forest (WF7-1), and kahikatea, pukatea forest (WF8) ecosystem types. These forest and fen mosaic ecosystems are characteristic of the Manukau Harbour with a warm humid climate (favouring WF8) and mild winters with either drained volcanic solids (favouring WF7-1) or poorly drained and gleyed alluvial soils and peats on river flats and swamps.

Historic aerial images show Sunfield South has been cleared of vegetation since 1960, with the only vegetation present situated within shelter belts throughout the site (Figure 6). The site has been used as agricultural land since the 1960s, with the surrounding landscaping consisting of farmland till present day. Agricultural activities undertaken in Sunfield South overtime consist of pasture grazing and horticulture crops. Currently, the site consists of a few small dwellings, and paddocks with a land use mixture of livestock grazing for horse and cattle, and cropping, including berries.

Due to historic and current intensive agriculture and pastoral land use, the site contains predominantly pasture, with very limited shrub and tree vegetation. The site does not support a SEA. The key terrestrial ecological values of the site are associated with occasional indigenous vegetation largely limited to the riparian yards, managed pasture, and shelterbelts (Figure 7). The ecological values of these features are linked to indigenous terrestrial fauna that may be utilising these as habitat.

Figure 6. Historic aerial image of Sunfield South from 1960. Image sourced from Retrolens.

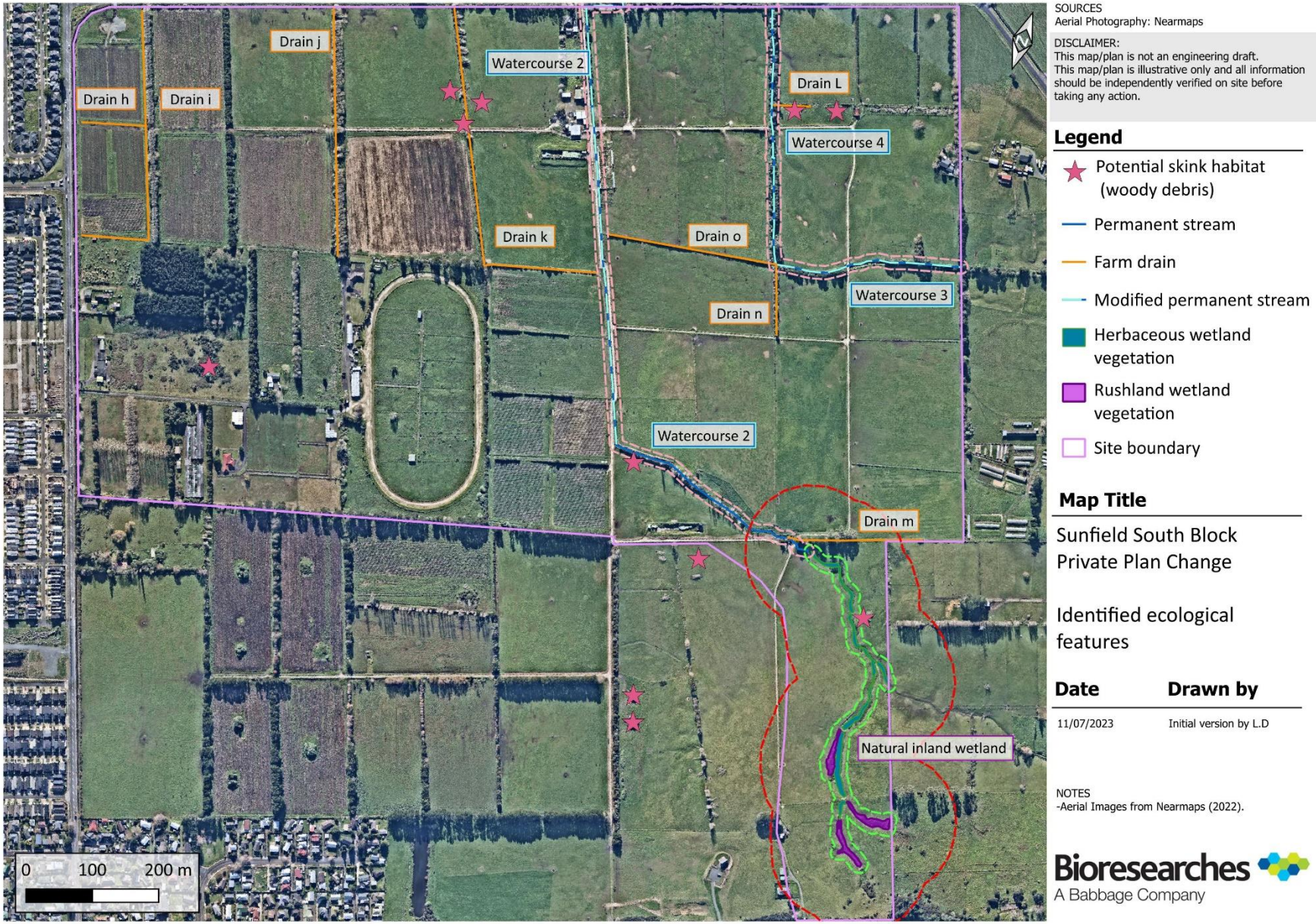

Figure 7. Identified ecological features within the Sunfield South block.

5.2 Terrestrial Ecology

5.2.1 Vegetation

The overall ecological value of vegetation areas within Sunfield South was assessed to be **Low**.

The majority of the vegetation present within Sunfield South is exotic and largely consists of vegetation for agricultural purposes (*Photo 22* & *Photo 23*). Woody vegetation such as trees and shrubs were largely limited to shelter belts and riparian yards which comprised of common, introduced species such as tree privet, poplars, willow (*Salix* sp.), cypress and pine (*Photo 24*). Within these shelter belts and riparian yards, pest infestation is present with gorse and woolly nightshade, with Japanese honeysuckle, morning glory, and ivy observed overgrowing the woody vegetation.

Native vegetation within the site is limited, and largely restricted to occasional tōtara trees within the shelter belts and riparian yard (Photo 25). The 'Ecosystem Current Extent' overlay in Geomaps does not classify any of the terrestrial features within the site as native ecosystems.

Photo 22. Horticultural paddocks within Sunfield South.

Photo 23. Pasture grazing vegetation within Sunfield South.

Photo 24. Woody vegetation was restricted to shelter belts and riparian yards.

Photo 25. Spare native vegetation was present in the shelter belts.

5.2.2 Connectivity and Ecological Function

The terrestrial vegetation, as it pertains to ecological connectivity and function, was assessed to be **negligible**.

Connectivity between areas of vegetation is important to facilitate ecological function. Edge communities are heavily influenced by increased exposure to light, drying winds, and competitive weeds. This 'edge effect' restricts some native flora and fauna to forest interiors. Patch fragmentation increases the edge effects and decreases the availability of habitat for interior species. Loss of ecological connectivity can also impair reproductive function for both flora and fauna.

All exotic and native vegetation within the site is isolated within the surrounding environment and there is no direct connectivity to significant terrestrial habitats. The nearest extensive area of vegetation is located approximately 1.5 km east of Sunfield South. As the vegetation within the site is limited to isolated, narrow strips of shelter belt and riparian yard, the vegetation is highly fragmented and subject to significant edge effects.

5.2.3 Indigenous Fauna

5.2.3.1 Herpetofauna

No formal herpetofauna surveys were undertaken as part of this assessment. A review of historic lizard records from within 10 km of the project area indicated that copper skink, forest gecko, elegant gecko, and pacific gecko have been recorded within the wider landscape (DOC BIOWEB Herpetofauna and Auckland Council Herpetofauna databases).

Table 7. Herpetofauna that may be present within Sunfield South and/or have been recorded within 10 km of the project footprint (mainland taxa only), including conservation threat status (Hitchmough et al., 2021) and potential occurrence in the site.

	Common Name	Species Name	NZ threat status	Distance to nearest record	Habitat potential within site
Indigenous	Copper skink	*Oligosoma aeneum*	At Risk – Declining	< 2 km	✓
	Forest gecko	*Mokopirirakau granulatus*	At Risk - Declining	< 7 km	×
	Elegant gecko	*Naultinus elegans*	At Risk – Declining	< 4 km	×
	Pacific gecko	*Dactylocnemis pacificus*	Not Threatened	< 7 km	×
Exotic	Plague skink	*Lampropholis delicata*	Introduced & naturalised	< 2 km	✓
	Southern bell frog	*Ranoidea raniformis*	Introduced & naturalised	< 6 km	✓
	Green and golden bell frog	*Ranoidea aurea*	Introduced & naturalised	< 5 km	✓

For gecko (pacific, forest and elegant gecko) populations to persist, vegetated areas with good connectivity needs to be relatively stable over time. Due to the lack of established indigenous vegetation and complete lack of connectivity to other suitable habitat, these geckos are not expected to be found within the site. Copper and ornate skinks are generally found in areas supporting dense ground cover (including exotic rank grasses) or under logs or other debris around forest floors or vegetated edge habitats. Copper skinks occur widely throughout the Auckland region. Throughout the site, low quality skink habitat is present in the form of wooden logs/materials and rank long grasses. Due to the presence of low-quality skink habitat, and recorded observations within 2 km of the site, it is expected that copper skink may be present.

5.2.3.2 Avifauna

Due to the isolated nature and high edge effects, the avifauna habitat value within the site was considered to be **Low**.

