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Environmental Consultants



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SL1 Residential South Development Ecological Impact Assessment

Submitted to:
Saxby Rd JV Limited



water



fauna



flora



land

Quality Assurance

This report has been prepared and reviewed by the following:

Prepared by: Dr Simon Connolly
Ecologist



Chad Croft
Senior Ecologist



Reviewed by: Richard Montgomerie
Managing Director and Senior
Freshwater Ecologist



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ecoLogical solutions

tauranga office
115 the strand, tauranga 3110
p: 021 806 933

auckland office
building 4/195 main highway,
ellerslie, Auckland, 1051
p: 021 578 726

northland office
30 leigh street, kāeo
po box 180, kāeo 0448
p: 021 403 386

nelson office
p: 021 172 2091

www.ecoLogicalsolutions.co.nz

Qualifications, Experience and Code of Conduct

The qualifications and experience of the authors and technical director/reviewer of this report are summarised below. We confirm that we have read the Code of Conduct for Expert Witnesses Contained in the Environment Court of New Zealand Practice Note 2023 and we agree to comply with it. We confirm that the issues addressed in this report are within our area of expertise, except where we state that we are relying on the evidence or advice of another person. We have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this report.

Dr Simon Connolly – Ecologist

Dr Simon Connolly brings extensive experience from the research sector. He specialises in invertebrate ecology, having worked on New Zealand's threatened insect classification system and studied the behavior of native fishing spiders. His recent experience at Ecological Solutions includes opportunities and constraints assessments, assessments of rehabilitation outcomes, and ecological impact assessments across diverse habitats.



Signed: _____ Date: 2 September 2026

Chad Croft – Senior Ecologist

Chad Croft is a terrestrial and freshwater ecologist with 20+ years' experience delivering on a wide range of ecology projects from small scale land development to large scale infrastructure, public and private land management and landscape scale restoration. He has extensive experience in planning, managing and implementing both terrestrial and freshwater impact assessments, ecological surveys, ecosystem restoration, mitigation strategies and residual effects management through offset and compensation design.



Signed: _____ Date: 2 September 2026

Richard Montgomerie – Managing Director and Senior Freshwater Ecologist

Richard is the founder and managing director of Ecological Solutions and has over 27 years of ecology consulting experience. Throughout the past 27 years, Richard has led or supported assessments of the ecological effects of small- and large-scale land development, hydro schemes, primary industry, forestry and mining throughout New Zealand.



Signed: _____ Date: 2 September 2026

Executive Summary

Ecological Solutions Limited were engaged to undertake terrestrial and freshwater ecological surveys and prepare an ecological impact assessment (EclA) for the 'SL1 Residential South' development at 37a, 71 and 129 Saxbys Road, Hamilton (the 'Residential South Site') within the Southern Links 1 Project (SL1). The proposed Residential South Development comprises c. 46 ha of farmland located between Saxbys Road and Resthills Park.

Overall, the value of terrestrial ecological features on the Residential South Site ranged from negligible due to the predominance of exotic pasture and intensive farming, to very high due to the presence of long-tailed bats (*Chalinolobus tuberculatus*) which have a Conservation status of Threatened-Nationally Critical. Freshwater ecological features of the Residential South Site ranged from negligible due to the artificial watercourses (farm drains) to high due to the presence of two wetlands. According to the Waikato Regional Policy Statement (WRPS) ecological significance criteria the Residential South Site can be considered significant due to the presence of wetlands, and long-tailed bats; however, the level of bat activity recorded in comparison to other areas of Hamilton south and east of the Site indicates the Site is not likely important bat habitat.

The application of effects management measures to manage effects on indigenous fauna and habitat are outlined in specific management plans including a bird management plan (BirdMP), bat management plan (BMP), a fish management plan (FMP) a wetland management plan (WMP) and a lizard management plan (LMP). A Wildlife Approval under the FTAA is being applied for to implement the LMP and authorise the handling and incidental killing of lizards which may be missed during lizard management.

The ecological impacts attributable to the proposed development after application of effects management measures, ranged from very low to moderate, in accordance with the EclAG. A residual adverse effect, after the application of avoid, remedy, and mitigate, has been identified, attributable to the loss of wetland A and bat habitat. Commensurate compensation measures for the loss of these values have been proposed and sense checked with the Biodiversity Compensation Model (BCM) to achieve a 'net positive outcome'.

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1.0 Introduction

1.1 Background

Ecological Solutions Limited were engaged to undertake terrestrial and freshwater ecological surveys, prepare an ecological impact assessment (EclA) and associated ecological management plans as part of a FTAA substantive application for the SL1 Residential South Development. The SL1 Residential South Development is located at 37a, 71 and 129 Saxbys Road, Hamilton (the 'Residential South Site' or the 'Site') (Figure 1).

The SL1 Residential South Site is exclusively within Waipa District and is contiguous with Hamilton City Council's southwestern boundary.

1.2 Project Description

The SL1 Residential South Development forms part of the residential component of 'Southern Links 1', a listed project under FTAA 2024. The Southern Links 1 project is a combined 106 ha development, including residential and industrial activities. The residential component comprises circa 46 ha and is in single ownership and is currently used for rural farming activities. The landholding includes five land parcels legally described as Lot 2 DP 589463 (22.21 ha); Part Lot 2 DP 25668 and Part Lot 1 DP 25668 (33.64 ha); Lot 3 DP 394366 and Lot 1 DP South Auckland 51518 (7.58 ha); Lot 1 DPSA 69842, Lot 2 DPSA 11357, Lot 1 DPSA 75305 and Section 1 SO 60814 (26.13 ha); and Part Lot 1 DP 25668 (26.50 ha). This site is part of the wider Southern Links Growth Cell, a circa 440 ha contiguous land area that stretches the south-western edge of Hamilton that includes the Hamilton Southern Links (RoNS) designation.

The proposal seeks approval for a Substantive Application under the Fast-Track Approvals Act 2024 for a comprehensively master planned and staged residential development. This includes all necessary resource consents under the Resource Management Act 1991, including regional, district approvals where required.

The residential component provides for the establishment of c. 938 residential units, together with a neighbourhood commercial node, open spaces, waterbodies, and infrastructure devices including wetlands and roading as shown in the concept masterplan (Figure 2).

The proposal includes substantial enabling works to establish developable land, including bulk earthworks across the Site. An integrated stormwater management system including wetlands, detention/attenuation devices and treatment ponds supports the development. Ecological restoration is integrated via riparian and corridor planting with appropriate design measures being adopted to enhance and protect key features including the upper tributaries of the Mangakōtukutuku Stream and associated drains.

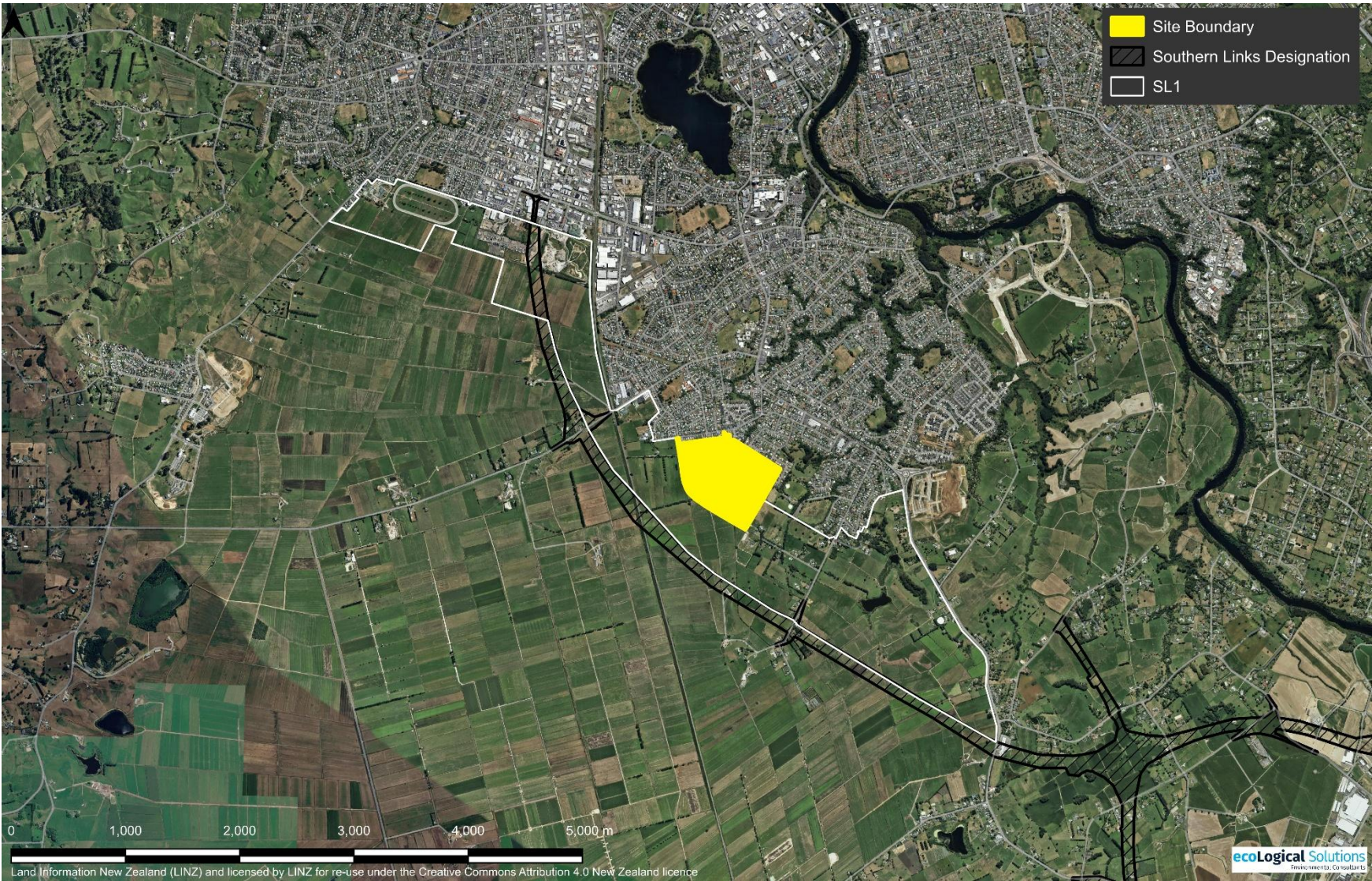


Figure 1: Location of Residential South Site within greater SL1 Growth Cell.

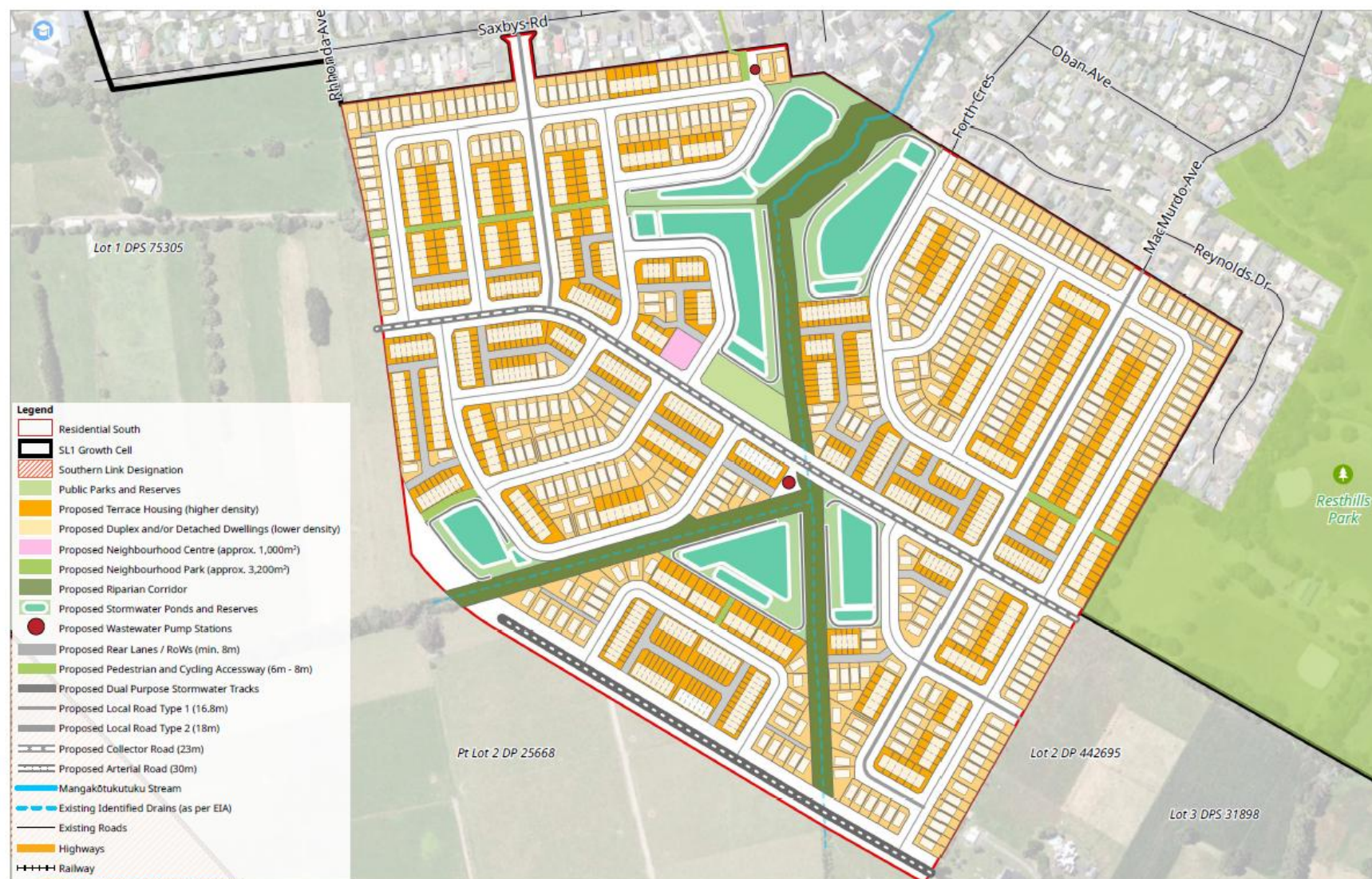


Figure 2: Concept Masterplan (provided by Barker and Associates 2026).

2.0 Scope of Report

The following EclA identifies the actual and potential ecological effects attributable to the proposed Residential South Development and provides recommendations for the management of adverse effects in accordance with the effects management hierarchy.

The following EclA considers both the New Zealand National Policy Statement for Freshwater Management 2020 amended December 2025 (NPS-FM; MfE 2025a) and the National Policy Statement for Indigenous Biodiversity 2023 amended December 2025 (NPS-IB; MfE 2025b). It has been prepared as part of a substantive application that will be lodged with the Environmental Protection Agency (EPA) for consideration by an expert panel.

3.0 Ecological Setting

3.1 Hamilton Ecological District

The Residential South Site lies within the Hamilton Ecological District ('the district') which covers c. 159,376 ha and is one of the most modified districts in New Zealand with only 1.6% of the original indigenous vegetation remaining (Leathwick et al. 1995). Vegetation was formerly predominantly bog, shrubland and fernland with small areas of swamp forest (McEwen 1987). Hamilton City, in the centre of this transformed landscape, has only a few tiny remnants of the former indigenous forest cover, less than c. 20 ha in total of high-quality indigenous habitat (Clarkson and McQueen 2004), but recent efforts have been made to restore gully systems and city-wide ecological connectivity via gully restoration projects.

No Significant Natural Areas (SNAs), identified in Schedule 9c of the Hamilton District Plan or the Waipa District Plan, occur within or immediately adjacent to the Residential South Site. The nearest operative SNA to the Residential South Site is the Mangakōtukutuku Gully located c. 1 km to the northeast. Proposed SNAs under Plan Change 9 (PC9) are located immediately adjacent to the north and east boundaries of the Residential South Site as part of the Mangakōtukutuku stream corridor and Resthills Park respectively (Figure 3).

3.2 Threatened Environment Classification

The Threatened Environment Classification (TEC) combines data from three national databases: Land Environments of New Zealand (Manaaki Whenua Landcare Research 2012), the Land Cover Database (LCDB V5.0), and the national protected areas network (Cieraad et al. 2015, Walker et al. 2015). The TEC is designed as a regional-national scale tool for assessing the threat status of land environments based on the loss of original natural vegetation cover and the extent to which the remaining indigenous vegetation is protected. The entire Residential South Site is within Threatened Environment Classification 2 (10–20% indigenous cover left), which means that any remaining indigenous vegetation would be ecologically important because of its rarity.

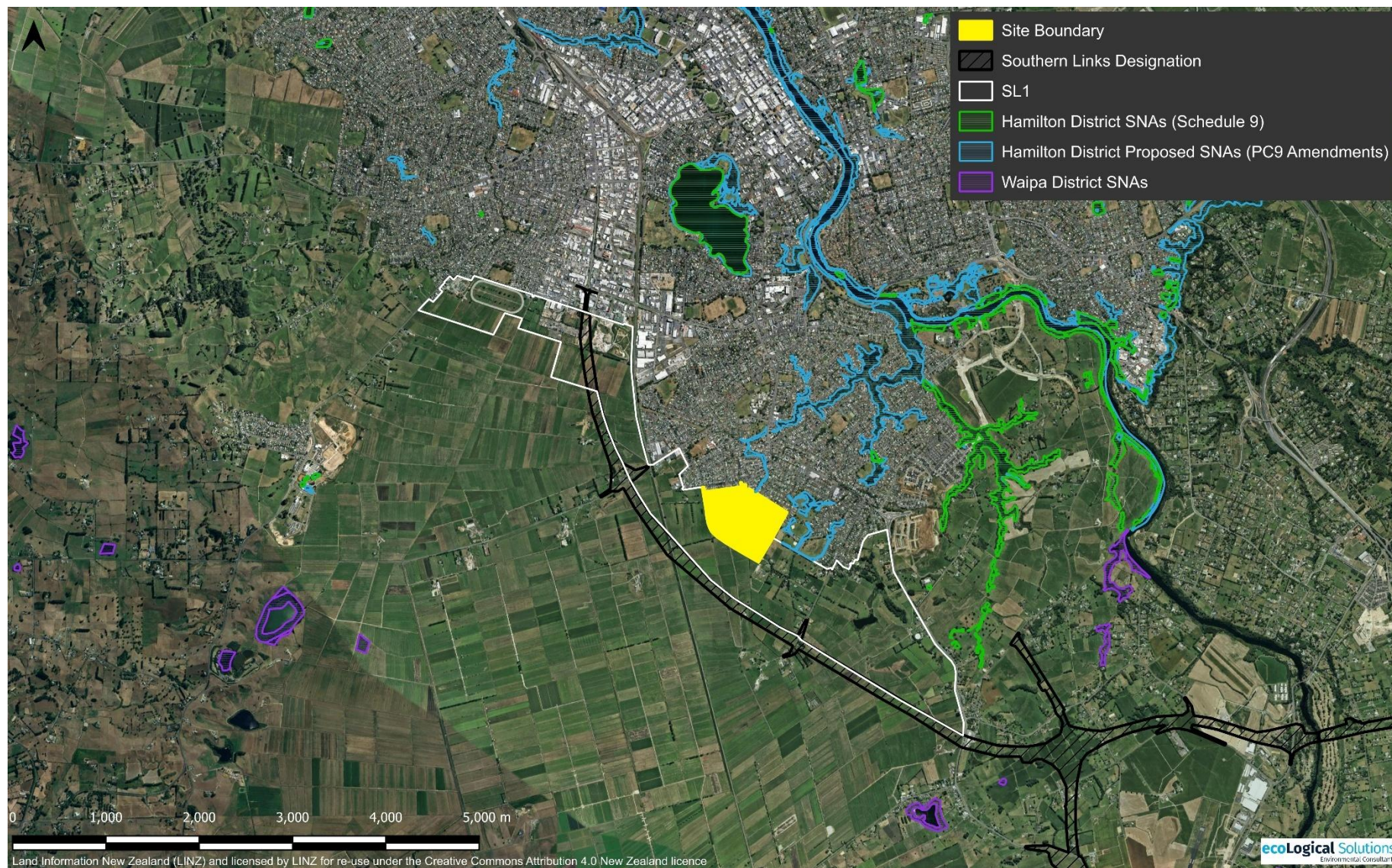


Figure 3: Significant Natural Areas in proximity to the Residential South Development.

4.0 Methods

4.1 Terrestrial Ecology

4.1.1 Vegetation

An initial desktop assessment of aerial imagery (e.g. Google Earth, Retrolens), topographic maps, GIS datasets (e.g., Land Cover Database version 5.0 (LCDB V5.0), Waikato Regional Council, Hamilton City Council) was used to inform an assessment of historic landcover and vegetation types, as well as current landcover and vegetation types within the Residential South Site and the Hamilton ED more generally.

Current vegetation at the Residential South Site was assessed during a survey undertaken by Ecological Solutions on 8 and 9 July 2025. Vegetation was photographed and described in terms of composition, value, structure, and integrity. Any 'Threatened' or 'At Risk' plant species encountered were recorded. Vegetation within any potential wetlands was surveyed as set out in Section 4.2 below.

4.1.2 Birds

A search of the eBird database (data retrieved April 2025) was undertaken for records within 10 km of the Site. Species with a conservation status of 'Threatened' or 'At Risk' (Robertson et al. 2021) were identified and their potential to use habitats within or near the Site was assessed.

All birds seen or heard during the July 2025 site survey were also recorded.

4.1.3 Lizards

A search of the Department of Conservation BioWeb database within 12 km¹ of the Site was undertaken to identify species which might be present. Data were issued by the Department of Conservation in March 2025.

Any potential lizard habitat on site was identified, photographed and location mapped during the July 2025 site survey. Manual habitat searches were undertaken within suitable lizard habitat areas during the site survey.

4.1.4 Bats

A search of the national bat database was undertaken for records within 25 km of the Site. Data were issued by the Department of Conservation on 4 February 2025. In addition, the Waikato Region Bats Distribution online map was reviewed for any additional data that may have been uploaded to the DOC database after February 2025 as well as any spatial planning information. The Waikato Region Bat Distribution represents data from the DOC National Database as at 17 June 2025 and includes spatial planning layers as at June 2024.

The Waikato Region Bat Distribution data includes three bat spatial planning layers (A, B and C) indicating differing spatial and content aspects for identifying bat habitat. These layers were prepared for the Bat Alliance group consisting of Waikato, Hamilton, and Waipa Districts where Layer A covers bat roost areas, Layer B covers connections including foraging and commuting corridors as bats fly across landscapes between roosts and foraging areas using waterways and waterbodies and Layer C covers areas of opportunity for habitat connectivity and identified gaps. In addition, an overlay polygon has been

¹ Distance to existing lizard records not precise. 12km equals smallest reporting distance in accordance with ESL's GIS data sharing agreement with the Department of Conservation.

created by placing a 2 km buffer around known bat roost locations for the southern Hamilton bat population. While these spatial layers have no regulatory function, the distribution of these layers in relation to the Residential South Site were examined to better understand the bat habitat values present.

Two automatic bat monitor (ABM) surveys were undertaken across the Site from 10 April–6 May 2025 broadly aligning with mating season and from 6 November–4 December 2025 corresponding to the pre-parturition period. Six AR4/AR5 ABMs were deployed across the Residential South Site in the April - May survey. The number of ABMs deployed during the November–December survey was increased to 11 with six deployed at the same locations over both surveys and additional ABMs added to increase coverage of the Site. Two ABMs were also deployed within Resthills Park as reference sites.

All ABM data was analysed using BatSearch Version 3.23. The number of valid survey nights was determined using the requirements outlined in the Bat Roost Protocols (Department of Conservation 2024). Weather data was provided by EnviroNZ from their onsite weather monitoring station (-37.808425, 175.258896).

Potential bat roost trees and features, (i.e. trees with a >15 cm dbh with cavities, crevices, loose bark etc), observed during the Site surveys were noted and photographed.

4.2 Wetlands

An initial desktop assessment was carried out using aerial imagery (e.g. Google Earth, Retrolens), topographic maps and GIS datasets (e.g., LCDB V5.0, Waikato Regional Council, Hamilton City Council). These were used to assist in assessing historic hydrological conditions and identify possible wetland locations and extents within the Site and within 100m of the Site for subsequent field survey.

A survey was undertaken on 9 July 2025 to determine the presence of wetland areas as defined in the Resource Management Act 1991 (RMA) and 'natural inland wetlands' as defined by the NPS-FM 2020 as amended in December 2025 (MfE 2025a) using the Wetland Delineation Protocols (MfE 2020).

4.3 Freshwater Ecology

4.3.1 Sampling sites

Freshwater ecological data collected in July 2025 from three locations (A, B, C; Table 1) within the Residential South Site included water physiochemistry, aquatic and riparian habitat and benthic macroinvertebrate community data. In addition, fish presence data was collected via trapping surveys and environmental DNA (eDNA) samples. The locations of the three assessment sites (A, B, C) are shown on Figure 4.

Table 1: Sites where freshwater ecological data was collected in July 2025.

Drain	Site description	NZTM	
		North	East
A	Main drain - Mangakōtukutuku Stream confluence	5810902.1	1800642.1
B	Western drain	5810781.9	1800524.0
C	Lesser western drain	5811096.2	1800309.3



Figure 4: Watercourse sampling sites – July 2025.

4.3.2 Water physiochemistry

Water physicochemical parameters including temperature, dissolved oxygen, pH and conductivity were measured at all sites using a calibrated handheld YSI meter. All water physicochemistry parameters were measured in accordance with National Environmental Monitoring Standards for Water Quality (NEMS 2020a).

4.3.3 Watercourse classification

Watercourses were classified in accordance with the definitions outlined in the Waikato Regional Plan (WRP) as set out in Table 2.

Table 2: Watercourse definitions in the Waikato Regional Plan.

Watercourse classification	Description
Artificial	A watercourse that contains no natural portions from its confluence with a river or stream to its headwaters and includes irrigation canals, water supply races, canals for the supply of water for electricity power generation and farm drainage canals.
Farm Drainage Canal	An artificial watercourse on a farm that contains no natural portions from its confluence with a river or stream to its headwaters, and includes a farm drain or a farm canal.
Modified Watercourse	An artificial or modified channel that may or may not be on the original watercourse alignment and which has a natural channel at its headwaters.
Ephemeral	Streams that flow continuously for at least three months between March and September but do not flow all year.
Perennial	Streams that flow year-round assuming average rainfall.

4.3.4 Aquatic and riparian habitat

Aquatic and riparian habitat data was collected at each site in accordance with the regional guidelines outlined in Collier and Kelly (2005). Data collected included:

- Channel width and water depth (at 10 transects).
- Streambed substrate composition.
- Streambed compaction and embeddedness.
- Streambank/channel erosion and channel modification.
- Organic matter content (woody debris, leaf litter and detritus).
- Channel shade, riparian vegetation.
- Waikato Regional Council (WRC) Habitat Scores (maximum possible 180).

4.3.5 Stream Ecological Valuation (SEV)

Stream Ecological Valuation (SEV) data can provide an indication of ecological function and values of watercourses. SEV surveys were undertaken along three representative reaches in accordance with the methodology in Storey et al. (2011). The location of the three SEV reaches are shown on Figure 4.

4.3.6 Benthic macroinvertebrates

A single benthic invertebrate sample was collected using a kick-net (mesh size 500 µm) in accordance with the National Environmental Monitoring Standards for Macroinvertebrates

(NEMS 2020b). Samples were collected from the same reach where water physicochemistry, habitat and aquatic flora cover data was collected. The following invertebrate metrics and indices were calculated:

- *Community composition* – relative abundance of the main taxonomic groups making up the macroinvertebrate communities recorded from each watercourse.
- *Taxa number* – measure of the overall health of macroinvertebrate communities. In general, high taxa number can be an indication of a healthy waterway.
- *Abundance* – measure of the total number of individuals in a sample.
- *EPT taxa number* – measure of the overall health of the community and of habitat and water quality. A higher number of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) (EPT) indicates a healthier waterway.
- *Macroinvertebrate Community Index (MCI-sb)* – presence/absence-based index for measuring stream health and in particular organic enrichment in streams. MCI-sb scores range from <80 (poor) to >120 (excellent) (Table 3; Stark and Maxted 2007). The NPS-FM also presents MCI thresholds (Table 4) (MfE 2025a).
- *Quantitative Macroinvertebrate Community Index (QMCI-sb)* – quantitative variant of the MCI-sb with an abundance component. QMCI-sb scores range from <4.00 (poor) to >6.00 (excellent) (Table 3; Stark and Maxted 2007). The NPS-FM also presents QMCI thresholds (Table 4) (MfE 2025a).
- *Average Score Per Metric (ASPM-sb)* – average score of the normalised MCI-sb, EPT and %EPT metrics. Scores range from 0 (low ecological integrity) to 1 (high ecological integrity) (Table 4).

Table 3: MCI-sb and QMCI-sb quality classes (Stark and Maxted 2007).

Stream health	Descriptions	MCI-sb	QMCI-sb
Excellent	Clean water	>120	>6.00
Good	Doubtful quality/possible mild pollution	100–119	5.00–5.99
Fair	Probable moderate pollution	80–99	4.00–4.99
Poor	Probable severe enrichment	<80	<4.00

Table 4: MCI and QMCI and APSM Attribute Bands and descriptions (NPS-FM 2020; MfE 2025a).