A formal avifauna survey was not undertaken; however, an opportunistic survey was carried out and all avifauna seen or heard were recorded. Desktop investigations of indigenous avifauna recorded within close proximity to the site was undertaken. During the site assessment, a range of not threatened indigenous avifauna species were observed, including fantail (*Rhipidura fuliginosa*), swamp harrier, welcome swallow and pūkeko. Additional exotic avifauna seen or heard included sparrow, chaffinch (*Fringilla coelebs*) and skylark (*Alauda arvensis*).

Desktop investigations show a range of commonly seen indigenous avifauna are present within the general area of the site and included sacred kingfisher, waxeye and blacked backed and red bill gulls. No suitable habitat for gulls was considered to be present within the site, however the species may rarely use the site for resting and scavenging, and it is highly unlikely that 'At Risk' or 'Threatened' species would utilise the site on a permanent basis.

Table 8. Avifauna observed within Sunfield South, and avifauna recorded within close proximity to the site, including conservation status (Robertson et al, 2021).

Species Name	Common Name	Threat Classification	Observation
Larus dominicanus	Black-backed gull	Not Threatened	eBird
Fringilla coelebs	Chaffinch	Introduced and Naturalised	On-site
Rhipidura fuliginosa	Fantail	Not Threatened	On-site
Chloris chloris	Greenfinch	Introduced and Naturalised	On-site
Gerygone igata	Grey warbler	Not Threatened	eBird
Acridotheres tristis	Myna	Introduced and Naturalised	On-site
Vanellus miles	Plover	Not Threatened	On-site
Porphyrio melanotus	Pūkeko	Not Threatened	On-site
Chroicocephalus novaehollandiae	Red-billed gull	At Risk – Declining	eBird
Todiramphus sanctus	Sacred kingfisher	Not Threatened	eBird
Alauda arvensis	Sky lark	Introduced and Naturalised	On-site
Passer domesticus	Sparrow	Introduced and Naturalised	On-site
Circus approximans	Swamp harrier	Not Threatened	On-site
Zosperops lateralis	Waxeye	Not Threatened	eBird
Hirundo neoxena	Welcome swallow	Not Threatened	On-site
Egretta novaehollandiae	White-faced heron	Not Threatened	eBird

5.2.3.3 Bats

The April bat survey targeted both the Sunfield North and South areas, with no bats detected (Figure 5).

Available habitat for bats within the Sunfield South site is largely restricted to scattered mature trees and exotic shelter belts. Pines within the site may provide roost habitat for bats on an intermittent basis.

The trees present within the Sunfield South block are considered less likely to support roosting bats than those in the Sunfield North block, due to lower availability of roosting features within the trees. Nonetheless, it is possible that long-tailed bats may visit the site; and could roost within the mature trees if suitable roost features are present, although the likelihood is considered low.

Although no bats were detected during the April 2024 survey and the habitat potential is limited, the presence bats during other times of the year cannot be ruled out. The ecological value of the site for bats is therefore conservatively considered to be **Low.**

5.2.4 Terrestrial Ecological Values Overview of Sunfield South

Matter	Score and justification
Representativeness	**Low** The site is dominated by exotic woody vegetation and pasture grasses, with indigneous vegetation consisting of sparse common trees. Vegetation within the site is not representative of the ecological district, or historic ecosystem extents.
Rarity/distinctiveness	**Moderate** No naturally uncommon or rare flora species are present within the site. The diversity of indigenous flora is low and includes common 'Not Threatened' Fauna values generally considered to be low, with the diversity of avifauna typical of common or exotic species. There is the potential presence of 'At Risk' terrestrial fauna species (copper skink), often associated with edge and regenerating ecosystems, as well as potential for 'Threatened' long-tailed bats
Diversity and patter	**Low** Floral diversity and pattern are low due to the lack of the expected range and abundance of species within all vegetation tiers. Vegetation within the site is predominantly mixed exotic and native vegetation, with no diversity in structure. Indigenous vegetation is restricted to isolated specimens present within the shelter belts and riparian yards. The site lacks diversity and abundance of fruiting and flowering species which would provide a year-round food source.
Ecological context	**Low** The vegetation is surrounded by residential subdivisions and rural land, and is generally of low botanic quality. The vegetation within Sunfield South does not provide linkages or steping stone habitat within the local or wider landscape context. None are providing significant or important buffering to indigenous areas of vegetation.
Overall Ecological Value	**Low**

5.3 Freshwater Ecology

The Auckland Council GeoMaps indicated several watercourses to be present thought Sunfield South (Figure 1). These were ground-truthed and classified during the site assessment as to their permanent, intermittent, ephemeral or artificial status. These watercourses are tributaries of the Papakura Stream, which flows in a western direction before discharging into the Manukau Harbour. One wetland was identified within the site and delineated per the Ministry for the Environments wetland delineated protocol guidelines, and contributes to the aquatic habitat present within the site (Figure 7).

5.3.1 Watercourse 2

The ecological values of Watercourse 2 were assessed as **Low**.

Watercourse 2 was present within the lower half of Sunfield South, forming the headwater of the tributary and flowed through a natural flow path (*Photo 26*) for approximately 750 m before being diverted and deepened into a farm drain (*Photo 27*). Watercourse 2 was classified as a **permanent stream** which has been modified through historic straightening and deepening. The upper reach and headwater of Watercourse 2 flowed through a natural inland wetland, further described in Section 5.3.4. Watercourse 2 had an average width, including the modified reach, of approximately 1 m, with an average depth of 0.5 m. The bank morphology throughout the reach was variable, with some sections containing highly incised, near vertical banks up to 0.5 m high or relatively low sloping banks with connectivity to the floodplain.

Photo 26. Upstream reach of Watercourse 2

Photo 27. Downstream reach of Watercourse 2

Flow was generally slow through Watercourse 2, with hydrological variation relatively low and consisting of runs and pools, with the uneven channel bed around tree roots creating occasional shallow cascades *(Photo 28*). The dominant substrate throughout the reach was soft with a layer of fine silt present on the stream bed (*Photo 29*). Macrophytes growing within the stream reach consisted of water celery (*Helosciadium nodiflorum*), and willow weed, with the density of these macrophytes dependant on shade provided by the riparian yard (*Photo 30*). The riparian yard was fenced, extending approximately one metre from the edge of the stream. Vegetation observed within the riparian yard consisted of occasional willow, poplars and Chinese privet, with understory vegetation consisting of rank pasture grasses (*Photo 31*). Shade was variable and ranged between high to very low, due to the lack of evergreen trees throughout the entire reach.

Photo 28. Root mats present in the upper reach

Photo 29. Watercourse 2 was soft bottomed with a fine layer of silt.

Photo 30. Macrophytes dominated the channel were shade was lowest.

Photo 31. The riparian yard was fenced and consisted of exotic trees.

Aquatic habitat within Watercourse 2 was considered to be low and largely restricted to the upper reach of the stream. Aquatic habitat included runs with of root mats, undercut banks, and occasional pools which would be suitable for common indigenous fish such as shortfin eel and banded kōkopu.

5.3.2 Watercourse 3

The ecological values of Watercourse 3 were assessed as **Low.**

Watercourse 3 was located on the eastern side of Sunfield South, and was classified as a **permanent stream**, which has largely been modified through straightening and deepening (*Photo 32*). Watercourse 3 flowed in an east to west direction for 208 m before forming a confluence with Watercourse 4. Watercourse 3 had an average width of 0.4 m and an average depth of 0.35 m with a relatively consistent channel morphology. The channel banks throughout the reach were steep and incised restricting the connectivity to the floodplain. Hydrological variation throughout Watercourse 3 was low, with the stream reach predominantly consisting of a single slow run and small pools present (*Photo 33*). The dominant substrate throughout Watercourse 3 was soft with fine sediments overlaying the compacted clay bed, and with suspended sediments present within the water column increasing the turbidity.

Photo 32. Watercourse 3 had been modified through straightening and deepening.

Photo 33. The reach consisted of a straight run with little variation.

The riparian yard of Watercourse 3 was fenced approximately 2 m to 4 m from the edge of the stream banks. Riparian vegetation adjacent to the stream was variable, comprised of tōtara, pine, tree privet, Chinese privet (*Ligustrum sinense*), and bamboo (*Bambusa glaucescens*) and overgrown with morning glory (*Ipomoea purpurea*) and bindweed (*Calystegia silvatica*) (*Photo 34* and *Photo 35*). Ground cover consisted of rank pasture grasses and weedy vegetation. The riparian yard provided a moderate degree of shade to the watercourse, particularly on the upstream reach. Filtration and bank stability were considered to be low, as evident by the turbid water and lack of sufficient rooting groundcover.

Photo 34. Occasional woody trees and shrubs present within the riparian yard.

Photo 35. Riparian yard was fenced approximately 2 m from the edge of the stream banks.

Aquatic habitat within Watercourse 3 was low, with a low degree of abundance and diversity. Habitat observed throughout Watercourse 3 consisted of straight runs and occasional pools and overhanging vegetation. Species which could access and reside within Watercourse 3 would be similar to those described in Watercourse 2, consisting of common, robust species.

5.3.3 Watercourse 4

Watercourse 4 flowed in a general south to north direction for approximately 400 m and discharges from the site to a roadside drain. Watercourse 4 had been modified through straightening and deepening with some variation in terms of depth, width, meanders and channel shape than the remaining modified watercourses within the site. Watercourse 4 was more reflective of a natural stream channel (*Photo 36*) and had an average width of 0.3 m and an average water depth of 0.25 m, with the downstream reach

widening to approximately 0.6 m in width and deeper water. Channel banks throughout Watercourse 4 were variable with some incision occurring and some relatively low bank profiles providing some connectivity to the floodplain (*Photo 37*).