Attribute	Description ^{a,b}	MCI	QMCI	Description ^c	ASPM
A	Macroinvertebrate community indicative of pristine conditions with almost no organic pollution or nutrient enrichment.	≥130	≥6.50	Macroinvertebrate communities have high ecological integrity, similar to that expected in reference condition.	≥0.6
B	Macroinvertebrate community indicative of mild organic pollution or nutrient enrichment. Largely composed of taxa sensitive to organic pollution / nutrient enrichment.	≥110 and <130	≥5.5 and <6.5	Macroinvertebrate communities have mild-to-moderate loss of ecological integrity.	<0.6 and ≥0.4
C	Macroinvertebrate community indicative of moderate organic pollution or nutrient enrichment. There is a mixture of taxa sensitive and insensitive to organic pollution / nutrient enrichment.	≥90 and <110	≥4.5 and <5.5	Macroinvertebrate communities have moderate-to-severe loss of ecological integrity.	<0.4 and ≥0.3
National bottom line		90	4.5	National bottom line	0.3
D	Macroinvertebrate community indicative of severe organic pollution or nutrient enrichment. Communities are largely composed of taxa insensitive to organic pollution / nutrient enrichment.	<90	<4.50	Macroinvertebrate communities have severe loss of ecological integrity.	<0.3

Note: ^aMCI; ^bQMCI; ^cASPM.

4.3.7 Fish

A search of the New Zealand Freshwater Fish Database (NZFFD) (updated February 2025) was carried out to identify fish records within the Site and wider catchment.

During the site surveys, watercourses were inspected and assessed for their capacity to support fish, including black mudfish (*Neochanna diversus*), which are classified as 'At Risk – Declining' (Dunn et al. 2025). Watercourse reaches that contained adequate habitat and water levels were intensively trapped over two periods.

Initial survey - July 2025

Initial fish surveys were carried out over two nights of trapping within onsite watercourses with 60 Gee's minnow traps, two fine mesh fyke nets and six replicate eDNA samples collected from two reaches on 8 July 2025. The location of traps, nets and eDNA sampling sites are shown in (Figure 4).

Second survey – September 2025

An additional night of trapping was carried out on 9 September 2025 in response to a positive eDNA result for black mudfish from the July 2025 survey at the downstream sampling location. This additional sampling was used to determine if black mudfish were present within Drains C, and E (Figure 5) upstream of the positive eDNA sample. This trapping effort utilised 128 Gee's minnow traps over a c. 1 km of drain length sampled.



Figure 5: Watercourse sampling sites (black mudfish trapping) – September 2025.

4.4 Ecological Values and Effects

4.4.1 Assigning ecological value

Ecological values were assigned following the approach outlined in the Environment Institute of Australia and New Zealand's (EIANZ) Ecological Impact Assessment guidelines (EclAG) (Roper-Lindsay et al. 2018). The EclAG outline a standardised approach for defining ecological values. The approach involves assessing four matters including representativeness, rarity/distinctiveness, diversity/pattern and ecological context with consideration of the attributes outlined in Table 4 of the EclAG (Appendix A).

The overall ecological values within the Site and vicinity were assigned based on the four matters outlined above and using the scoring system outlined in Table 6 of the EclAG (Appendix A).

4.4.2 Assessment of ecological effects

The level of effects was assessed in accordance with the EclAG (Roper-Lindsay et al. 2018). This method involves assigning ecological values as above and determining the magnitude of effects based on criteria outlined in Table 8 of the EclAG and summarised below in Table 5.

The overall level of effect was assigned based on the value and the magnitude using the matrix in Table 10 of the EclAG and summarised below in Table 6. The magnitude of the effects was considered at the Site and ecological district scale, with consideration to factors relevant at a regional and national scale.

Table 5: Criteria for describing magnitude of effect (EclAG 2018).

Magnitude	Description
Very high	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns; AND/OR having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation; AND/OR having negligible effect on the known population or range of the element/feature.

Table 6: Criteria for describing level of effects (EclAG 2018).

Magnitude ▼	Ecological value ►				
	<i>Very high</i>	<i>High</i>	<i>Moderate</i>	<i>Low</i>	<i>Negligible</i>
Very high	Very high	Very high	High	Moderate	Low
High	Very high	Very high	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very low	Very low
Negligible	Low	Very low	Very low	Very low	Very low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

5.0 Terrestrial Ecology

5.1 Vegetation

The Residential South Site was predominantly occupied by managed/improved pasture covering c. 44 ha, which included rye grass (*Lolium perenne*), red clover, white clover (*Trifolium pratense* and *Trifolium repens*), narrow-leaved plantain (*Plantago lanceolata*) and occasional curled dock (*Rumex crispus*) and other common herbaceous pasture species.

Exotic trees consisted of a small London plane (*Platanus × acerifolia*) shelterbelt (c. 0.3 ha) along the northwestern site boundary, two oak (*Quercus* sp.) specimen trees within the riparian margin and a Lombardy poplar (*Populus nigra* var. *italica*) within the northern portion of the Site.

Mature native vegetation was limited to six isolated kahikatea trees (*Dacrycarpus dacrydioides*) grouped together (c. 0.06ha) and surrounded by grazed pasture in the southeast portion of the Site. These kahikatea trees (Figure 7) were moderately large (> 15 cm dbh and c. 20 m tall); however, they did not form a closed canopy, contained no indigenous understory, and were not fenced from stock grazing.

The riparian buffer along the Mangakōtukutuku Stream, Drain A and Drain B was planted with regenerating native vegetation including mānuka (*Leptospermum scoparium* agg.), kānuka (*Kunzea* sp.), kōwhai (*Sophora* sp.) ribbonwood (*Plagianthus regius*) and cabbage tree (*Cordalene australis*) covering c. 1.6 ha and generally formed a closed canopy. Exotic weed species were also noted within the riparian margins including willow (*Salix* sp.), small leaved privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*). Drain C had very little riparian vegetation along its length, with the vegetation that was present being made up of rank grass and pasture weeds.

Hamilton City Council Operative District Plan maps do not show any significant natural areas (SNAs) or protected trees within or adjacent to the Residential South Site. The nearest operative SNA is the Mangakōtukutuku Gully which is c. 1 km to the northeast of the Residential South Site. Proposed SNAs as part of PC9 are mapped immediately adjacent to the north and east boundaries of the Residential South Site along the Mangakōtukutuku stream and Resthills Park respectively (Figure 3).



Figure 6: Planted riparian buffer vegetation community.



Figure 7. Isolated mature kahikatea trees within grazed pasture.



Figure 8: Location of vegetation types within the Site.

5.2 Birds

5.2.1 eBird database

The eBird database includes records of 74 bird species (either native or introduced and naturalised) within a 10 km radius of the Site (Appendix B). Bird species recorded were those typically expected of modified farmland and semi-urban areas. Of the native species recorded, 23 are considered to be 'At Risk' or 'Threatened' (Robertson et al. 2021). Spatial distribution of these records is shown on Figure 9.

Most of the species of conservation interest have been recorded along the alignment of the Waikato River, open waterbodies, or peat lakes and are aquatic birds which are unlikely to use the Site beyond infrequent loafing or foraging. Four of these species are most often found in forest habitats and are also unlikely to occur due to the lack of suitable habitat. There were multiple records of karearea - New Zealand falcon (*Falco novaeseelandiae*) and New Zealand pipit (*Anthus novaeseelandiae*), which are regarded as 'Threatened – Nationally Vulnerable' and 'At Risk – Declining', respectively (Robertson et al. 2021). New Zealand falcon and New Zealand pipit are unlikely to use the Site outside occasional visits.

5.2.2 Site observations

Birds observed by Ecological Solutions during the survey were mostly exotic species such as skylark (*Alauda arvensis*), goldfinch (*Carduelis carduelis*), chaffinch (*Fringilla coelebs*), and mallard (*Anas platyrhynchos*). Native species recorded included welcome swallow (*Hirundo neoxena*), pūkeko (*Porphyrio melanotus*), swamp harrier (*Circus approximans*) and fantail (*Rhipidura fuliginosa*). The native species identified are all considered 'Not Threatened' (Robertson et al. 2021) and are common in rural and semi-urban habitats. There was limited habitat for native bird species, with the exception of ground nesting species such as the New Zealand pipit, within the Site. Isolated trees and planted riparian margins along Mangakōtukutuku, Drain A and Drain B provided potential nesting habitat for passerines.

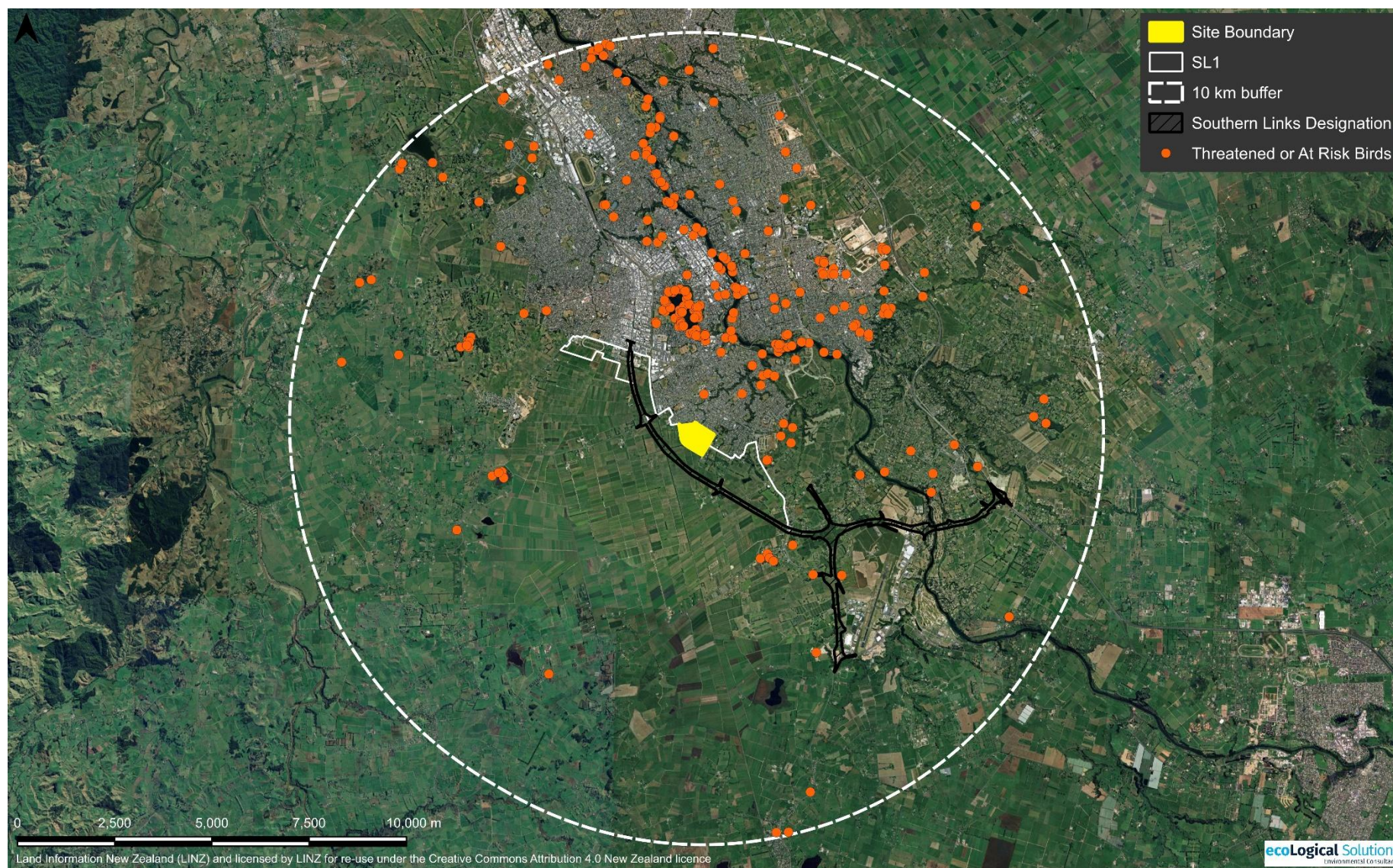


Figure 9: eBird records of 'Threatened' or 'At Risk' species within 10 km of the Site.

5.3 Lizards

5.3.1 Desktop assessment

The Department of Conservation herpetofauna database holds records for four indigenous lizard species recorded within 12 km of the Site. Two of the species recorded were geckos (Pacific gecko – *Dactylocnemis pacificus* and goldstripe gecko – *Woodworthia chrysosiretica*). Pacific geckos are both terrestrial and arboreal favouring mature lowland forests, Mānuka and kānuka scrubland, and other areas of dense vegetation. Goldstrip gecko are primarily found in the Taranaki region and are semi-arboreal in nature favouring forests, scrub, and flaxlands.

There were 170 records of copper skink (*Oligosoma aeneum*) within 12 km of the Site. Copper skinks are 'At Risk – Declining' (Hitchmough et al 2026). They are ground dwelling skinks which are common across the Waikato region favouring forests, shrublands as well as urban areas with dense ground cover like logs, deep leaf litter, and long rank grass often in damp conditions. The only other indigenous skink record within 12 km of the Site was a Newman's speckled skink (*Oligosoma newmani*) from 1968. Newman's speckled skink is a South Island species occupying habitats from coastal to alpine areas. This record is likely a misidentification.

5.3.2 Habitat survey

The planted riparian margins offered the highest quality habitat for native skinks, if present, as the majority of the Residential South Site is in improved pasture and has a long history of regular disturbance by livestock grazing, pasture maintenance, and farming operations (Figure 10). Manual habitat searches were undertaken within potential habitat for native skinks including the planted riparian margins along Mangakōtutuku Stream, Drain A and Drain B, isolated areas of rank grass associated with hedgerows and fenced side drains as well as under some organic and inorganic debris piles. No indigenous lizards were observed within the Residential South Site during the manual habitat searches.

The high proportion of grazed pasture within the Residential South Site and the absence of any systematic predator control programme limits available migration corridors and functional habitats for skinks. If lizards are present within the Residential South Site, they are most likely to be copper skinks distributed in low numbers within identified habitat areas (Figure 10).



Figure 10: Potential skink habitat.

5.4 Bats

5.4.1 Desktop assessment

An abundance of bat activity has been previously recorded within 25 km of the Site (Figure 11). Extensive surveying confirming long-tailed bat (*Chalinolobus tuberculatus*) activity, utilising automatic bat monitors (ABM) recording acoustic bat echolocations (AECOM 2025; Le Roux & Le Roux 2012; Wildlands 2017 etc.) and radio tracking (Davidson-Watts Ecology 2019), have been undertaken to the south and east of the Southern Links designation. Most of this survey effort has been undertaken as part of baseline data collection and long-term bat monitoring programmes associated with the Southern Links Transport Network (AECOM 2025; Wildlands 2017, Davidson-Watts Ecology 2019), a Hamilton City Bat Monitoring programme (Le Roux & Le Roux 2012) and several small and large-scale resource consent applications. Bat activity to the southeast of the Southern Links designation is extensive with extensive records including known roost sites within the Peacocke Structure Plan Area.

The Waikato Region Bat Distribution and Department of Conservation National Bat Database records show long-tailed bat activity within the Residential South Site, Resthills Park and further east along the Mangakōtukutuku gullies. Records of bat activity to the west of the Residential South Site were sparse with the nearest activity recorded c. 8 km away at Barrett Bush Reserve, West of Temple View.

Two Waikato Region Bat Distribution layers created for the Bat Alliance group intersect with the Residential South Site. Layer A covers bat roost areas and extends c. 50 m into the Residential South Site from Resthills Park at the Eastern boundary to encompass the stand of six mature kahikatea trees. Layer B extends c. 190 m into the Residential South Site along the Mangakōtukutuku Stream from the Northern boundary capturing a wider foraging and commuting corridor as bats fly across landscapes between roosts and foraging areas using waterways and waterbodies. The 2 km buffer around known bat roost locations overlay extends into the Site c. 400 m at its maximum distance.