Photo 36. Watercourse 4 was more reflective of a natural stream channel.

Photo 37. Some sections of the stream bank contained connectivity to the floodplain.

The dominant substrate throughout Watercourse 4 was soft with compacted clay bed and banks and a layer of fine sediment. Root mats, woody debris and leaf litter were prevalent throughout the watercourse with the macrophyte willow weed present along the channel banks and sparse patches of red ludwigia within the stream channel. There was a low degree of hydrological heterogeneity, with the reach consisting of a slow run with occasional fast runs present (Photo 38). Within the slow runs, water clarity was poor indicating turbidity with the fast runs containing clearer water. Vegetation observed throughout Watercourse 4 included poplars, willows, Chinese privet, bamboo and pine, with morning glory, English ivy and Japanese honeysuckle smothering the woody vegetation. Ground cover throughout the riparian yard consisted of rank grasses and leaf litter, with lianes covering the ground and woody vegetation (Photo 39). The riparian yard was fenced approximately 4 m from the banks of the stream, with the vegetation providing a moderate degree of shade to the watercourse. Filtration and bank stability are likely to be low, due to the shallow rooting long grasses and trailing plant groundcover.

Photo 38. Hydrological variation was low and consisted of runs and occasional pools.

Photo 39. The riparian yard was smothered by climbing lianes.

Aquatic habitat abundance and diversity was low, and consisted of slow runs and occasional pools. Some exposed root mats are present on the edges of the stream, which may provide some low-quality fish

cover. Aquatic fauna that is likely to be present within Watercourse 4 would be similar to Watercourse 1-3, and include shortfin eel and potentially banded kōkopu.

5.3.4 Artificial Watercourses

The ecological values of the artificial watercourses were assessed as **Negligible**.

Within the Sunfield South site, multiple artificial channels were present throughout the site on the paddock boundaries. The farm drains were classified as **artificial watercourses** as no natural overland flow paths are present within the vicinity of the drains in historic aerial images, and the drains contain no natural portions between their confluence and headwater were present. Drain h, L, m and o transported water in an east to west direction, while Drain i, j, k and n drained water flowing in a south to north direction. The drains were unnaturally straight and uniform in shape (Photo 40 to Photo 43). No natural overland flow paths present within historic aerials which may have been modified to form artificial watercourses. The drainage channels discharged into roadside drains, with the exception of Drain m, which discharges into Watercourse 2.

Photo 40. Drain j

Photo 41. Drain k (northern reach)

Photo 42. Drain k (eastern reach)

Photo 43. Drain m

The drains were approximately 0.6 m in width and water depth between 0.1 m to 0.2 m, with the banks steep and incised. Each drain consisted of a single run, with the substrate soft and consisting of compacted clay bed and banks with willow weed growing within the drain channel. Riparian vegetation lining the artificial drains consisted of shelter belts, with the vegetation observed mixed exotic and native. The

dominant vegetation included tree privet, poplars and pines with rank grasses and occasional sedges forming the ground cover.

Aquatic habitat within the drainage channels was low and restricted to single runs and occasional areas of woody debris. Due to the degraded state, indigenous aquatic fauna which would access and reside within the drainage channels would be restricted to robust species such as shortfin eel, and potentially banded kōkopu.

5.3.5 Natural Inland Wetland

The ecological values of the natural inland wetland were assessed as **Low.**

A natural inland wetland (the wetland), was established within the headwaters and upper reach of Watercourse 1 with a defined flow path meandering through the hydric vegetation. The natural inland wetland was approximately 3,930 m^2 in size and consisted of two distinct plant communities of which herbaceous hydric vegetation formed 2,340 m^2 of the wetland, established within the stream channel and edges, and rush fields covering 1,590 m^2 of the floodplain. Vegetation within the herbaceous community consisted of common, weedy plants including the notified pest plant reed-sweet grass (*Glyceria maxima*), willow weed, water celery and red ludwigia (*Ludwigia repens*) (Photo 44). Within the rush community, soft rush (*Juncus effusus*) dominated the area with lotus (*Lotus pedunculatus*), buttercup (*Ranunculus* sp.) and occasional willow weed (*Photo 45*). Both the herbaceous vegetation and rush field passed the rapid dominance test and the collective area was classified as **natural inland wetland**.

Photo 44. Herbaceous plant community

Photo 45. Rushland plant community

Photo 46. Deep standing water was present throughout the wetland.

Photo 47. The natural inland wetland discharged to Watercourse 2 through an undersized culvert.

At the time of assessment, the wetland contained boggy ground and standing water outside of the flow path, with deep standing water in the stream channel (Photo 46). The wetland was severely pugged, with areas not subject to stock impacts within the neighbouring property consisting of a grassed swale. Multiple undersized culverts supporting farm crossings extend over the flow path and wetland. Riparian vegetation established around the natural inland wetland consisted of grazed pasture grasses, with sparse barberry, and privet. The upper 30 m of flow path which contained dense stands of gorse and some fencing. Aquatic habitat was low throughout the wetland and solely consisted of the defined flow path through the centre, however the thick rhizomes and root mats of the reed-sweet grass likely restricts fish passage through the area. The natural inland wetland discharges into the stream reach of Watercourse 1 through an undersized culvert (Photo 47).

5.3.6 Freshwater Ecological Values Overview of Sunfield South

Matter	Score and justification
Representativeness	**Low** Surface water systems within the site consist of artificially constructed farm drains or permanent streams which have been modified through straightening and deepening to form drainage channels. Water within these channels are highly turbid and provide a very low degree of aquatic habitat. The wetland is dominated by exotic plant species, including listed pest plant, and has been highly modified from its original vegetation. Streams within the site have been highly modified through straightening and deepening to form drainage channels for the surrounding landscape
Rarity/distinctiveness	**Low** No rare or 'At Risk' species are expected to live within the watercourses due to their degraded state. Macrophytes consist of exotic species, with exotic woody vegetation dominating riparian yards, with occasion, common native trees present. Wetland is entirely vegetation with non-native plant species. Dominance of reed-sweet grass would prevent the establishment and growth of indigenous wetland, or floodplain appropriate vegetation.
Diversity and pattern	**Low** Watercourses within the site consist of straight and deep channels, with no diversity in channel morphology and aquatic habitat. The surface water systems would support a low natural diversity of aquatic fauna, with macroinvertebrate communities expected to consist of pollutant tolerant species. Low complexity in in-stream habitats, stream morphology and riparian yards. The degraded wetland and exotic vegetation community would limit the degree of food resources to native fauna. Furthermore, the degraded state of the wetland and presence of reed-sweet grass would restrict the degree of aquatic habitat and movement of aquatic fauna through the area.
Ecological context	**Low** No stock damage to watercourses due to fencing, however riparian yards narrow (<2m) restricting riparian yard functions. Vegetation consists of exotic species with sparse native shelter belt trees, lacking complexity. Highly modified or constructed watercourses to facilitate farm drainage providing poor instream habitat, consisting of turbid, nutrient enriched waters with soft sediments and uniform channel shape and morphology. Watercourses within the site provide a low connectivity to the wider catchment Vegetation types within the wetland are relatively uniform throughout the wetland, and consisted of only herbaceous tier vegetation with no living trees or other structural tiers present. The wetland is impacted by stock access through pugging and grazing, with no riparian buffer. In some areas, gorse bushes are present however these offer little riparian function or benefits to the wetland. The wetland is linked to a modified permanent stream, however has no connectivity to moderate quality and above freshwater ecosystems.
Overall Ecological Value	**Low**

6 COSGRAVE ROAD

6.1 Background and Ecosystem Classification

Historically (pre-human), the site would have comprised of a mixture of bog/fen mosaic, pūriri forest (WF7-1), and kahikatea, pukatea forest (WF8), ecosystems types with a small section of tararie, tawa, podocarp forest (WF9) (Singers *et al*., 2017). These forest and fen mosaic ecosystems are characteristic of the Manukau ecological district, which are characterised by low altitude topography near the Manukau Harbour with a warm humid climate (favouring WF8) and mild winters with drained volcanic soils (favouring WF7-1).

Historic aerial images show the site has been partially cleared of vegetation for approximately 60 years, with shrub-like vegetation present in the centre of the site (Figure 8). The scrub vegetation was subsequently cleared prior to 1981 (Figure 9), with the site and surrounding landscape consisting of agricultural farmland until the present day. Agricultural activities within the site overtime include horticultural activities and pasture grazing. Currently, the site consists of a few small dwellings, and paddocks with a land use mixture of livestock and crops, including horses and fruit (watermelon and strawberry).

Due to historical and current intensive agricultural and pastoral land use activities, the site contains predominantly pasture, with very limited shrub/tree vegetation. The key terrestrial ecological values of the site are associated with occasional indigenous vegetation, managed pasture, exotic shelterbelts and planted tree stands. The site does not support a Significant Ecological Area (SEA). The ecological values of these features are linked to the indigenous terrestrial fauna that may be utilising these as habitats.

Figure 8. Historic aerial image from 1960 showing a section of vegetation within the centre of the site and lack of natural overland flow paths. Image sourced from Retrolens.

Figure 9. Historic aerial image from 1981 showing the remnant of the vegetation after bush clearance and natural overland flow paths are absent. Image sourced from Retrolens.

6.2 Terrestrial Ecology

6.2.1 Vegetation

The overall ecological value of vegetation areas was conservatively assessed to be of low ecological value.