5.4.2 Acoustic bat surveys

Long-tailed bat activity was recorded on all six ABMs deployed between 10 April and 6 May 2025 (27 nights, with 14 valid survey nights) with a total of 278 bat passes over the survey period. The majority of bat activity (229 bat passes) was recorded on ABM AR53 located within the stand of isolated mature kahikatea trees on the eastern boundary of the Site. The level of bat activity across the Site ranged from 0.43–16.36 bat passes per valid survey night.

A summary of the bat activity recorded during the April survey is provided in Table 7 below with the distribution of ABMs and level of bat activity recorded shown in Figure 12.

Table 7: Summary of bat activity recorded during April ABM survey.

ABM number	Total bat passes	Valid Survey Nights	Passes per Valid Survey Night
AR44	11	14	0.79
AR49	6	14	0.43
AR50	10	14	0.71
AR53	229	14	16.36
AR55	6	14	0.43
AR61	16	14	1.14
Total	278		19.86

A second ABM survey was undertaken from 6 November–4 December with an additional three ABMs deployed across the Site compared to the April survey in order to better capture a greater proportion of the Site's habitat. All nine of the ABMs deployed recorded bat activity during the survey period (30 nights, with up to 21 valid survey nights) with a total of only 45 bat passes over the survey period. The highest total number of bat passes (14) was recorded on ABM AR37 which was located in the isolated mature kahikatea stand similar to the April survey. The level of bat activity across the Site ranged from 0.13–0.67 bat passes per valid survey night. A summary of the bat activity recorded during the survey is provided in Table 8 below with the distribution of ABMs and level of bat activity recorded shown in Figure 13.

ABMs AR39 and AR42 were deployed within Resthills Park as offsite reference sites. These ABMs recorded substantially higher levels of bat activity both in total bat passes (363) and passes per valid survey night (17.29). By comparison, bat activity levels recorded at a site in the Peacocke Structure Plan Area from 2019 to 2021 had even higher levels of bat activity ranging from 254 – 1638 total bat passes per survey and 19.5–102 bat passes per valid survey night using a similar number of ABMs (Ecology New Zealand 2022).

The results of both the April (post-parturition) and November (pre-parturition) surveys at the Site show the inherent variability of bat activity across time and space. The substantially higher levels of bat activity found within Resthills Park and the Peacocke area to the east and south respectively, suggests these habitats may represent higher value bat habitat than that of the open pasture habitat dominating the Residential South Site. The difference in bat activity levels and the distribution of previously recorded bat activity across the Peacocke and Southern Links areas suggests that the Residential South Site is positioned near a range extent for the Hamilton Bat population. The limited structural habitat values to the north and west of the Site (primarily urban and open pasture) may represent a movement and habitat boundary whereby bat activity is limited by the bat values present and the existing disturbance regime associated with urbanisation.

Table 8: Summary of bat activity recorded during November ABM survey.

ABM number	Total bat passes/calls	Valid Survey Nights	Passes/calls per Valid Survey Night
The Site			
AR22	5	21	0.24
AR27	3	21	0.14
AR28	4	16*	0.25
AR35	4	21	0.19
AR37	14	21	0.67
AR38	3	20*	0.15
AR41	2	16*	0.13
AR47	1	21	0.05
AR61	9	21	0.43
Total	45		2.25
Resthills			
AR39	161	21	7.67
AR42	202	21	9.62
Total	363		17.29

* ABMs failed to record for full survey period

5.4.3 Bat habitat assessment

Long-tailed bats are known to preferentially use the edges of different habitat types (e.g. closed vs open) for commuting, foraging, and socialising (Rockell et al. 2017, O'Donnell 2001 and 2018). As a result, the c. 1.6 ha of existing riparian margin plantings along the Mangakōtūkutu Stream, Drain A and Drian B may provide suitable commuting and/or foraging habitat for bats (Figure 6). The isolated mature exotic trees and six native kahikatea present on site covered c. 0.4 ha, were > 15 cm diameter at breast height (DBH), contained potential roost features (PRF) and were therefore considered potential bat roost habitat (Figure 7). The Hamilton long-tailed bat population are also known to commute, socialise, and forage across open pasture, such as that making up the majority of the Residential South Development Site (Davidson-Watts 2019). Therefore, the Site provided c. 46 ha of potential habitat for long-tailed bats.

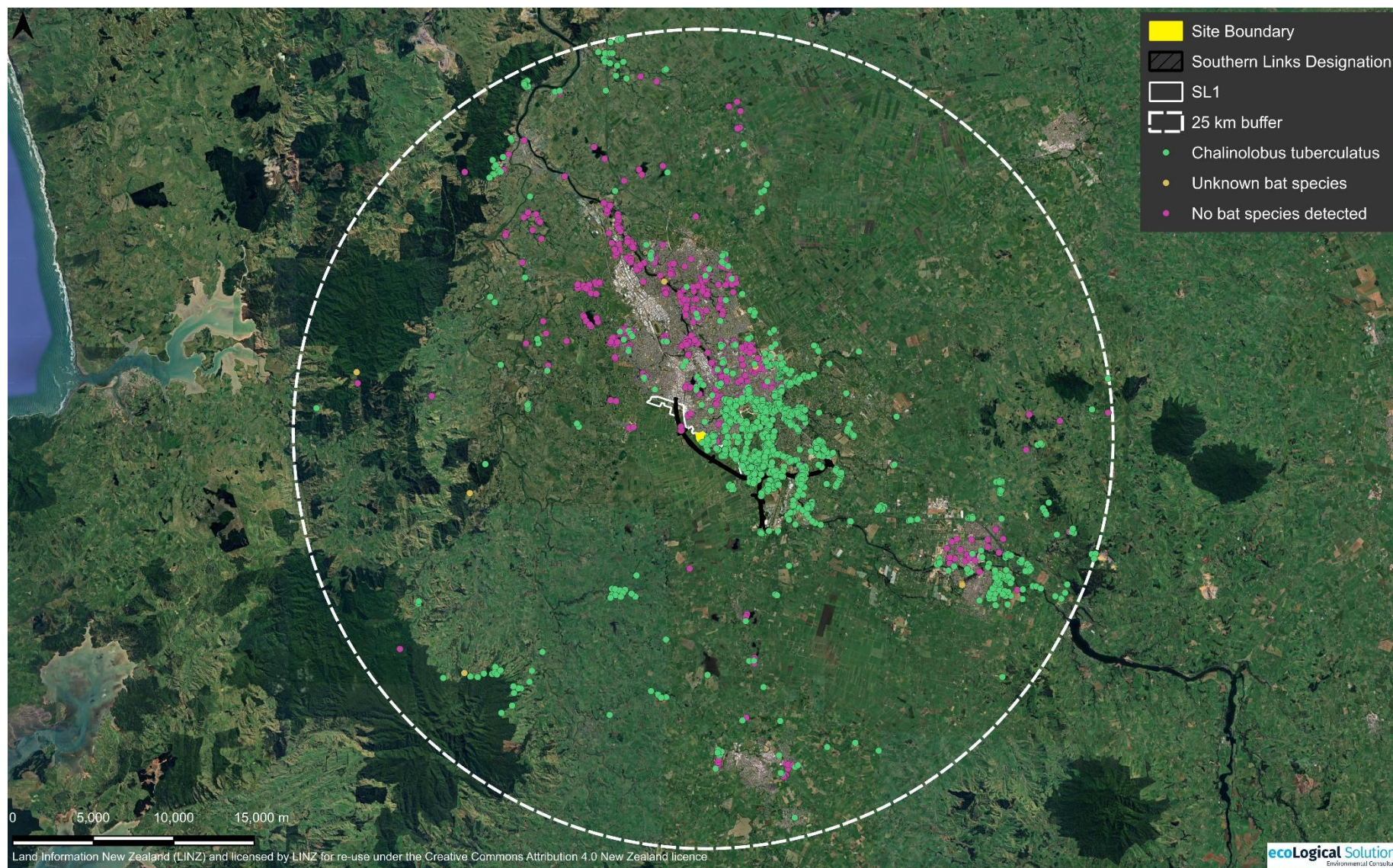


Figure 11: National bat database records within 25 km of the Site.



Figure 12: ABM locations and long-tailed bat activity recorded 10 April to 6 May 2025.



Figure 13: ABM locations and long-tailed bat activity recorded 7 November to 4 December 2025.

6.0 Wetlands

Two wetlands were recorded within the Residential South Site. These were Wetland A near the northeastern boundary and Wetland B associated with the upper reaches of the Mangakōtutukutuku Stream. Both wetlands qualify as Natural Inland Wetlands under the NPS-FM 2020 (MfE 2025a). The locations of the wetlands are shown on Figure 14.

Wetland A (c. 285 m²) located near the northeastern boundary of the Residential South Site was associated with a natural draw that appears to have been modified through stock access and grazing damage resulting in widening (Figure 15). Vegetation within Wetland A comprised exotic hydric species including creeping bent (*Agrostis stolonifera*), soft rush (*Juncus effusus*) and creeping buttercup (*Ranunculus repens*).

Wetland B (c. 50 m²) was located on the floodplain of the Mangakōtutukutuku Stream. The wetland had formed on the inside of a meander where sediment had been deposited and vegetation comprised of sedges (*Carex geminata*) and cabbage trees (*Cordyline australis*) (Figure 16).



Figure 14: Location of wetlands within the Site.



Figure 15: Wetland A near northeastern boundary.



Figure 16: Wetland B on floodplain of Mangakōtuketuku Stream.

7.0 Freshwater Ecology

7.1 Watercourses

Watercourses within the Site included the upper reach of the Mangakōtutukutuku Stream and a network of artificial watercourses with no natural portions remaining from their confluence with the Mangakōtutukutuku Stream to their headwaters (i.e., farm drainage canals) in accordance with the WRP watercourse classification definitions (Table 2). These artificial watercourses are hereafter referred to as Drains A–G.

7.1.1 Artificial watercourses

The Residential South Site is located within what was historically known as the 'Rukuhia Swamp'. It has been well documented how large, extensive drain networks were constructed in this area to facilitate drainage of the bog for the purpose of farming the rich organic soils (Pronger, et al. 2004). Examination of digital elevation models (DEM) (Figure 17) and historical aerial imagery from 1943 (Figure 18) shows the unnaturally straight alignment, and depth as well as the absence of smaller order tributaries at the origin of these drains.

This suggests these drains were not constructed to modify any natural watercourses but appear to be artificial in nature. There are no natural portions remaining from the confluence with the Mangakōtutukutuku Stream to their headwaters.

The location, alignment and length of the Mangakōtutukutuku Stream and artificial farm drains A–G within the Site are shown on Figure 19.



Figure 17: DEM of drain alignment



Figure 18: Aerial (1943) of drain alignment.



Figure 19: Watercourses within the Site.

The following sections describe the morphology, habitat and biological communities noted within the watercourses of the Residential South Site.

7.1.2 Mangakōtutukutuku Stream

The headwaters of Mangakōtutukutuku Stream extend into the northern portion of the Residential South Site approximately 150 m in length. The Mangakōtutukutuku channel was incised and ranged in width between 2.6–4.2 m with water depths ranging between 0.45–0.87 m. There was good flow in Mangakōtutukutuku Stream at the time of the survey (velocity: 0.1–0.9 m/s). The channel had a natural soft-bottomed streambed dominated by fines with occasional woody debris. Aquatic habitat was dominated by runs with occasional deeper pools. Riparian margins had been planted with native species.



Figure 20: Mangakōtutukutuku Stream looking downstream.

7.1.3 Drains A and B

Farm drains A, B and C discharge to the headwaters of Mangakōtutukutuku Stream within the Site. The bankfull depth and width of Drains A (Figure 21) and B (Figure 22) were substantial as these drains conveyed a lot of water during parts of the year. Over time they appear to have somewhat naturalised features with fluvial scour, undercut banks and small flood plains so they look like streams; however, they do not appear to have any natural portions from their confluence to their headwaters.

Drains A and B originate to the south and west of the Site, respectively. Drain B flows into Drain A before discharging into the headwaters of Mangakōtutukutuku Stream. Drains A and B had straight, deep channel alignments that reflected their artificial status with no evidence of a historical meander pattern across the surrounding flat topography, and no natural tributary watercourses visible on historical aerial imagery (Figure 18).

The channels were deeply incised, constrained, and intercepted groundwater, so had flowing water with moderate velocity (0.2–0.6 m/s). Wetted channel widths ranged between 0.8–3.2 m. Water was moderately deep (i.e., up to 1 m) in both drains. Streambanks were steep, high, and unstable due to the constrained nature of flow resulting in erosion,

downcutting and slumping of streambanks. Material from slumped streambanks resulted in the formation of narrow floodplains in places and some small meandering around slumped material. The bed substrate was predominantly sand/silt. Habitat was dominated by runs with occasional pools. Woody debris and leaf litter was occasionally recorded throughout the drains. Riparian margins had been planted (2–5 m height) with mainly native species (e.g., mānuka, kānuka, cabbage tree) but provided minimal shade on both drains due to low canopy cover and the wide channel width.

The WRC qualitative habitat scores were 102 (57%) and 107 (59%) for Drains A and B, respectively. WRC scores indicated Drains A and B provided moderate quality habitat despite being artificial watercourses and reflected the planted riparian margins and flowing water at the time of the survey. Drains A and B had SEV scores of 0.40 and 0.44, respectively, and indicated moderate-low ecological function and values. Both drains scored low for hydraulic function (0.36–0.37), moderate for biogeochemical function (0.48–0.58) and low for habitat provision function (0.35–0.36).



Figure 21: View of Drain A upstream of confluence with Mangakōtukutuku Stream.



Figure 22: View of Drain B upstream of confluence with Drain A.

7.1.4 Drain C

Drain C originates to the west of the Site and flows eastwards before discharging into the Mangakōtukutuku Stream near the Drain A confluence (Figure 23). Drain C had a straight channel alignment, was incised with steep banks (1–2 m high) and held less water than Drains A and B. The channel was 0.7–1.8 m wide, moderate-shallow water depths (i.e., up to 0.43 m deep) and was not flowing at the time of the survey. The streambed comprised sand/silt with occasional woody debris.

Riparian vegetation was highly modified and dominated by exotic grasses/weeds and occasional cabbage tree that provide poor channel shade. Vegetation recorded within the channel included water buttercup (*Ranunculus tricophyllus*) and exotic grasses.

The WRC qualitative habitat score for Drain C was 53 (out of 180) (29%) and indicated 'very poor' habitat conditions. The SEV score for Drain C was 0.31 and indicated the artificial watercourse had low ecological function and value. Drain C scored low for hydraulic function (0.27), biogeochemical function (0.30) and habitat provision function (0.36).



Figure 23: View of Drain C within the Site.

7.1.5 Drain D–G

Drains D–G are smaller side drains that flowed into Drains B and C (Figure 24). These side drains are artificial watercourses according to WRC definitions with no natural portions. Side drains had similar habitat characteristics to Drain C and held a small amount of non-flowing water at the time of the survey. The side drains lacked vegetated riparian margins, were poorly shaded, choked with aquatic and terrestrial vegetation and provided ‘very poor’ quality aquatic habitat.