The majority of the vegetation present within the site is exotic and largely consists of vegetation for agricultural purposes, with pasture grasses utilised for horse grazing, and horticulture (Photo 48 and Photo 49). Woody vegetation such as trees and shrubs were largely limited to shelterbelts, which comprised of commonly utilised introduced species such as wattles (*Acacia* sp.), poplars (*Populus alba*), Japanese cedar (*Cryptomeria japonica*) and bald cypress (*Taxodium distichum*) (Photo 50 and Photo 4).

Photo 48. Vegetation was predominantly used for horse grazing

Photo 49. Failed watermelon crop present within the site.

Photo 50 & Photo 51. Woody vegetation throughout the site was limited to shelter belts.

Native vegetation within the site is limited, and is largely restricted to occasional indigenous trees within the shelter belts and riparian margins (Photo 52 and Photo 6). Vegetation observed included kānuka (*Kunzea ericoides*), tōtara (*Podocarpus totara*) and flax (*Phormium tenax*). The 'Ecosystems Current Extent' overlay in Geomaps does not classify any of the terrestrial features within the site as native ecosystems.


Photo 52 & Photo 53. Indigenous vegetation was limited to riparian yards.

The terrestrial vegetation within the site is predominantly comprised of exotic and common indigenous species; therefore, the botanical values are considered to be low. The vegetation may provide habitat for common indigenous avifauna and lizards.

6.2.2 Connectivity and Ecological Function

The terrestrial vegetation, as it pertains to ecological connectivity and function, was considered to be of negligible ecological values.

Connectivity between areas of vegetation is important to facilitate ecological function. Edge communities are heavily influenced by increased exposure to light, drying winds and competitive weeds. This 'edge effect' restricts some native flora and fauna to forest interiors. Patch fragmentation increases the edge effect and decreases the availability of habitat for interior species. Loss of ecological connectivity can also impair reproductive function for both flora and fauna.

All exotic and native vegetation within the site are isolated within the surrounding environment and there is no direct connectivity to significant terrestrial habitat. The nearest extensive area of vegetation is located more than 2 km to the south-east of the site. As the vegetation within the site is limited to isolated, narrow strips such as shelter belts and riparian areas, the vegetation is highly fragmented, and is subject to significant edge effects.

6.2.3 Indigenous Fauna

6.2.3.1 Herpetofauna

No formal herpetofauna surveys were undertaken as part of this assessment. A review of historic lizard records from within 10 km of the project area indicated that copper skink (*Oligosoma aeneum*), forest gecko (*Mokopirirakau granulatus*), elegant gecko (*Naultinus elegans*), and Pacific gecko (*Dactylocnemis pacificus*) have been recorded within the wider landscape (DOC BIOWEB Herpetofauna and Auckland Council Herpetofauna databases).

Table 9. Herpetofauna that may be present within the project footprint and/or have been recorded within 10 km of the project footprint (mainland taxa only), including conservation threat status (Hitchmough et al., 2021) and potential occurrence in the site.

	Common name	Species name	NZ threat status	Distance to nearest record	Habitat potential within site
Indigenous	*Mokopirirakau granulatus*	Forest gecko	At Risk – Declining	< 8 km	x
	Naultinus elegans	Elegant gecko	At Risk – Declining	< 3 km	x
	Dactylocnemis pacificus	Pacific gecko	Not threatened	< 8 km	x
	Oligosoma aenuem	Copper skink	At Risk – Declining	< 1 km	✓
Exotic	*Lampropholis delicata*	Plague skink	Introduced & Naturalised	< 1 km	✓
	Litoria aurea	Green and golden bell frog	Introduced & Naturalised	< 8 km	✓
	Litoria sp.	Unidentified frog	Introduced & Naturalised	< 6 km	✓

Forest, pacific and elegant geckos are arboreal (tree dwelling) species that are typically associated with regenerating scrubland and forests. Pacific and forest geckos will also inhabit clay banks and rock walls within and around such forests or scrubland, and elegant geckos inhabiting a variety of forest ecosystems, including swamps and scrublands. For populations of these species to persist, vegetated areas with good connectivity need to be relatively stable over time. Due to the lack of established indigenous vegetation and complete lack of connectivity to other suitable habitats, these gecko species are not expected to be found within the site.

Copper skinks are generally found in areas supporting dense ground cover (including exotic rank grasses) or under logs or other debris around forest or vegetation edge habitats. Copper skinks occur widely across the Auckland Region. Throughout the site, low quality skink habitat is present in the form of woody debris piles, wooden pallets, and felled fence posts (Photo 54 and Photo 8) (Figure 10). Due to the presence of low-quality skink habitat, and recorded observations within 500 m of the site, it is expected that copper skink may be found within the site.

Overall, the complete lack of connectivity to other terrestrial habitats decreases the likelihood of stable populations of native lizards to persist; therefore, the lizard habitat value within the site was considered low.


Photo 54 & Photo 55. Potential copper skink habitats present within the site.

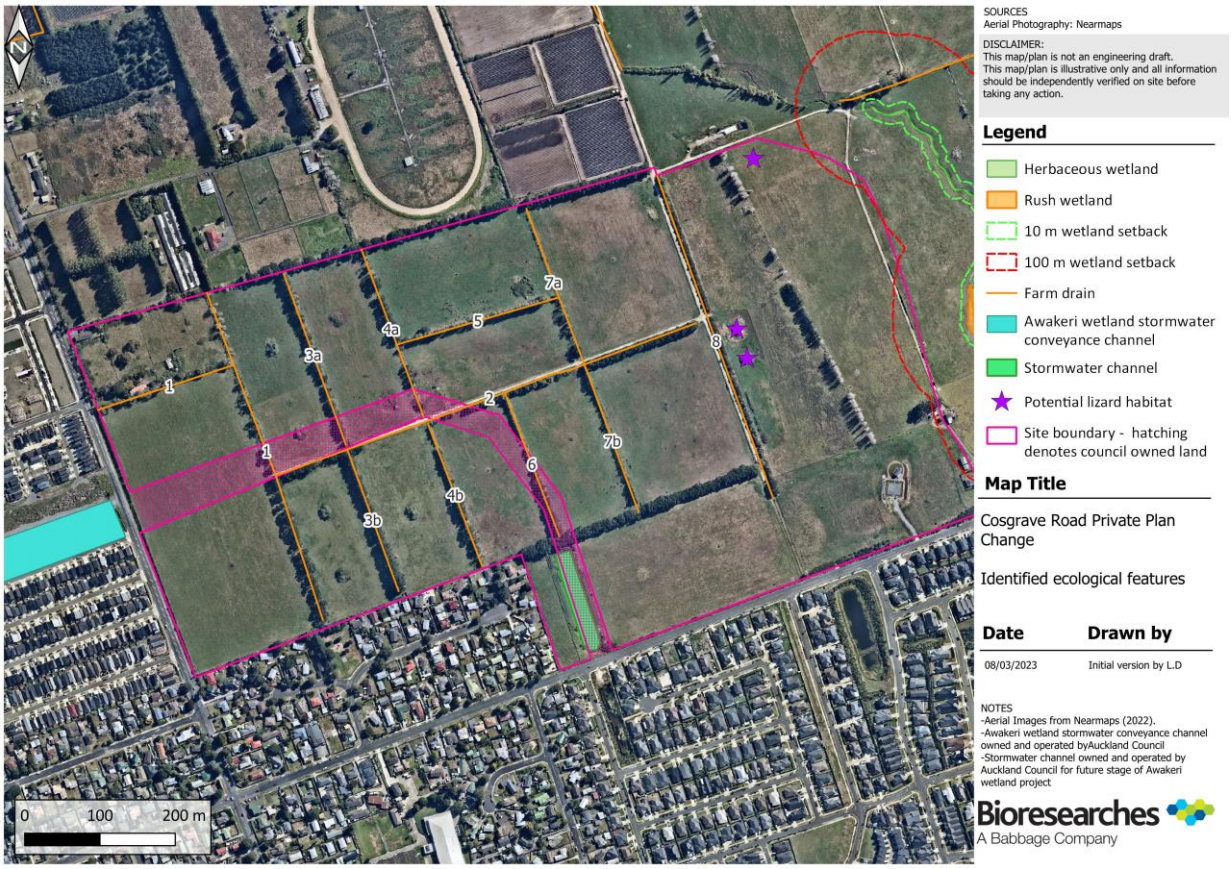

Figure 10. Identified ecological features within the Cosgrave Block. Note pink hashed polygon represents land owned by Auckland Council

6.2.3.2 Avifauna

Due to the isolated nature and high edge effects the avifauna habitat value within the site was considered to be very low.

A formal avifauna survey was not undertaken; however, an opportunistic survey was carried out and all avifauna seen or heard were recorded. During the site assessment, a range of not threatened indigenous avifauna species was observed, including pūkeko (*Porphyrio melanotus*), swamp harrier (*Circus approximans*), welcome swallow (*Hirundo neoxena*), fantail (*Rhipidura fuliginosa*), and shining cuckoo (*Chrysococcyx lucidus*). It is unlikely that 'At Risk' or 'Threatened' species utilise the site even on an intermittent basis.

6.2.3.3 Bats

Long-tailed bats (*Chalinolobus tuberculatus*) are classified as 'Nationally Critical' (O'Donnell et al., 2023). Long-tailed bats are highly mobile and have large home ranges of up to 5,629 ha (O'Donnell, 2001). No bat surveys have been undertaken within the site, and the closest bat records are 6 km south of the site and 6km north of the site (DOC bat records database, Feb 2024 version).

The closest records of short-tailed bats (*Mystacina tuberculata* – 'Nationally Vulnerable') are outside of the Auckland region (excepting Little Barrier Island), with the nearest records within the Coromandel region. This species has far more specific habitat requirements than long-tailed bats (mature forest tracts with minimal introduced predators).

The April 2024 bat survey had one unit at the edge of the Cosgrove area (unit 5) and one within (unit 6), although this latter unit failed to record. No bats were recorded across the Sunfield sites during the survey.

Due to recorder failure and change in habitat use by bats across seasons and life stages, the potential intermittent use of mature trees/ exotic shelterbelts by bats within the site for feeding, roosting, or as ecological corridors cannot be dismissed. Nonetheless, the ecological value of the available habitat for bats within the site is considered **Low**.

6.2.4 Terrestrial Ecological Values within Cosgrave

Matter	Score and justification
Representativeness	**Low** Riparian margins provide only native canopy which lacks sufficient ground cover. It is unlikely to support moderate or high value native fauna on a permanent basis.
Rarity/distinctiveness	**Moderate** No rare or distinct plant species were observed on site and none are considered likely, even on an intermittent basis. Fauna values generally considered to be low, however there is consideration of likelihood of two 'At Risk' terrestrial fauna species.
Diversity and pattern	**Low** The riparian vegetation on site is mixed exotic with some common natives, with no diversity in structure. Remainder of the site consists of pasture grasses and horticulture.
Ecological context	**Negligible** The vegetation is surrounded by residential subdivisions and rural land, and is of generally low botanic quality. Dense vegetation, approximately 1-2 km south-east of the site is more likely to provide resting habitat and corridors/linkages for native fauna.

6.3 Freshwater Ecology

The watercourses within Cosgrave Road were all artificial drainage channels, and were likely created to drain the surrounding landscape, and all flow from the site on the western boundary drain into a roadside drain. No natural inland wetlands, or areas indicative of a natural inland wetland, were observed within the site.

6.3.1 Drain 1

The ecological values of Drain 1 were assessed as **Negligible**.

Drain 1 was present on the western side of the site and consisted of a straightened and uniform channel, flowing in a south to north direction before a right-angle bend diverts the channel to a western flow. Drain 1 was approximately 1-2 m in width and was entirely straight with no natural portions throughout the entire length of the reach. As such, Drain 1 was classified as an **artificial watercourse.** The earliest historic aerial images of the site (1960) do not show a natural stream path to be present within the vicinity of Drain 1, however the watercourse may have been constructed prior to 1960 as the presence of a straight shelterbelt obscures the location of Drain 1.

The watercourse contained slow flowing run habitat between 0.2 m to 1 m in depth, with surface scums present (Photo 56). No variation on hydrological heterogeneity was observed. Water clarity was poor and opaque indicating a high degree of suspended sediments present throughout and a very high level of turbidity (Photo 57). Silt substrates dominated the watercourse, with willow weed (*Persicaria maculosa*)

covering approximately 10% of the watercourse. At the time of assessment, the drains were completely full and no evidence of bank collapse was obvious on the upper banks, however the banks appear to be vertical.

Drain 1 was fenced with some indigenous riparian planting present on the true left bank and included kānuka and flax. Additional vegetation observed throughout the riparian yard included poplars, privet (*Ligustrum lucidum*), and wattles, with groundcover consisting of long grasses and blackberry (*Rubus fruticosus*) (Photo 58 and Photo 59). The riparian vegetation provided low-moderate shading to the drain, and the narrow width of vegetation would provide low riparian functions such as filtration and bank stability. Aquatic habitat was of low value and limited to macrophytes and some woody debris present within the channel. As such, it is expected only shortfin eel (*Anguilla australis*) would reside within the farm drain.

Photo 56. Drain 1 was wide and deep.

Photo 57. Water clarity was poor.

Photo 58. Upstream ripairan vegetation for Drain 1.

Photo 59. Downstream riparian vegetation for Drain 1.

6.3.2 Drain 2

The ecological values of Drain 2 were assessed to be **Negligible.**

Drain 2 flowed in an east to west direction, with the headwaters forming at a farm track intersection and drained into Drain 1. Drain 2 was classified as an **artificial watercourse** as it contained no natural portions from its headwaters to its confluence. Furthermore, historic aerial images do not indicate a stream to be present within the vicinity of Drain 2. Multiple farm drains discharge into Drain 2.

The flow path of Drain 2 was straight and uniform, approximately 1.5 m in width. Water depth was highly variable at the time of assessment, with the upper reaches completely dry (Photo 60) and the lower reaches of Drain 2 containing slow flowing water, which overtopped the channel banks in some locations (Photo 61 and Photo 62). The drain is likely dominated by silt substrates with heavy loading of fine sediments and turbidity present within the water column where water is present.

Drain 2 was lined by a shelter belt consisting of exotic trees including wattles, bald cypress and willow (*Salix* sp.) (Photo 63). Shade was variable throughout Drain 2, with drain reaches with lower shade containing willow weed macrophytes. The riparian vegetation is expected to provide only a low degree of filtration due to the lack of ground cover, and low bank stability due to the narrow width of the riparian vegetation. Aquatic habitat is similar to Drain 1 and limited to macrophytes and woody debris which has the potential to support robust indigenous fauna such as shortfin eel.

Photo 60. The upper section of Drain 2 was dry.

Photo 61. The downstream reach contained standing water.

Photo 62. Sections of Drain 2 overtopped the banks.

Photo 63. Riparian vegetation consisted of an exotic shelter belt.

6.3.3 Drain 3, Drain 4 and Drain 7

The ecological values of Drain 3, Drain 4 and Drain 7 were assessed to be **negligible**.

Drain 3, Drain 4 and Drain 7 have been grouped as they contain similar channel characteristics (Photo 64, Photo 65 and Photo 66). The entirety of the three drains is approximately 450 m in length with Drain 2 dividing the drains in the centre. The drains are each formed by two channel segments; one channel flowing from north to south and entering Drain 2 (Drain 3a, Drain 4a and Drain 7a), and the second section

draining south to north before discharging into Drain 2 (Drain 3b, Drain 4b and Drain 7b). Each segment is approximately 220 m in length. The drains are entirely straight and uniform in size, and do not contain any natural portions from their headwaters to their confluence with Drain 2. No natural streams are present in historic aerials in the same location as Drain 3, Drain 4 or Drain 7. As such, these drains were classified as **artificial watercourses**.

Standing water was present throughout the three drains, approximately 0.10 m to 0.60 m in depth and 0.60 m in width. No discernible flow was observed throughout the two drains and water was highly turbid with water murky and dirty in colour. The drains are entirely soft bottomed and there is heavy loading of fine sediments throughout. The drains were lined by shelter belts, with exotic vegetation such as sweetgum (*Liquidambar styraciflua*), wattles, willow, Japanese ceder, and bald cypress. Shade throughout the drain is variable, and as a result, willow weed has clogged over 60% of Drain 4. Aquatic habitat was very low, with the dense macrophyte growth limiting the abundance of habitat, and it is expected only shortfin eel would be present.

Photo 64. Drain 3.

Photo 65. Drain 4.

Photo 66. Drain 7.

6.3.4 Drain 5 and 6

The ecological values of Drain 5 and Drain 6 were assessed to be **negligible**.

Drain 5 was present within the central area of the site, parallel to Drain 2, and discharges into Drain 4. Drain 6 is present within the southern area of the site, flowing in a general south to north direction, and discharges into Drain 2. Drain 5 and Drain 6 were approximately 200 m – 220 m in length. The upstream

reach of Drain 6 falls within property owned by Auckland Council. Drain 5 and Drain 6 are entirely straight and uniform in channel shape with no natural section from their headwater to their confluence, and do not appear in historic aerial images prior to 2001. As such, Drain 5 and Drain 6 were classified as **artificial watercourses**.

Drain 5 and Drain 6 were uniform in channel shape, with an average wetted width of 0.6 m and an average depth of 0.3 m. The two drain reaches were soft bottomed and dominated by silt with occasional patches of willow weed present throughout the drains. There was very low hydrological heterogeneity, with the drains consisting of very slow runs with the water clarity murky, indicating a high degree of turbidity. Riparian vegetation throughout Drain 5 and Drain 6 consisted of mature, exotic trees forming a shelter belt. Vegetation observed throughout Drain 6 included Japanese ceder, sweet gum and willow. Drain 5 was lined by poplars with occasional flax interspersed throughout.

6.3.5 Drain 8

The ecological features of Drain 8 were considered to be **Low**.

Drain 8 was present on the eastern side of the site and flows in a general south to north direction, and discharges through a culvert into a farm drain, located outside of the property boundary. Drain 8 was approximately 450 m in length, and 0.70 m wide, with the channel straight and uniform throughout the reach. Drain 8 contained no natural portions from its headwaters to its confluence. Approximately 200 m of the downstream reach drain is present in aerial images from 1960, with the remainder of the upstream reach constructed prior to 1996. No natural stream features for the upstream reach are present in the 1960's aerial. As such, Drain 8 was classified as an **artificial watercourse**.

Standing water was present throughout the entire length of Drain 8 and was approximately 0.3 m deep at the time of assessment (Photo 67). The dominant substrate throughout the reach was silt, with a high loading of suspended sediment present within the water column, made evident by the murky and opaque colouration. Duck weed (*Lemna minor*), and willow weed were abundant throughout the reach, covering approximately 60% of the channel (Photo 68), with hydrological heterogeneity limited to a single slow run. The drain banks were steep, approximately 0.5 m to 0.7 m high, however no bank incision or collapse was observed, and the bank height was likely created when the drain was constructed (Photo 69).