Figure 24: Example of side drain within the Site (Drain G).

7.2 Benthic Macroinvertebrate Community

Relative abundance of the main taxonomic groups recorded at sites is presented in Figure 25. The macroinvertebrate communities recorded from Drains A, B and C were dominated by taxonomic groups that can tolerate poor habitat and water quality conditions including Crustacea, Diptera (true-flies), Coleoptera (beetles) and Oligochaeta (worms). The most abundant taxa were Copepoda, Scirtidae, *Austrosimulium*, *Chironomus* and worms.

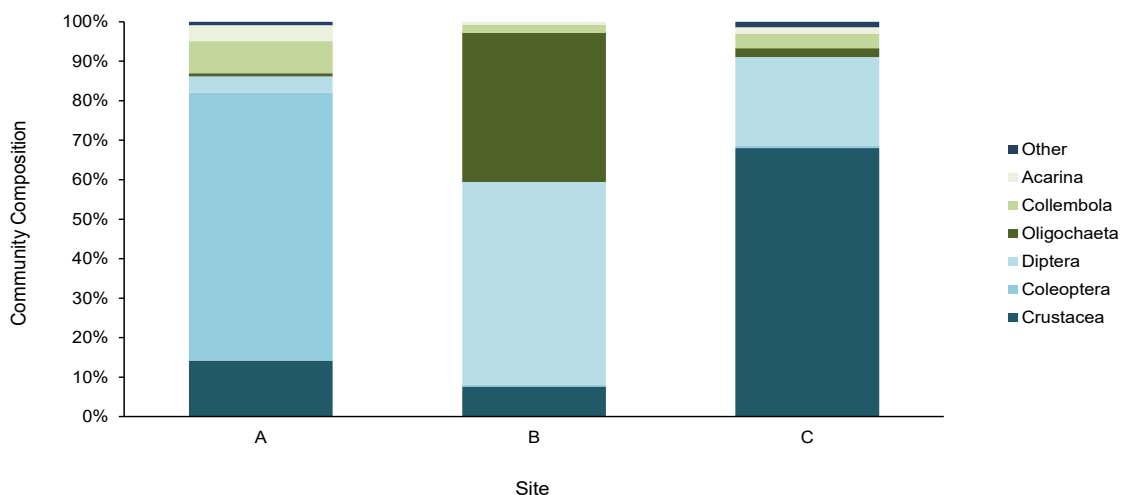


Figure 25: Relative abundance of macroinvertebrate groups during the survey.

Macroinvertebrate indices and metrics for Drains A, B and C are presented in Table 9. Taxa number ranged between 10–17 and abundance between 498–774 in Drains A, B and C. No EPT taxa were recorded in Drains A or B but a small number of *Triplectides* (caddisfly) were recorded in Drain C and represented 1% of community abundance.

MCI-sb scores were 78, 100 and 92 for Drains A, B and C. MCI-sb scores indicated 'poor' stream health in Drain A, 'good' health in Drain B and 'fair' health in Drain C according to Stark and Maxted (2007). The MCI-sb score for Drain A was below the NPS-FM National Bottom Line and indicated 'severe nutrient enrichment'. MCI-sb scores for Drains B and C were in 'Attribute Band C' of the NPS-FM and indicated 'moderate nutrient enrichment'.

QMCI-sb scores ranged between 3.8 and 3.1 for Drains B and C (indicating 'poor' health) and 5.4 for Drain A (indicating 'good' health). The higher QMCI-sb score for Drain A was due to high relative abundance (523 individuals) of higher scoring Scirtidae (MCI-sb = 6.4). QMCI-sb scores for Drains B and C were below the NPS-FM National Bottom Line and indicated 'severe nutrient enrichment whilst the score for Drain A was in 'Attribute Band C' of the NPS-FM and indicated 'moderate nutrient enrichment'.

ASPM-sb scores were low for Drains A, B and C (0.13–0.17). ASPM-sb scores were below the NPS-FM National Bottom Line and indicated 'severe loss of ecological integrity'.

Table 9: Macroinvertebrate indices/metrics during the 2025 survey.

Site	Taxa	Abundance	EPT	%EPT	MCI-sb	QMCI-sb	ASPM-sb
A	10	774	0	0	78	5.4	0.13
B	16	498	0	0	100	3.8	0.17
C	17	569	1	1	92	3.1	0.17

7.3 Fish

7.3.1 New Zealand Freshwater Fish Database

The NZFFD holds records of 13 species of freshwater fish within the Mangakōtukutuku Stream catchment as set out in Table 10. These records include nine indigenous fish species and four exotic fish as well as kōura (*Paranephrops planifrons*). Fish of conservation concern include common smelt (*Retropinna retropinna*), giant kōkopu (*Galaxias argenteus*) and longfin eel (*Anguilla dieffenbachii*) which are 'At Risk – Declining'; banded kōkopu (*Galaxias fasciatus*), torrentfish (*Cheimarrichthys fosteri*) and redfin bully (*Gobiomorphus huttoni*) which are 'At Risk – Naturally Uncommon' and īnanga (*Galaxias maculatus*) which are 'Threatened – Nationally Vulnerable' (Dunn et al. 2025). Locations of fish captured are shown in Figure 26.

Table 10: Fish records in the NZFFD for Mangakōtukutuku Stream catchment.

Common name	Scientific name	Conservation status (Dunn et al. 2025)
Indigenous fish		
Common smelt	<i>Retropinna retropinna</i>	At Risk – Declining
Giant kōkopu	<i>Galaxias argenteus</i>	At Risk – Declining
Longfin eel	<i>Anguilla dieffenbachii</i>	At Risk – Declining
Banded kōkopu	<i>Galaxias fasciatus</i>	At Risk – Naturally Uncommon
Torrentfish	<i>Cheimarrichthys fosteri</i>	At Risk – Naturally Uncommon
Redfin bully	<i>Gobiomorphus huttoni</i>	At Risk – Naturally Uncommon
Īnanga	<i>Galaxias maculatus</i>	Threatened – Nationally Vulnerable
Common bully	<i>Gobiomorphus cotidianus</i>	Not Threatened
Shortfin eel	<i>Anguilla australis</i>	Not Threatened
Exotic fish		
Koi carp	<i>Cyprinus carpio</i>	Introduced and Naturalised
Gambusia	<i>Gambusia affinis</i>	Introduced and Naturalised
Rainbow trout	<i>Oncorhynchus mykiss</i>	Introduced and Naturalised
Brown trout	<i>Salmo trutta</i>	Introduced and Naturalised

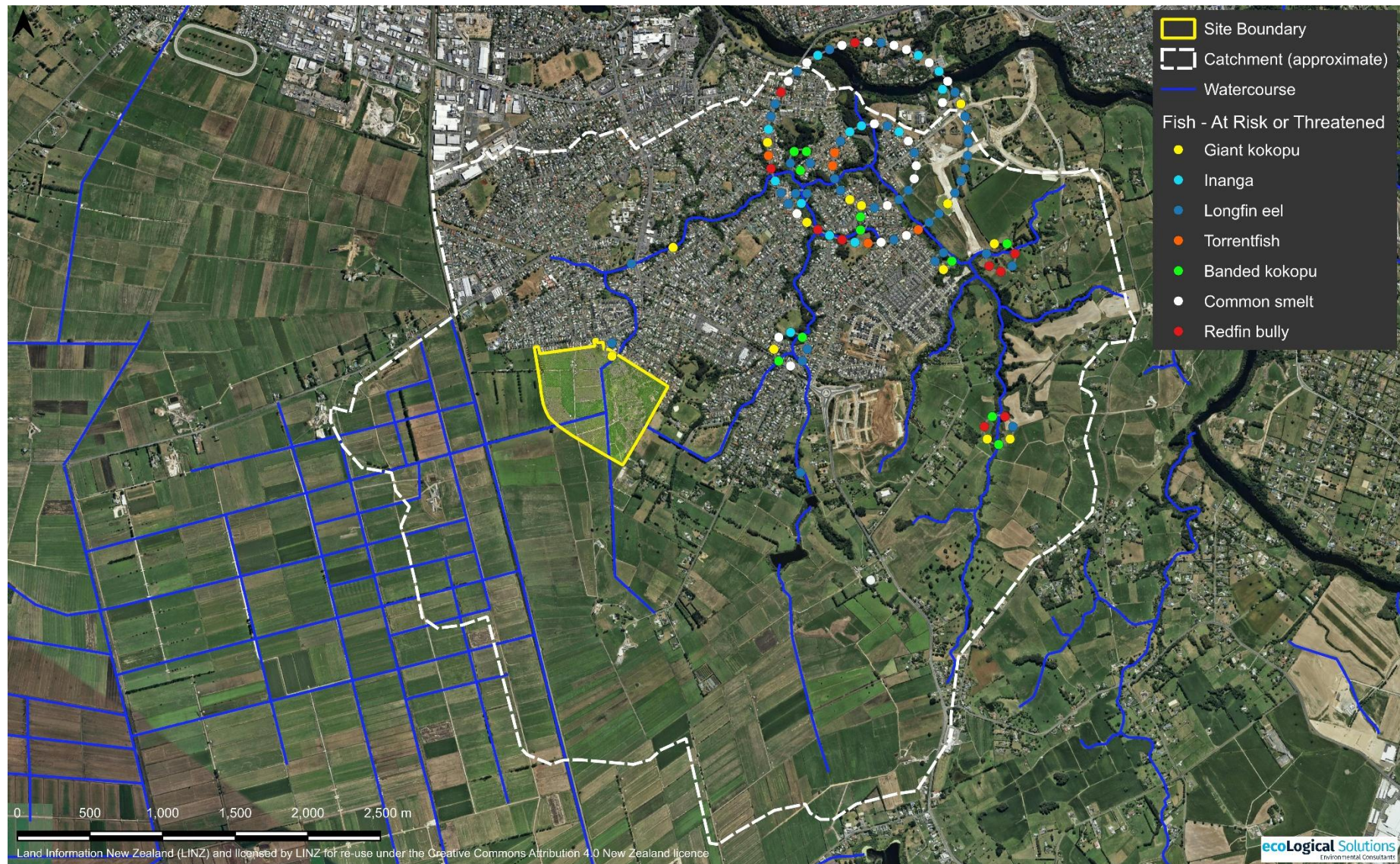


Figure 26: NZFFD records of 'Threatened' or 'At Risk' fish species within the Mangakōtutuku Stream catchment.

7.3.2 Environmental DNA

Fish species recorded in the eDNA sample collected from the lower reach on Drain A (below the confluence with Drain B) included shortfin eel, longfin eel, giant kōkopu and banded kōkopu. Fish species recorded within the Mangakōtukutuku Stream below the confluence with Drain C included shortfin eel, longfin eel, giant kōkopu, banded kōkopu and black mudfish (*Neochanna diversus*). As a result of the positive black mudfish sample, a second, more intense trapping survey was undertaken within the Drains C, E, F and G.

7.4 Water Physicochemistry

Water physicochemistry measured in Drains A, B and C between 9:30 a.m. and 1:00 p.m. on 9 July 2025 are presented in Table 11. Water temperatures ranged between 11.1–12.7°C. Dissolved oxygen was moderate in Drains A and B (7.9–8.7 g/m³ and 74–79%) where there was flowing water and was low in Drain C (5.2 g/m³ and 48%) where there was no flow at the time of the survey. Dissolved oxygen measured in watercourses were within the ‘unsatisfactory’ category (i.e., <80%) according to WRC guidelines and had the potential to limit aquatic biota, especially in Drain C. Electrical conductivity data indicated moderate dissolved ion concentrations in Drains A, B and C (276–330 µS/cm). Water pH was 4.5 in Drain B and 5.9–6.0 in Drains A and C. Water pH at all sites were within the ‘unsatisfactory’ category (i.e., <6.5) according to WRC guidelines.

Table 11: Water physicochemistry measured during the 9 July 2025 survey.

Site	Time	Temperature (°C)	Dissolved oxygen		Conductivity (µS/cm)	pH
			(%)	(g/m ³)		
A	1:00 p.m.	12.7	74	7.9	292	5.9
B	10:30 a.m.	11.1	79	8.7	330	4.5
C	9:30 a.m.	11.7	48	5.2	267	6.0

Note: Waikato Regional Council guidelines: Temperature (Oct–Apr) ⇒ excellent <16°C, satisfactory 16–20°C, unsatisfactory >20°C. Dissolved oxygen (%) ⇒ excellent >90%, satisfactory 80–90%, unsatisfactory <80. pH ⇒ excellent 7–8, satisfactory 6.5–7.0 or 8–9, unsatisfactory <6.5 or >9.0.

7.4.1 Trapping/netting survey

No fish were captured in the 60 Gee’s-minnow traps set during the first survey in Drains A, B, C, E and G within the Site. Adult giant kōkopu, banded kōkopu and longfin eel were recorded in the fyke net set in Drain B. A single shortfin eel was recorded in the fyke net set in Drain A. A single shortfin eel was captured in Drain C in the 128 Gee’s-minnow traps set during the second survey in Drains C, E, F and G. No mudfish were captured.

Table 12: Freshwater fish species recorded in eDNA samples.

Scientific name	Common name	Conservation status (Dunn et al. 2025)	Mangakōtukutuku Stream	Drain A
<i>Anguilla australis</i>	Shortfin eel	Not Threatened	✓	✓
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk – Declining	✓	✓
<i>Galaxias argenteus</i>	Giant kōkopu	At Risk – Declining	✓	✓
<i>Galaxias fasciatus</i>	Banded kōkopu	At Risk – Naturally Uncommon	✓	✓
<i>Neochanna diversus</i>	Black mudfish	At Risk – Declining	✓	-

Note: ✓ denotes detected. – denotes not detected

8.0 Ecological Values

8.1 Terrestrial

8.1.1 Vegetation

Vegetation within the Residential South Site comprised c.44 ha of exotic pasture with sparse isolated exotic specimen trees. Grazed exotic pasture provides poor habitat for native fauna and has negligible botanical value. On that basis, the grazed exotic pasture within the Site was considered to have 'negligible' ecological value.

The extent of intact Kahikatea Forest across the Waikato Region has been greatly reduced (i.e., about 1% of original extent, WRC 2021). The small stand of six remnant Kahikatea trees within the exotic pasture onsite is small (c. 0.06 ha), and functionally isolated with no understory. This stand represented isolated paddock trees rather than a forest fragment and is unlikely to persist in the long-term without management intervention and was assessed as having 'moderate' ecological value.

The c.1.6 ha of planted riparian margins along Drain A, Drain B and Mangakōtukutuku Stream have enhanced stream ecological values through the provision of shade, filtering and bank stabilisation, provided a potential corridor for indigenous fauna, and was assessed as having 'moderate' ecological value.

8.1.2 Birds and bird habitat

No 'At Risk' or 'Threatened' birds (Robertson et al. 2021) were recorded during the site visits. Some species listed in the eBird database (e.g., NZ falcon, NZ pipit) are unlikely to be present but may use pasture habitat within the Site for foraging from time to time. New Zealand pipit typically avoid high producing pasture habitat so are unlikely to use the Site for breeding or nesting. The overall ecological value for birds and bird habitat within the Site was assessed as 'low'.

8.1.3 Lizards and lizard habitat

No indigenous lizards were recorded during manual habitat searches. Potential skink habitat within the Site was of low quality, fragmented and surrounded by intensively managed pasture. There was no potential gecko habitat within the Site. If lizards are present, they are likely to be of low diversity and abundance based on existing records, available habitat, poor connectivity with off-site habitats and the absence of any systematic predator control. If present, the lizard species most likely to occur within the Site is copper skink (*Oligosoma aeneum*, 'At Risk – Declining'). The overall ecological value for lizards and lizard habitat within the Site was considered 'moderate'.

8.1.4 Bats and bat habitat

Long-tailed bats (Threatened – Nationally Critical (O'Donnell et al. 2023)) were confirmed to be using the Residential South Site based on acoustic surveys and existing database records.

Long-tailed bats in Hamilton have shown a preference for foraging and commuting along vegetated edges such as those of riparian areas, the Mangakōtukutuku gullies and clusters of both exotic and native trees (Davidson-Watts 2019). This is consistent with others who have characterised long-tailed bats as edge adapted foragers whereby, they hunt most efficiently along the edges and above canopies of trees (O'Donnell 2018; Parsons 2001; O'Donnell 2000). Davidson-Watts (2019) also found that Hamilton bats flew over open parklands, agricultural habitats, and lifestyle blocks to access core areas. While some bats would spend extended time in these habitats; there was no significant use of these habitats

over any other habitat type (Davidson-Watts 2019).

Potential bat roost trees were identified within the Residential South Site but were generally assessed as being of lower quality due to their isolated spatial distribution, characteristics of potential roost features and proximity to existing artificial light sources.

While ABMs alone are not able to identify roosting behaviour or confirm the presence of active roosts, bat emergence and return timing is used as a proxy for signalling the potential for roosting behaviour. Emergence and return timing is influenced by a number of biotic and abiotic factors (Feng et. al. 2025). Research regarding roost emergence timing in New Zealand is limited; however, O'Donnell and Borkin (2021) summarise mean emergence times of several long-tailed bat colonies across New Zealand including the Hamilton colony. The mean emergence timing for the Hamilton colony was indicated to be c. 51 minutes after sunset (O'Donnell and Borkin 2021).

Bat activity during either ABM survey was not recorded within 1 hr of sunset or 1 hr of sunrise suggesting there may not have been any active roosting nearby at the time of the surveys. Consequently, the value of bat habitat on Residential South Site was considered 'moderate' based on the surveys undertaken.

8.2 Wetlands

8.2.1 Wetland A

Wetland A was dominated by exotic vegetation typical of wetlands affected by grazing livestock in a pastoral setting. Despite its poor condition, wetland habitats are both regionally and nationally rare and therefore the ecological value was considered 'moderate', due to that rarity.

8.2.2 Wetland B

Wetland B on Mangakōtuketuku Stream represents a rare habitat type and there are fish species present in the stream that may use this habitat for spawning (e.g., banded kōkopu, giant kōkopu). Wetland B was considered to have 'high' ecological value due to being dominated by indigenous vegetation and its potential to provide spawning habitat for 'At Risk – Declining' giant kōkopu.

8.3 Freshwater

8.3.1 Upper Mangakōtuketuku Stream

The upper Mangakōtuketuku Stream is a perennial watercourse that provides moderate quality aquatic habitat. Riparian margins within the Site had been restored via planting and increased function and values but there was evidence of channel incision and streambank erosion. The stream scored moderate for representativeness but low for other matters considered. Mangakōtuketuku Stream does provide a pathway for diadromous indigenous fish species to upstream artificial watercourses but there are no natural streams upstream. Some sections may provide spawning habitat for kōkopu species. The section of Mangakōtuketuku Stream within the Residential South Site was assessed as having 'moderate' ecological value.

8.3.2 Artificial watercourses

Drains A and B were deeply incised, conveying flowing water, and had planted riparian margins that provided potential habitat including spawning habitat for native fish such as 'At Risk – Declining' giant kōkopu. Drains A and B were assessed as having 'moderate'

ecological value, on the basis of potential habitat for 'At Risk' species.

Drain C held non-flowing surface water, lacked riparian vegetation, and generally provided poor quality habitat for aquatic fauna. All other drains (D–G) were smaller side drains that held limited surface water and provided marginal aquatic habitat. Drains (C–G) were assessed as having 'negligible' ecological value.

8.3.3 Macroinvertebrates

Watercourses within the Residential South Site supported macroinvertebrate communities that reflected highly modified or degraded habitat and water quality conditions and taxa that are typically found in streams draining agricultural catchments. The communities were not representative of pristine conditions, had no rare or distinctive taxa, dominated by tolerant taxa and had indices that indicated nutrient enrichment and loss of integrity.

Macroinvertebrate communities in watercourses draining the Site had 'negligible' ecological value.

8.3.4 Fish

Survey results indicate the fish fauna in Mangakōtuketuku Stream, Drain A, Drain B and Drain C were of low diversity but contained 'At Risk – Declining' giant kōkopu, and longfin eel. No black mudfish 'At Risk – Declining' were captured.

Black mudfish were recorded in an eDNA sample collected from Mangakōtuketuku Stream below the confluence with Drain C; however, additional trapping within Drain C did not capture any black mudfish.

The presence of 'At Risk – Declining' fish species in Mangakōtuketuku Stream, Drain A and Drain B indicates the ecological value of fish in these watercourses was 'moderate'.

9.0 Waikato Regional Policy Statement Assessment of Significance

The operative Waikato Regional Policy Statement (WRPS) sets out the criteria in Appendix 5 for determining significance of indigenous biodiversity (WRC 2016). Table 13 below summarises the assessment of indigenous vegetation and habitats of indigenous fauna recorded across the Site against these criteria. If any one criterion is met, the Site is deemed significant under the WRPS (WRC 2016).

In summary the Site is deemed significant under the WRPS criteria with respect to indigenous vegetation, habitat or ecosystem type with the predominately indigenous Wetland B and indigenous fauna (long-tailed bats – 'Threatened - Nationally Critical'); however, the level of bat activity recorded across two acoustic surveys at the Site, in comparison to other areas of Hamilton south and east of the Site indicates the Site is not likely important bat habitat.

Table 13: WRPS criteria for determining significance of indigenous biodiversity.

Ecological values		Criteria met
2.	In the Coastal Marine Area, it is indigenous vegetation or habitat for indigenous fauna that has reduced in extent or degraded due to historic or present anthropogenic activity to a level where the ecological sustainability of the ecosystem is threatened.	N/A
3.	It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: • classed as threatened or at risk, or • endemic to the Waikato region, or • at the limit of their natural range.	Y
4.	It is indigenous vegetation, habitat or ecosystem type that is under-represented (20% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.	Y
5.	It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, chenier plain, or karst ecosystems, hydrothermal vents or cold seeps.	N
6.	It is wetland habitat for indigenous plant communities and/or indigenous fauna communities (excluding exotic rush/pasture communities) that has not been created and subsequently maintained for or in connection with: • waste treatment; • wastewater renovation; • hydro electric power lakes (excluding Lake Taupō); • water storage for irrigation; or • water supply storage; unless in those instances they meet the criteria in Whaley et al. (1995).	N
7.	It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type. Note this criterion is not intended to select the largest example only in the Waikato region of any habitat type.	N
8.	It is aquatic habitat (excluding artificial water bodies, except for those created for the maintenance and enhancement of biodiversity or as mitigation as part of a consented activity) that is within a stream, river, lake, groundwater system, wetland, intertidal mudflat or estuary, or any other part of the coastal marine area and their margins, that is critical to the self sustainability of an indigenous species within a catchment of the Waikato region, or within the coastal marine area. In this context "critical" means essential for a specific component of the life cycle and includes breeding and spawning grounds, juvenile nursery areas, important feeding areas and migratory and dispersal pathways of an indigenous species. This includes areas that maintain connectivity between habitats.	N
9.	It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because: • its structure, composition, and ecological processes are largely intact; and • if protected from the adverse effects of plant and animal pests and of adjacent land and water use (e.g. stock, discharges, erosion, sediment disturbance), can maintain its ecological sustainability over time.	N
10.	It is an area of indigenous vegetation or habitat that forms part of an ecological sequence, that is either not common in the Waikato region or an ecological district, or is an exceptional, representative example of its type.	N
Role in protecting ecologically significant area		
11.	It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor and which is necessary to protect any site identified as significant under criteria 1-10 from external adverse effects.	N

Table 14: Summary of terrestrial ecological values following the EclAG (Roper-Lindsay et al. 2018).

Feature	Representativeness	Rarity and Distinctiveness	Diversity and pattern	Ecological Context	Overall score	Comments
Vegetation (exotic pasture)	Very low	Very low	Very low	Very low	Negligible	The majority of the Site is covered by exotic pasture with a low diversity of species and provides negligible ecological value.
Vegetation (exotic trees)	Very low	Very low	Very low	Very low	Negligible	The exotic trees at the Site provide negligible ecological value.
Vegetation (kahikatea trees)	Low	Moderate	Low	Moderate	Moderate	Vegetation is not representative of any native ecosystem type and exhibits low diversity and therefore does not exhibit higher ecological value. However native vegetation has been heavily reduced across the landscape in general.
Vegetation (riparian planting)	Moderate	Moderate	Low	Moderate	Moderate	Riparian vegetation has been planted with common native revegetation species. Plantings are still young so full functional value has yet to be achieved and pest plant species ingress is reducing value.
Birds	Low	Low	Low	Low	Low	No 'Threatened' or 'At Risk' bird species recorded or expected to be using the Site.
Bird Habitat	Low	Low	Low	Low	Low	The habitat for birds within the Site is typical of rural/peri-urban habitats utilised by common native and introduced birds within the Waikato Region. The habitats are not representative of indigenous habitats or the previously occurring habitats, which would have had extensive wetlands and substantially more forest present.
Lizards	Low	High	Low	Low	Moderate	Based on existing records and available habitat, only one species is expected to be present (copper skink (At Risk – Declining)), and likely only in low numbers due to the lack of suitable habitat.
Lizard habitat	Low	Low	Moderate	Moderate	Moderate	The riparian planting provides some potential habitat and a migration pathway through the Site. The other habitats are small and sparsely distributed. Access to separate fragments of available habitat was considered low because of the active farm management.
Bats	High	Very High	High	High	Very High	Long-tailed bats (Threatened – Nationally Critical (O'Donnell et al. 2023)) confirmed to be utilising the Residential South Site.
Bat habitat	Low	Low	Low-moderate	Moderate	Moderate	Low bat activity recorded across two ABM surveys. Low quality commuting and foraging habitat based on prevalence of open pasture. Some potential roosting features present in exotic trees and six kahikatea.

Table 15: Summary of wetland and freshwater ecological values following the EclAG (Roper-Lindsay et al. 2018).

Feature	Representativeness	Rarity and Distinctiveness	Diversity and pattern	Ecological Context	Overall score	Comments
Wetland A	Very low	High	Very low	Very low	Moderate	Wetlands have been severely degraded by drainage and current and historic grazing. Wetland value limited by agricultural activities. Habitats do not reflect former wetland vegetation types.
Wetland B	Moderate	Very high	Moderate	High	High	Connects to Mangakōtutuku Stream during high flows and provides galaxiid spawning habitat.
Upper Mangakōtutuku Stream	Moderate	Low	Low	Moderate	Moderate	Within the broader catchment context, the upper Mangakōtutuku Stream provides moderate ecological functions and services. It provides habitat for eel, giant kōkopu, and may provide spawning habitat for banded kōkopu and giant kōkopu.
Artificial watercourses (Drains A and B)	Low	Low	Moderate	Moderate	Moderate	Drains A and B are artificial watercourses and are not representative of natural streams. The drains have straight alignments and eroding banks but have planted riparian margins and flowing water due to the incised channels intercepting groundwater
Artificial watercourses (Drains C–G)	Very low	Very low	Very low	Very low	Negligible	Drains C–G are water short artificial watercourses that lack vegetated riparian margins. Provide uniform and marginal aquatic habitat
Macroinvertebrates	Very low	Very low	Very low	Very low	Negligible	Drains support poor quality invertebrate communities with no or sparse EPT taxa. Biological indices (MCI-SB, QMCI-sb, ASPM) indicate poor community health and loss of integrity.
Fish	Low	High	Low	Low	Moderate	Low diversity communities but includes 'At Risk – Declining' species such as longfin eel and giant kōkopu. Black mudfish may occur within the Site based on eDNA sampling results.

10.0 Assessment of Effects

10.1 Introduction

This section assesses the actual and potential ecological effects associated with developing the Residential South Site as described in Section 1.2 and shown on the Stage 1 Master Plan presented in Figure 2. Positive and adverse effects, cumulative effects, and residual adverse effects are considered, and the assessment informs the nature and scale of effects management required. The approach to effects management follows the effects management hierarchy outlined in the NPS-FM (MfE 2025a) and the NPS-IB (MfE 2025b).

10.2 Effects Summary

The positive and adverse effects on terrestrial and freshwater values attributable to the proposed development are summarised as:

Terrestrial Effects

- Positive
 - Increased native biodiversity through restorative planting of native vegetation communities cumulatively covering c. 4.6 ha.
 - Retention and repositioning of operationally manageable portions of the six Kahikatea trees which contain potential bat roost features as wildlife snags within the Mangakōtukutuku Stream reserve.
 - Implementation of pest plant and animal control programme within watercourse corridors, and reserves.
- Adverse
 - Clearance of c. 43.2 ha of existing low value exotic dominated vegetation.
 - Habitat loss for terrestrial native fauna (e.g. birds, lizards, bats).
 - Direct effects on terrestrial fauna such as birds, lizards, bats including disturbance, displacement, possible injury or death.

Wetland Effects

- Positive
 - Removal of stock/farming effluent runoff entering Wetland B reducing nutrient loading.
 - Creation of native ecological wetland areas and vegetation communities covering c. 348 m² within an expanded and enhanced Mangakōtukutuku Stream reserve covering c. 3.5 ha.
- Adverse
 - Removal of c. 285 m² of existing poor-quality wetland in Wetland A.

Freshwater Effects

- Positive
 - Removal of stock/farming effluent runoff entering watercourses reducing nutrient loading.
 - Implementation of a high-quality stormwater management system reducing

- contaminated runoff into watercourses.
- Expansion and enhancement of watercourse corridor along the Mangakōtukutuku Stream.
- Restorative planting of native riparian vegetation communities along the watercourse corridors improving surface runoff filtration, shade, and bank stabilisation.
- Maintenance of fish passage at watercourse crossings.
- Adverse
 - Earthworks and effects on water quality and habitat during construction.
 - Stormwater discharge to watercourses.
 - Direct effects on native aquatic species such as fish including injury or death during reclamation of artificial watercourses.

10.3 Terrestrial Effects and Effects Management

10.3.1 Vegetation

The existing native riparian vegetation and mixed exotic shelterbelt will be avoided and retained.