The riparian yard on the true right bank has been planted, and included indigenous vegetation such as tōtara, mānuka (*Leptopermum scorparium*), and flax, with pest infestation occurring with gorse (*Ulex europaeus*), woolly nightshade (*Solanum mauritianum*), blackberry, pampas (*Cortaderia selloana*) and privet present (Photo 70). Riparian vegetation on the true left bank consisted of scrubby ground cover such as buttercup (*Ranunuculus* sp.), cocksfoot (*Dactylis glomerata*) and yarrow (*Achillea millefolium*), with some overhanging vegetation. Shade and filtration was considered to be low due to the lack of riparian vegetation on the true right bank. Aquatic habitat was low and limited to macrophytes, woody debris and overhanging vegetation. Species expected to reside within Drain 8 consists of shortfin eel.

Photo 67. Drain 8 contained slow flowing water and was relatively straight and uniform.

Photo 68. Macrophytes covered the surface of Drain 8.

Photo 69. The banks of Drain 8 were relatively steep.

Photo 70. Riparian vegetation was limited to the true right bank.

6.3.6 Freshwater Ecological Values Overview of Cosgrave Road

Matter	Score and justification
Representativeness	**Low** Catchment within the site entirely artificial and constructed for farm drainage with highly turbid water and very low aquatic habitat. Do not represent natural streams.
Rarity/distinctiveness	**Moderate** Freshwater systems within the site consist of constructed farm drains with visually poor water quality. No rare or distinct fauna species were observed on site and none are considered likely, even on an intermittent basis to access and reside within the site. Species assemblages would likely consist of robust fauna and pest species.
Diversity and pattern	**Low** Surface water systems consist of straight and narrow channels with no variation in aquatic habitat. Soft bottomed channels consisting of a single run which would support a very low diversity of freshwater fish and macroinvertebrates.
Ecological context	**Negligible** The surface water systems are surrounded by residential subdivisions and rural land, with little to no connectivity to the wider freshwater catchment. Low quality aquatic habitat and riparian yard complexity which would provide habitat to common, robust fauna.

6.4 Summary of Ecological Values

The terrestrial ecological value of the site is largely limited to the planted exotic vegetation and shelterbelts, and some small, isolated patches of planted native vegetation. The majority of the site is largely comprised of low-ecological value managed pasture.

The freshwater values of the site are limited to artificial watercourses created to facilitate farm drainage. No natural watercourses are apparent in aerial images, and the presence of highly-modified permanent/intermittent streams has been excluded. No natural inland wetlands area present, and aquatic fauna that may inhabit the artificial watercourses would be restricted to robust species such as shortfin eel.

7 POTENTIAL ECOLOGICAL CONSTRAINTS AND LIMITATIONS

7.1 Terrestrial Ecology

Low value vegetation is present throughout Sunfield South, predominantly consisting of mixed exotic and native riparian yards and shelter belts. Terrestrial vegetation within Sunfeild North is considered to be of moderate value, due to the likelihood of threatened bats and lizards. The site does not support an SEA overlay, notable tree overlay, or high-value vegetation which may meet the criteria of an SEA.

Based exclusively on the desktop assessment results, the potential presence of native lizards (e.g., copper skink) and long-tailed bats cannot be dismissed. As such, it is recommended a lizard survey is carried out across the site prior to the commencement of the development to determine the presence of native skinks. It is also recommended that an additional bat survey is conducted earlier during the breeding season (i.e. Dec-Jan) to give confidence that bats are absent, or that Bat Roost Protocols (Department of Conservation, 2024) are followed as a precaution when felling trees.

Under the AUP there are a number of constraints that apply to developing land near/in terrestrial ecosystems. The following rules in the AUP, relating to vegetation removal outside of riparian yards and the rural urban boundary Activity Table E15.4.1; Vegetation Management and Biodiversity):

- (A10) – Vegetation alteration or removal, including cumulative removal on a site over a 10-year period, of greater than 250 m^2 of indigenous vegetation that is contiguous vegetation on a site existing on 30 September 2012 and is outside the rural urban boundary is a restricted discretionary activity.

7.1.1 NPS-IB and Managing Indigenous Biodiversity Outside SNAs

The NPSIB (2023) provides direction to Council's to protect, maintain and restore indigenous biodiversity in the terrestrial environment. The NPSIB is considered relevant to the proposal because the site is in the terrestrial environment, and it contains indigenous biodiversity as defined in Section 1.6 (Interpretation) of the NPS-IB.

Section 3.16 (1) (NPSIB) states that any significant adverse effects must be managed by applying the effects management hierarchy (avoid, minimise, remedy, offset, compensate). The potential adverse effects, as assessed herein, are considered low level and therefore not significant.

Section 3.16 (2) (NPSIB) states that all other adverse effects that may adversely affect indigenous biodiversity outside an SNA must be managed to give effect to the objective and policies of the NPSIB.
The overall objective of the National Policy Statement is (2.1, NPSIB):

a. to maintain indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity after the commencement date; and
b. to achieve this:
    i. through recognising the mana of tangata whenua as kaitiaki of indigenous biodiversity; and
    ii. by recognising people and communities, including landowners, as stewards of indigenous biodiversity; and
    iii. by protecting and restoring indigenous biodiversity as necessary to achieve the overall maintenance of indigenous biodiversity; and while providing for the social, economic, and cultural wellbeing of people and communities now and in the future.

7.2 Freshwater Ecology

The current ecological values of freshwater ecosystems within the Sunfield Blocks and Cosgrave Block were assessed to range from negligible to low. A number of modified permanent streams, and artificial watercourses flow through the sites, with a natural inland wetland present within Sunfield South. Under the AUP, the National Policy Statement for Freshwater Management 2020 (NPS-FM) and National Environmental Standards for Freshwater 2020 (NES-F), there are a number of constraints that apply to developing land near/in freshwater ecosystems.

AUP Activity Table E3.4.1 (E3; Lakes, rivers, streams and wetlands) applies to potential works within the modified permanent streams at the site. Where there are the same rules within the NES-F and AUP, the more stringent of the two rules would apply. These AUP rules apply to activities in, on or over the bed of lakes, rivers, streams (including intermittent stream) and wetlands:

- (A19) – Diversion of a river or stream to a new course and associated disturbance and sediment discharge is a discretionary activity;
- (A23) Replacement, upgrading or extension of existing structures[2] complying with the standards in E3.6.1.12 is a permitted activity;
- (A24) – demolition or removal of structures lawfully existing[2] on or before 30 September 2013 is a permitted activity;
- (A29) - Bridges or pipe bridges complying with the standards in E3.6.1.16 is a permitted activity;
- (A32) - Culverts or fords less than 30 m in length when measured parallel to the direction to the direction of water flow complying with the standards in E3.6.1.8 is a permitted activity. Culverts or fords over 30 m in length is a discretionary activity (A33;
- (A49) – New reclamation or drainage, including filling over a piped stream is a non-complying activity; and
- (A53) – Any activity that is undertaken in, on, over or within the bed of an ephemeral river and stream complying with the standards in E3.6.1.1 is a permitted activity.

The following rules in the AUP, relating to vegetation removal near freshwater bodies (modified permanent streams and wetlands) (Activity Table E15.4.1; Vegetation Management and Biodiversity) may apply to the development of the site:

- (A6) – Pest plant removal is a permitted activity;
- (A17) – Vegetation alteration or removal within 10 m of rural streams in the Rural – Rural Production Zone and Rural – Mixed Rural Zone is a restricted discretionary activity; and
- (A18) – Vegetation alteration or removal within 20 m of a natural wetland or in the bed of a river is stream (permanent or intermittent) is a restricted discretionary activity.

Under the NES-F regulations, constraints may apply to developing land near natural inland wetlands. Wetland protections will be established through appropriate earthworks designs and the implementation of a construction management plan, which includes the requirement for appropriate erosion and sediment controls within Sunfield South.

[2] Structures lawfully existing on or before 30 September 2013 and the associated bed disturbance or depositing any substance, diversion of water and incidental temporary damming of water.

Drainage of natural inland wetlands

- 52 (1) – Earthworks outside, but within a 100 m setback from, a natural inland wetland is a non-complying activity if it
    - (a) results or is likely to result, in the complete or partial drainage of all or part of a natural inland wetland; and
    - (b) does not have another status under any of regulations 38 to 51.
- 52(2) – The taking, use, damming or diversion of water outside, but within a 100 m setback from, a natural inland wetland is a non-complying activity if it –
    - (a) results or is likely to result, in the complete or partial drainage of all or part of a natural inland wetland; and
    - (b) does not have another status under any of regulations 38 to 51.

Other activities

- 54 – the following activities are non-complying activities if they do not have another status under this subpart:
    - (a) Vegetation clearance within, or within a 10 m setback from, a natural inland wetland:
    - (b) Earthworks within, or within a 10 m setback from, a natural inland wetland
    - (c) The taking, use damming or diversion of water within, or within a 100 m setback from, a natural inland wetland if –
        - (i) There is a hydrological connection between the taking, use, damming or diversion and the wetland; and
        - (ii) The taking, use, damming, or diversion will change, or is likely to change, the water level range or hydrological function of the wetland:
    - (d) The discharge of water into water within, or within a 100 m setback from, a natural inland wetland if –
        - (i) There is a hydrological connection between the discharge and the wetland; and
        - (ii) The discharge will enter the wetland; and
        - (iii) The discharge will change, or is likely to change, the water level range or hydrological function of the wetland.