The Residential South Site was dominated by exotic improved pasture of 'negligible' ecological value. It is anticipated that the c. 43.2 ha of exotic improved pasture across the Site will be removed in its entirety. The resulting pre-effects management level of effect was considered 'very low', as set out in Table 16.

'Low' and 'very low' levels of effect should not normally be of concern, although normal design, construction and operational care should be exercised to minimise adverse effects.

Six mature kahikatea trees considered to have a 'moderate' ecological value make up the only mature native vegetation cover within the Residential South Site. It is proposed to remove the six kahikatea trees (though sections of these will be retained and repositioned to preserve potential bat roost features (see Section 10.3.4), the botanical value of these trees will be removed). This will result in a pre-effects management level of effect of 'moderate' as set out in Table 16.

Management of the effects attributable to vegetation clearance will include remediation of the removal of exotic vegetation through native restoration planting within the extended Mangakōtukutuku Stream reserve, riparian margins of artificial watercourses (Drains A and B), stormwater management areas and along the boundary of Resthills Park cumulatively covering c. 4.6 ha. Restoration of native vegetation communities is expected to lead to an overall increase in native vegetation structure and biodiversity across the Site and have a 'positive' magnitude of effect and an overall 'net gain' outcome for vegetation values (Table 16).

10.3.2 Birds and bird habitat

The proposed development activities will result in the removal of low-quality potential bird nesting habitat in the form of exotic trees and grassland.

If vegetation clearance occurs during the primary bird breeding season (September to February inclusive), direct mortality or injury to birds could result due to the potential presence of nests and nesting birds. Consequently, the pre-effects management magnitude of effect on birds and bird habitat is expected to be 'moderate' leading to a pre-effects management level of effect of 'low' (Table 16).

While the pre-effects management level of effect on birds and bird habitat was considered 'low' and therefore should not normally be of concern, almost all native birds are absolutely protected under the Wildlife Act 1953. Consequently, it is recommended that vegetation clearance be avoided between September and February inclusive; or, where this is not practicable, pre-clearance nest checks should be undertaken by a suitably qualified ecologist. If native bird nests are identified, a 20 m setback from the nest will be implemented and maintained until the nest has been determined to have failed or the chicks have fledged. These measures are outlined in a Bird Management Plan (BirdMP) (Ecological Solutions 2026a). With the implementation of the above effects management measures, the post-effects management level of overall effect will be 'very low' (Table 16).

10.3.3 Lizards and lizard habitat

The existing riparian planting along the Mangakōtukutuku Stream, drains and isolated areas of rank grass associated with fenced drains and scattered organic/inorganic debris piles provide potential ground dwelling skink habitat within the Site. The presence of lizards on Site has not been confirmed; however, it is likely that are present in low numbers. Consequently, clearance of potential lizard habitat areas has the potential to cause injury or death of copper skinks ('At Risk – Declining'). Consequently, the pre-effects management level of effect is 'moderate' (Table 16).

Vegetation clearance will also result in a loss of lizard habitat. Given the low value of this habitat on Site, the pre-effects management level of effect on lizard habitat is 'low' (Table 16).

Management of the potential adverse effects on lizards are outlined in a Lizard Management Plan (LMP) (Ecological Solutions 2026b). A Wildlife Approval under the FTAA is being sought with respect to lizards. The LMP details implementation of a pre-vegetation clearance lizard capture and relocation programme as well as lizard habitat restoration details to be included in restoration or amenity plantings across the development. With the above effects management measures implemented, the post effects management level of effects on lizards will be 'low'.

10.3.4 Bats and bat habitat

Surveys showed a relatively low level of use of the Residential South Site by long-tailed bats ('Threatened – Nationally Critical') compared to neighbouring Resthills Park and the Peacock Structure Plan area to the south and east of the Residential South Site. There was limited roost opportunities within the Residential South Site with the exception of the six mature Kahikatea trees which are proposed to be removed. Should bats be present in bat roost features at the time of clearance, the pre-effects management, level of effect on bats will be 'very-high', due to their 'Threatened – Nationally Critical' status.

Vegetation clearance and development of the Residential South Site will result in the loss of c. 43.2 ha of 'low' value bat habitat (open pasture) and the disturbance of c. 2 ha of retained 'moderate' value bat habitat (riparian vegetation and Kahikatea trees). The existing riparian vegetation along the watercourses on site and the trees along the border of the adjacent Resthills Park will be avoided and are not directly impacted by vegetation clearance but the wider area on the southern and western boundaries will be disturbed via increased light and sound in close proximity. The Residential South Development will increase the amount of artificial light at night such as street, security, outdoor and vehicle illumination which has the potential to disrupt bat behaviour resulting in adverse effects on bats and their ability to use these habitats (Schamhart et al. 2024). In addition, the portions of the Kahikatea trees with potential bat roost features will be retained and repositioned within the riparian corridor. Consequently, the pre-effects management level of effect on bat habitat is 'moderate' (Table 16).

Management of the adverse effects on bats is outlined in a Bat Management Plan (BMP) (Ecological Solutions 2026c). The BMP details implementation of pre-vegetation clearance 'bat roost protocols' (Department of Conservation 2024) as well as bat sensitive lighting design guidelines and the planting of mixed native and non-invasive, fast growing exotic trees considered suitable for future bat habitat in accordance with the New Zealand Bat Recovery Group Advice Note (Department of Conservation 2025) and the Hamilton City Bat Management Plan (HCC-BMP) (Phoenix Ecology 2024). This planting will be throughout the Mangakōtukutuku Stream reserve, riparian corridor, and screening of Resthills Park as part of the restoration and amenity plantings collectively covering c.4.6 ha.

Mixed native and exotic tree planting aimed at screening bat habitat along the riparian corridor and Resthills Park will be designed to ensure adequate interception of light and provide additional vertical structure for bat commuting and foraging in accordance with the recommendations in the HCC-BMP (Phoenix Ecology 2024). In addition, it is proposed to retain portions of the six mature kahikatea trees and resurrect them as standing wildlife trees within the Mangakōtukutuku Stream reserve. These snags will retain the potential bat roost features within the kahikatea trees and, along with the faster growing non-invasive exotic trees to be planted, provide a temporal bridge between when vegetation clearance occurs and native specimen trees grow and develop adequate bat roost features.

If the above effects management measures are implemented the post effects management level of effects on retained bat habitat will be 'low'; however, the loss of low value open pasture and the 'moderate' value kahikatea trees will result in a residual adverse effect because the loss of bat habitat area cannot be mitigated (Table 16). Therefore, it is proposed to provide a commensurate level of ecological compensation to manage this residual effect. Details of the ecological compensation proposal are in Section 11.0 – Residual Effects Management.

10.4 Wetland Effects and Effects Management

10.4.1 Wetland A

The proposed development will result in the unavoidable loss of c. 285 m² of Wetland A. Retaining this wetland would materially constrain the earthworks and development response in this location. The removal enables the road connection and adjoining residential areas to be formed as part of an integrated earthworks strategy. The pre-effects management level of effect was assessed as 'moderate' (Table 16).

While Wetland A was dominated by exotic species and had been heavily degraded by stock access the loss of c. 285 m² of wetland habitat cannot be mitigated. Therefore, the loss of Wetland A results in a residual effect. Therefore, it is proposed to provide c. 348 m² of compensatory ecological wetland habitat within the stormwater reserve. Details of the ecological compensation proposal are in Section 11.0 – Residual Effects Management.

10.4.2 Earthworks within 100 m of natural inland wetlands

The Hydrogeological Effects Assessment provided by WGA (WGA 2026) states that groundwater drawdown effects of the construction will be localised and temporary. Additionally, these will be managed via ongoing assessment by geotechnical specialists and return of groundwater flows upstream. Consequently, there are no significant hydrological effects within 100 m of a natural inland wetland, or other hydrological feature (WGA 2026).

While the pre-effects management level of effect is considered 'low' and therefore should not normally be of concern, normal design, construction and operational care will be implemented as part of the Construction Management Plan (Maven Associates 2026a).

10.5 Freshwater Effects and Effects Management

10.5.1 Earthworks and effects on water quality and habitat

Earthworks associated with developing the Site have the potential to result in fine sediment mobilisation and runoff into watercourses. The addition of fine sediment to freshwater environments has the potential to increase turbidity and decrease light penetration that affects primary production, smother invertebrate habitat, and adversely affect the feeding for some fish species.

The receiving environments are primarily artificial drains with poor water quality due to catchment land use pressures as well as the upper reaches of the Mangakōtukutuku Stream within the Site with a 'moderate' value. As a result, the ecological sensitivity to discharge from well-treated stormwater from earthworks areas is low. Proposed measures for erosion and sediment control have been designed and will be installed and maintained in accordance with WRC's Erosion and Sediment control Guidelines for Soil disturbing Activities, the Earthworks Management Plan (Maven Associates 2026b) and the Construction Management Plan (CMP) (Maven Associates 2026a).

With the implementation of appropriate silt controls and treatment of stormwater during earthworks, the potential effects of earthworks on water and habitat quality during construction will be minimised with the magnitude of effect expected to be 'low' and an overall level of effect post effects management of 'low'.

10.5.2 Stormwater discharge to watercourses

The proposed development will increase impervious area and lower stormwater residence time. Stormwater will also pose risks to water quality due to contamination, sediment, and erosion.

While the pre-effects management level of effect of stormwater discharge to the artificial drains and the Mangakōtukutuku Stream was considered 'low' and therefore should not normally be of concern, normal design, construction and operational care such as erosion and sediment control and stormwater treatment and attenuation measures will be exercised to minimise adverse effects. Details of sediment and erosion control are generally referred to as part of the Stormwater Management Plan (SMP) prepared by Maven Associates (2026c) with construction and detailed design sediment and erosion control measures prepared as part of the Construction Management Plan (Maven Associates 2026a).

10.5.3 Reclamation of artificial watercourses (farm drains)

The proposed development will result in the loss of c. 941 m of artificial watercourses (Drains C–G). Approximately 257 m of Drain C will be piped with the remaining 163 m remaining daylighted through the stormwater reserve. Approximately 684 m of Drains D–G will be reclaimed. The ecological value of the drains that will be removed were assessed as 'negligible' leading to the overall level of effect being assessed as 'very low' (Table 16).

While the pre-effects management level of effect on Drains C–G was considered 'very low' and therefore should not normally be of concern, there is potential for freshwater fish such as shortfin eels to be injured or killed should they be present in the drains at the time of removal. Therefore, a fish management plan (FMP) has been prepared that outlines the fish management measures to be implemented to ensure the protection of indigenous freshwater fish (Ecological Solutions 2026e). Specifically, the FMP outlines the timing and protocols for fish capture and relocation prior to drain reclamation commencement.

10.5.4 Enhancement of Mangakōtukutuku Stream and artificial watercourses

The proposed development includes enhanced riparian corridors which follow the primary

watercourses identified within the Site. Drains A, B, and the Mangakōtūkutu Stream. The existing riparian vegetation communities will be augmented with mixed native and non-invasive, fast growing exotic trees to provide future fauna habitat, increased biodiversity, and water quality benefits through increased filtration and bank stability. Implementation of these enhancement measures will result in a post-effects management level of effect of a 'net gain'.

10.5.5 Road culverts

The development road network includes two road crossings on Drain A. It is proposed to construct large open bottom arch culverts which span the drain channel at both of these crossing locations. Both crossing structures have been designed in accordance with the National Environmental Standards for Freshwater (NES-F) Regulation 70(2) and the New Zealand Fish Passage Guidelines (NIWA 2024).

The open bottom arch culverts will ensure the natural watercourse bed and banks are maintained, minimising disturbance and ensuring the current fish passage conditions remain. Figure 27 and shows a concept culvert design. Construction of these open bottom culverts will ensure the post-effects management overall level effect will be 'low'.

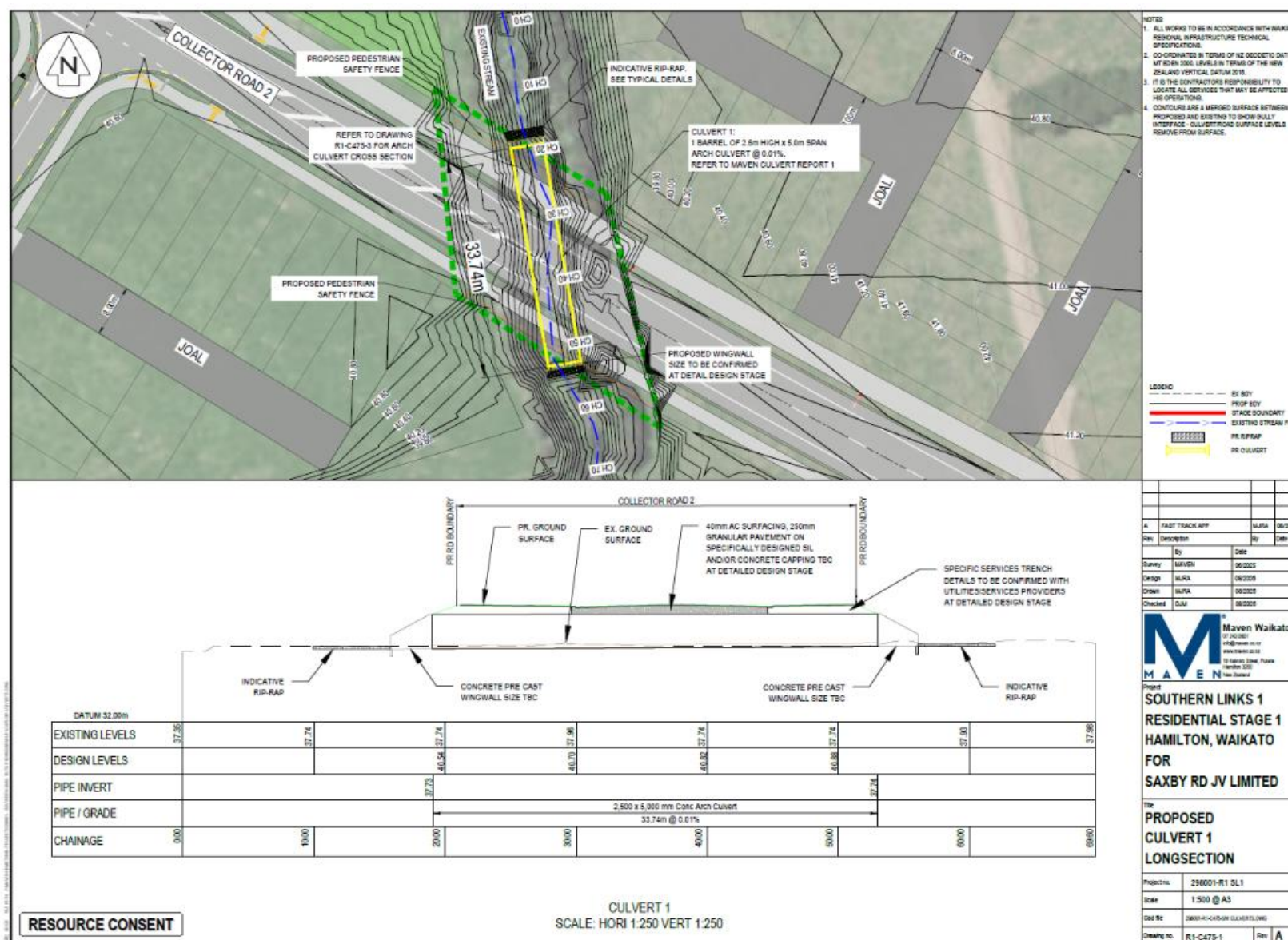


Figure 27: Proposed open bottom culvert 1 long section.