The proposal should apply the effects management hierarchy under the National Policy Statement for Freshwater Management 2020 (NPS-FM) where:

a) Adverse effects on wetlands and streams are first avoided, where practicable; and
b) Where adverse effects cannot be avoided, they are minimised where practicable; and
c) Where adverse effects cannot be minimised, they are remedied where practicable; and
d) Where more than minor residual adverse effects cannot be avoided, minimised, or remedied, aquatic offsetting is provided where possible; and
e) If aquatic offsetting of more than more than minor residual adverse effects is not possible, aquatic compensation is provided; and
f) If aquatic compensation is not appropriate, the activity itself is avoided.

Offset Requirements

Where it is not possible to remediate or mitigate effects to freshwater as there is a complete and permanent loss of aquatic habitat (such as stream reclamation). While stream reclamation cannot be mitigated, it can be offset or compensated. The loss of stream area would be considered a significant residual adverse effect under the AUP and the NPS-FM, and would require offset environmental compensation.

Under Section E3 Lakes, rivers, streams and wetlands of the AUP, E3.2. Objectives [rp] (3) states:

Significant residual adverse effects on lakes, rivers, streams or wetlands that cannot be avoided, remedied or mitigated are offset where this will promote the purpose of the Resource Management Act 1991.

The standard offset procedure for stream loss requires the use of Stream Ecological Valuation (SEV) methodology and Environmental Compensation Ratio (ECR) to quantify the amount of offset stream bed area required to achieve 'no-net-loss' of stream bed area (Stream length and average width). The requirements for stream environmental compensation and mitigation and the procedure to follow is detailed below.

Stream Offset Procedure

The following procedure summarises the steps required to calculate the amount of offset compensation required for stream works using the SEV and ECR methodology[3,4].

1. Characterise the quality of the aquatic habitat that will be lost as a result of the proposed development - undertake Stream Ecological (SEV) assessments of the impacted stream/s if appropriate.
2. Identify a compensation/offset site. Ideally this would be onsite either upstream or downstream of the site, within the same catchment, and as close to 'like for like' in character as the section of stream being impacted (similar stream width, characteristics) as outlined in the AUP (OP) Section E3.3(4). Initially onsite options would be investigated and if these options were not accepted as 'like for like', did not have enough length for mitigation works or were not suitable due to land ownership, then other options would be investigated offsite.
3. Once an offset site has been identified the habitat quality of the proposed offset stream would be characterised and an assessment undertaken.
4. The information would then be used to calculate the Environmental Compensation Ratio (ECR), which determines the area of compensation stream required based on the restoration/enhancement works taking place.
5. The section of compensation stream to be restored/enhanced would be defined. Restoration typically consists of undertaking native riparian planting to a minimum of 10m each side of the stream channel.

[3] SEV is the favoured method by Auckland Council, but an ecological value may also be based on the "Guidance of Good Practice Biodiversity Offsetting in New Zealand" document, which is an accepted alternative to SEV for offsetting (E3.3(4) AUP(OP)). Both documents have equal precedence within the AUP (OP).

[4] Storey, R. G., Neale, M. W., Rowe, D. K., Collier, K. J., Hatton, C., Joy, M. K., Maxted, J. R., Moore, S.,Parkyn, S. M., Phillips, N. & Quinn, J. M. (2011). Stream Ecological Valuation (SEV): A Method for Assessing the Ecological Function of AucklandStreams. Auckland Council Technical Report 2011/009. 66p.

6. A detailed restoration/riparian planting management plan would be developed. This plan would describe the areas and plant species to be planted, outline maintenance plans (e.g. weed management, pest management, plant replacement and fencing) and include any other restoration actions to be undertaken.
7. Legal agreement of the landowner to proceed would be obtained.
8. The restoration plan is then implemented.
9. Monitoring may be needed to confirm the riparian planting has been successful and that the ecological gains have been achieved.

The principles for aquatic offsetting within the NPS-FM[5], are

a. Adherence to effects management hierarchy
b. When aquatic offsetting is not appropriate
c. Scale of aquatic compensation
d. Additionally
e. Leakage
f. Long term outcomes
g. Landscape context
h. Time lags
i. Trading up
j. Financial contribution
k. Science and mātauranga Māori
l. Tangata whenua or Stakeholder participation
m. Transparency

Recommendations for stream loss offset

Offsetting, restoration and enhancement recommendations:

a. The site be located as close as possible to the subject site.
b. Be 'like-for-like'.
c. Achieve no net loss.
d. Preferably achieve biodiversity gains.
e. Offset ratios calculated by the ECR are adhered to, which are dependent on current and potential SEV values.
f. Minimum of 20 m (10 m either bank) of riparian planting undertaken within the offset site.
g. Consideration of the use of biodiversity offsetting.
h. The use of Storey et al. (2011), Appendix 8 (AUP) and the Ministry for the Environment et al. (2014) for guidance.
i. Legal protection of the offset site in perpetuity.

[5] Ministry for the Environment (2022. National Policy Statement for Freshwater Management 2020, amended December 2022.

REFERENCES

Alexander, J. (2001).

Ecology of long-tailed bats *Chalinolobus tuberculatus* (Forster, 1844) in the Waitakere Ranges: implications for monitoring. Unpublished MSc thesis, Lincoln University, Christchurch.

Borkin, K.M., Parsons, S. (2009).

Long-tailed bats' use of a *Pinus radiata* stand in Kinleith forest: Recommendations for monitoring. *New Zealand Journal of Forestry 53*: 83-43.

Department of Conservation. (2024).

Protocols for minimising the risk of felling occupied bat roosts (Bat Roost Protocols) (Version 4). Bat Recovery Group, Department of Conservation.

Griffiths, R. (1996).

Aspects of the ecology of a long-tailed bat *Chalinolobus tuberculatus* (Gray, 1843), population in a highly fragmented habitat. Unpublished MSc thesis, Lincoln University, Christchurch.

Hitchmough, R.A.; Barr, B.; Knox, C.; Lettink, M.; Monks, J.M.; Patterson, G.B.; Reardon, J.T.; van Winkel, D.; Rolfe, J.; Michel, P. (2021).

Conservation status of New Zealand reptiles, 2021. New Zealand Threat Classification Series 35. Department of Conservation, Wellington. 15 p.

O'Donnell, C. F. (2001).

Home range and use of space by *Chalinolobus tuberculatus*, a temperate rainforest bat from New Zealand. *Journal of Zoology*, 253, (2), 253–264.

O'Donnell, C. F. J., Borkin, K. M., Chrsitie, J., Davidson-Watts, I., Dennis, G., Pryde, M., & Michel, P. (2023).

Conservation status of bats in Aotearoa New Zealand, 2022 (Series 41; New Zealand Threat Classification, p. 18p). Department of Conservation.

Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. (2018)

Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

Singers N.J.D., Osbourne B., Lovegrove T., Jamieson A., Boow J., Sawyer J., Hill K., Andrews J., Hill S., and Webb C. (2017)

Indigenous terrestrial and wetland ecosystems of Auckland. *Auckland Council.*

Townsend, A.J.; de Lange, P.J.; Duffy, C.A.J.; Miskelly, C.M.; Molloy, J.; Norton, D.A. (2008).

New Zealand Threat Classification System manual. Department of Conservation, Wellington. 35 p.

APPLICABILITY AND LIMITATIONS

Restrictions of Intended Purpose

This report has been prepared solely for the benefit of Sunfield Developments Limited as our client with respect to the brief. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

Legal Interpretation

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards and should not be construed as legal opinions. Where opinions or judgements are to be relied on, they should be independently verified with appropriate legal advice.

Maps and Images

All maps, plans, and figures included in this report are indicative only and are not to be used or interpreted as engineering drafts. Do not scale any of the maps, plans or figures in this report. Any information shown here on maps, plans and figures should be independently verified on site before taking any action. Sources for map and plan compositions include LINZ Data and Map Services and local council GIS services. For further details regarding any maps, plans or figures in this report, please contact Sunfield Developments Limited.

Appendix A Bat Survey Memorandum

MEMORANDUM

Bioresearches
A Babbage Company

TO:	Sunfield Developments Limited	Date:	2 December 2024
COPY TO:	Simon Ash - Winton		
FROM:	Charlotte Garrett	Job No:	65507

BAT SURVEY 2024 – SUNFIELD DEVELOPMENTS

Bioresearches was engaged by Simon Ash, on behalf of Sunfield Developments Limited, to undertake a bat survey during the late summer season in 2024.

Previous bat survey work in the area has indicated that bats have been recorded within 5 km and 10 km of the site (Bioresearches, 2024). Some survey work has been undertaken immediately adjacent to the site (Department of Conservation bat records, Figure 2), with no bats detected. However, no survey work has been undertaken within the site.

Recorders were installed for three weeks at six locations during April 2024 (Figure 11). One recorder failed during this process (Recorder 6), and five recorders amassed a total of 67 valid survey nights across the survey period. Watercourses and areas of potential roost habitat were targeted.

Survey Period – Recording Methodology and Valid Nights

Department of Conservation (DOC) AR4s were used throughout the survey period to record activity. The first recorders were set on the 4th April, and the last data recorded on the 19th April. Time was set to record from one hour before official sunset, and one hour after official sunrise. AR4s were processed via DOC BatSearch 3.12.

Department of Conservation bat survey protocol was followed to determine the number of valid survey nights at each recorder. Nights were excluded when temperatures dropped below 10°C within the first four hours after official sunset. Nights were also excluded if rainfall exceeded 2.5mm within the first two hours after official sunset, and/or 5mm four hours after official sunset.

Table 1 above shows the recorders at each location, recorder type, total number of valid survey nights, and whether bat passes were detected. A table showing weather data on each survey night, including sunset time, rainfall and temperature, can be found in Appendix II.

Results

No bat recorders detected any bats. One recorder (Recorder 6) failed.

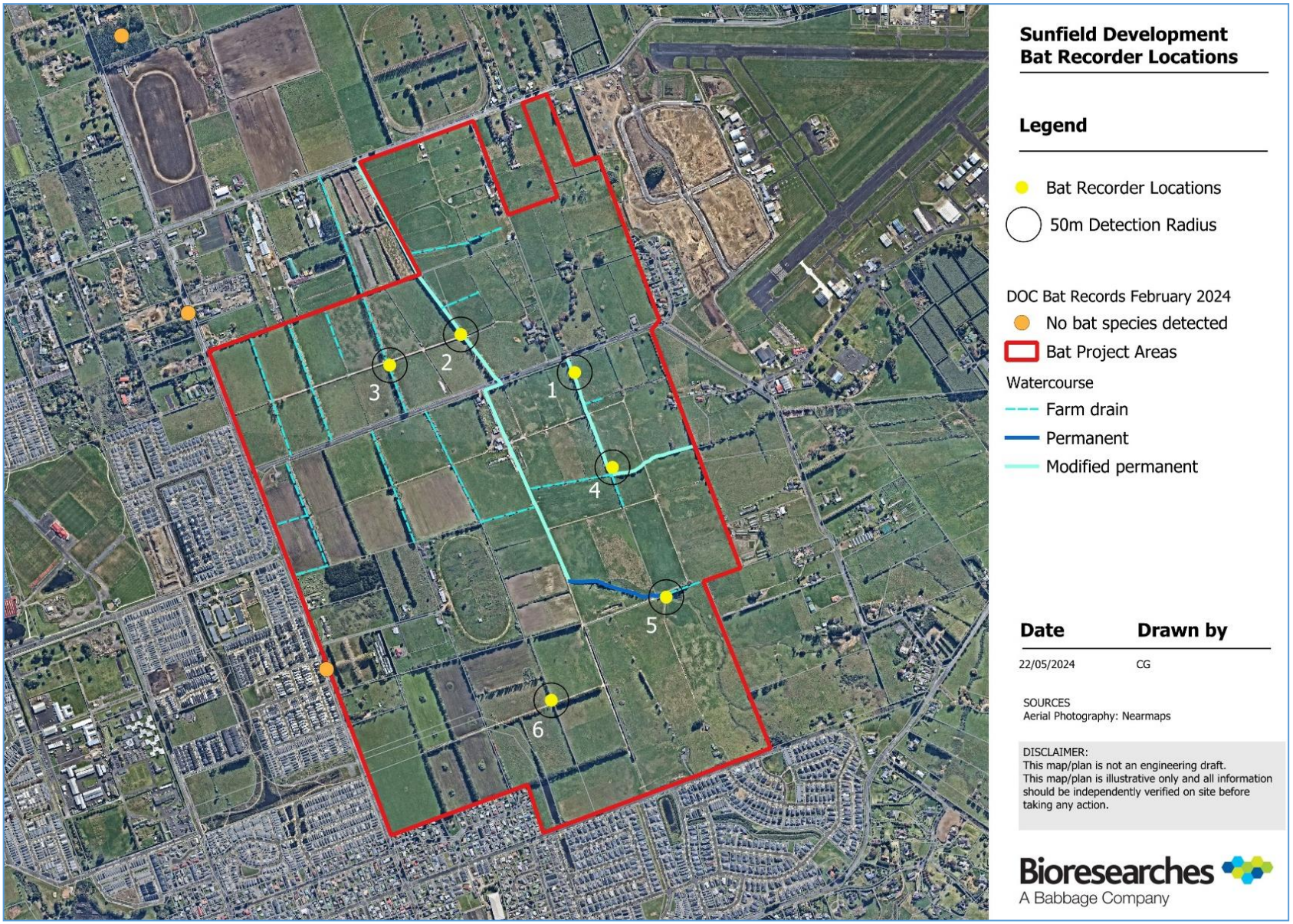

Figure 11: Map showing location of recorders within the Sunfield site, as well as local DOC records of previous bat survey work

Table 10: Table showing valid survey nights per recorder, and whether bat passes were detected

Recorder	Type	Date Set	Date Complete	Valid Survey Nights	Bat passes?
1	AR4	04/04/24	16/04/24	13	N
2	AR4	04/04/24	19/04/24	15	N
3	AR4	04/04/24	17/04/24	14	N
4	AR4	04/04/24	14/04/24	11	N
5	AR4	04/04/24	17/04/24	14	N
Total Valid Survey Nights				67	N

Conclusions

Overall, no bats were detected during the survey. The probability of bats using the site is low, given the surrounding urban environment, and lack of bat detections in previous surveys immediately adjacent to the site (DOC records, Figure 12). While the site is in proximity to longtail bat detections (Figure 2), the surrounding urban environment lowers the suitability of the site to LTBs, and previous detections have been made typically within remnant forest patches, or along extents of forested riparian margins.

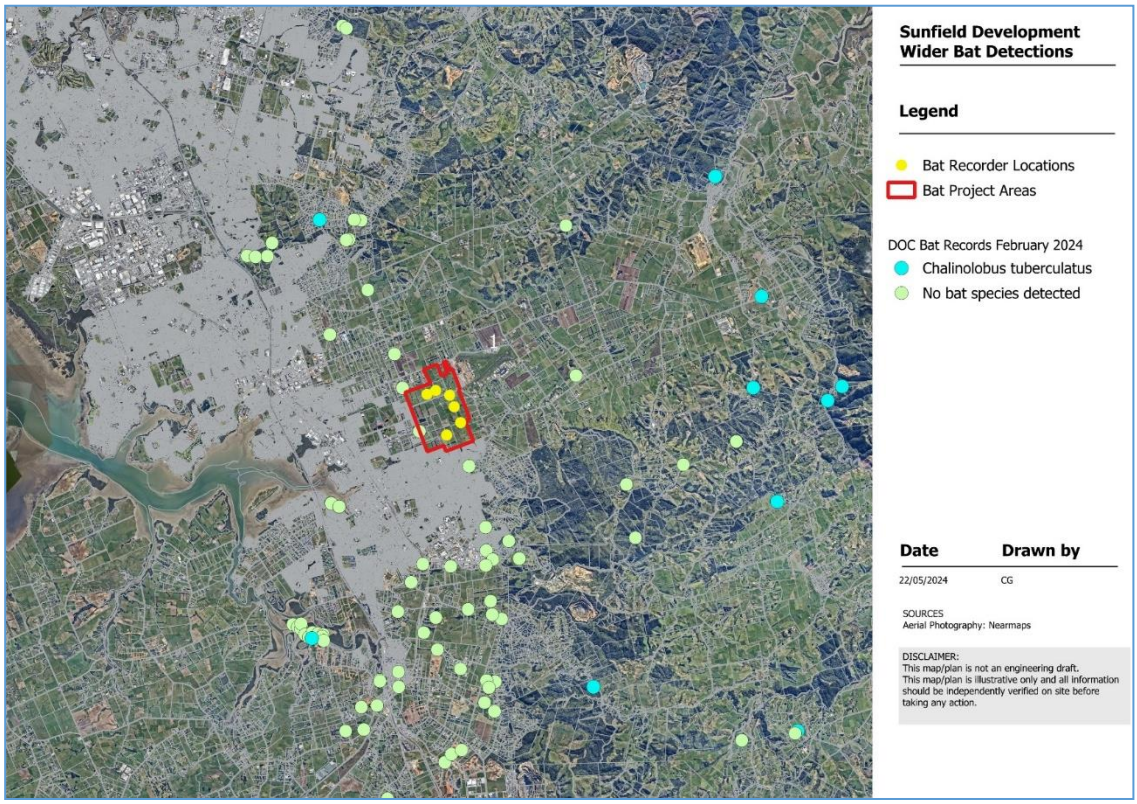

Figure 12: Map showing wider bat survey records surrounding the project area (survey records sourced from Department of Conservation)

Many thanks,

Charlotte Garrett B.Sc.
Ecologist
Bioresearches
A Babbage Company
Babbage Consultants Limited
Level 4, 68 Beach Road, Auckland 1010. PO Box 2027, Shortland Street, Auckland 1140

Auckland

Address | Level 4, 68 Beach Road, Auckland 1010
Post | PO Box 2027, Shortland Street, Auckland 1140, New Zealand
Ph | 64 9 379 9980
Fax | +64 9 377 1170
Email | contact-us@babbage.co.nz

Hamilton

Address | Unit 1, 85 Church Road, Pukete, Hamilton 3200
Post | PO Box 20068, Te Rapa, Hamilton 3241, New Zealand
Ph | +64 7 850 7010
Fax | +64 9 377 1170
Email | contact-us@babbage.co.nz

Christchurch

Address | 128 Montreal Street, Sydenham, Christchurch 8023
Post | PO Box 2373, Christchurch 8140, New Zealand
Ph | +64 3 379 2734
Fax | +64 3 379 1642

Email | solutions@babbage.co.nz

Babbage Consultants Australia Pty Ltd – Australia

Address | Suite 4, Level 2, 1 Yarra Street, Geelong, Victoria 3220, Australia
Ph | +61 3 8539 4805

Email | contact-us@babbage.co.nz

www.bioresearches.co.nz

www.babbage.co.nz

www.babbageconsultants.com.au