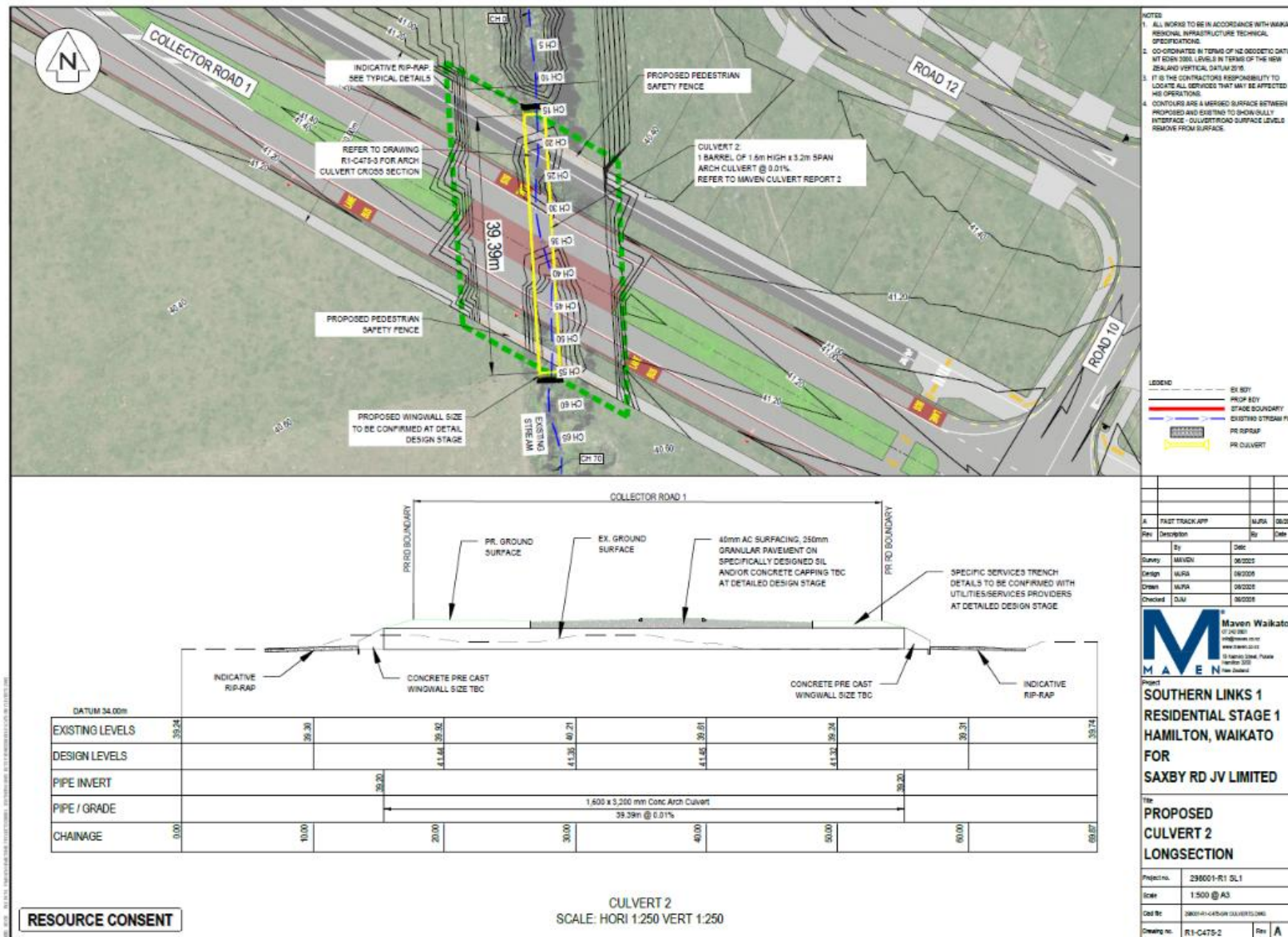


Figure 28: Proposed open bottom culvert 2 long section.

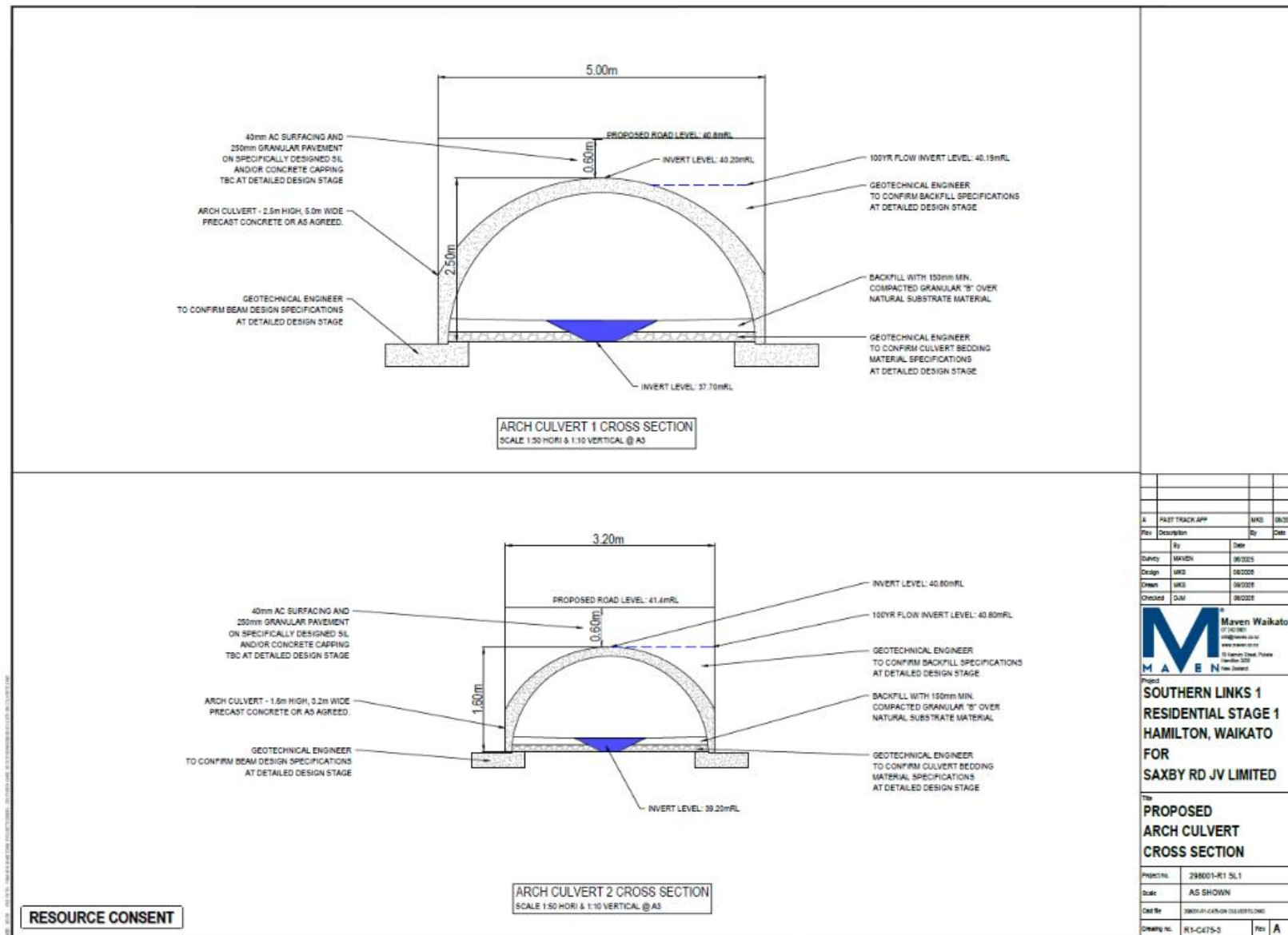


Figure 29: Proposed open bottom arch culvert cross section.

Table 16: Magnitude and level of effects for the proposed Residential South Development pre and post effects management.

Activity	Ecological Feature	Effect	Ecological value	Magnitude of effect	Level of effect (pre-effects management)	Proposed mitigation measures	Level of effect (post effects management)
Vegetation Removal	Exotic trees, kahikatea and grazed pasture	Loss of botanical value.	Negligible/Low	High	Low	Low effects should not normally be of concern. Native landscape planting of indigenous vegetation throughout the riparian corridors, screening planting and reserves will have a positive effect.	Very low/net gain
	Birds	Injury or mortality to birds.	Low	Moderate	Low	Low effects should not normally be of concern. Implementation of BirdMP (Ecological Solutions 2026a)	Very low
	Bird Habitat	Loss of bird habitat	Low	Moderate	Low	As above. Proposed plantings throughout the development should lead to a net increase in available bird habitat in the long-term.	Very low
	Lizards	Injury or death of indigenous lizards during vegetation clearance	Moderate	High	Moderate	Implementation of LMP (Ecological Solutions 2026b). Vegetation clearance supervision and salvage. Wildlife Approval applied for as part of Project.	Low
	Lizard habitat	Loss of indigenous lizard habitat	Low	Moderate	Low	Low effects should not normally be of concern. Proposed plantings throughout the development should lead to a net increase in available lizard habitat in the long-term.	Low
	Bats	Injury or death of bats during vegetation clearance	Very high	High	Very high	Implementation of BMP (Ecological Solutions 2026c). Bat roost protocols prior to vegetation clearance.	Low
	Bat habitat	Disturbance of retained bat habitat	Moderate	Moderate	Moderate	Implementation of BMP measures such as bat sensitive lighting design, native screen planting	Low

Activity	Ecological Feature	Effect	Ecological value	Magnitude of effect	Level of effect (pre-effects management)	Proposed mitigation measures	Level of effect (post effects management)
		Loss of bat habitat	Moderate	High	Moderate	Can not mitigate for habitat loss. Residual effects management. Compensation proposed. Refer to Section 11.	Residual Effect Management (see Section 11)
Reclamation of wetland	Wetland A	Loss of wetland extent and value	Moderate	High	Moderate	Can not mitigate for habitat loss. Residual effects management. Compensation proposed. Refer to Section 11.	Residual Effect Management (see Section 11)
Earthworks	Earthworks within 100m of natural inland wetlands and other hydrological features	Groundwater drawdown effects	Moderate	Low	Low	Development of site consistent with Hydrogeological Effects Assessment (WGA 2026) and Construction Management Plan (Maven Associates 2026a)	Very low
	Effects on water quality within Mangakōtutuku Stream and artificial watercourses	Sedimentation of watercourses	Moderate	Low	Low	Development of site consistent with Earthworks Management Plan (Maven Associates 2026b) and the Construction Management Plan (Maven Associates 2026a)	Low
Stormwater Discharge to Drains and Mangakōtutuku Stream	Mangakōtutuku Stream	Alteration of river flows and water quality	Moderate	Low	Low	Low effects should not normally be of concern. Standard practice and design guidelines to be implemented	Low
Reclamation of Artificial Farm Drains C-G.	Indigenous freshwater fish	Injury or death of indigenous fish stranded in drains	Moderate	High	Moderate	Implementation of FMP (Ecological Solutions 2026e).	Low
Enhancement of Mangakōtutuku Stream and artificial watercourses	Mangakōtutuku Stream and artificial watercourses	Enhancement of riparian corridors	Moderate	Positive	Net gain	Riparian vegetation community planting and maintenance	Net gain
Road Culverts	Indigenous freshwater fish	Construction of open bottom culverts	Moderate	Low	Low	Open bottom arch culverts avoid disturbance of watercourse bed and banks and maintain existing fish passage conditions in	Low

Activity	Ecological Feature	Effect	Ecological value	Magnitude of effect	Level of effect (pre-effects management)	Proposed mitigation measures	Level of effect (post effects management)
						accordance with the National Environmental Standards for Freshwater (NES-F) Regulation 70(2) and NZ Fish Passage Guidelines	

11.0 Residual Effects Management

The management of adverse effects outlined above includes a suite of effects management measures; however, the loss of natural inland wetland area (Wetland A) and long-tailed bat habitat results in residual adverse effects. In accordance with the effects management hierarchy, once measures to avoid, minimise and remedy adverse effects have been applied, any residual adverse effects are proposed to be offset or compensated for through additional habitat creation, restoration, enhancement or financial contributions (MfE 2025b).

Biodiversity offsetting and ecological compensation are characterised by adherence to demonstratable core principles as outlined in the NPS-IB (MfE 2025b). Specifically, offsetting differs from compensation, in that offsetting relates to a measurable outcome, that has been quantified through a robust and transparent process, whereas compensation relies on qualitative data and professional expertise and opinion.

Offsetting is preferable to compensation, as reflected in the effects management hierarchy. Compensation is to be considered only after the potential for offsetting effects has been assessed and the level of certainty in the outcome or 'trade-off' is determined to be inadequate.

While offsetting is preferential, the residual adverse effects attributable to the project's activities cannot be demonstrably offset with adequate certainty. This is a result of the complexity and dynamic nature of wetland ecosystems and long tailed bats and their use of different habitats which are too difficult to measure within a suitable timeframe. In addition, long-tailed bats are highly mobile, cryptic, and difficult to capture, monitor or measure, and therefore, acquiring the necessary data to secure adequate certainty in their response to specific conservation interventions is problematic. Where these situations persist, compensation measures are typically proposed.

Consequently, the following proposed compensation approach for managing the residual adverse effects attributable to the loss of Wetland A and long-tailed bat habitat has been designed using the Biodiversity Compensation Model (BCM) (Baber et al. 2021). Specifically, this model allows for qualitative inputs derived from expert ecological assessment and opinion as well as available literature, for determining the magnitude of compensation measures that are considered likely to achieve the best outcome possible.

The above approach, and variations on it have been previously applied and critiqued as part of RMA processes for the following projects:

- Dome Valley Regional Landfill in Auckland, associated with the management of identified residual effects on native forest, wetlands, Hochstetter's frog, threatened wetland birds, and Long-tailed bats².
- Amberfield subdivision within the Peacocke Structure Plan Area (PSPA) in Hamilton, for the management of residual effect on Long-tailed bats³.
- Broadwater Retirement Village within the PSA in Hamilton, for the management of residual effect on Long-tailed bats; and
- Manawatū Tararua Highway project for the management of residual effects on terrestrial and wetland values⁴.

² Tonkin & Taylor, 2020, Auckland Regional Landfill-Terrestrial and Wetland Biodiversity Offsets and Compensation Framework, Waste Management NZ

³ Baber, M.L and G. Kessels 2019 Addendum report to the Supplementary Statement of Evidence of Mr Kessels dated 19 August 2019 for Hamilton City Council in relation to the Council Hearing for Weston Lea's proposed Amberfield Development

⁴ Markham Josh, Terrestrial Offset and Compensation Report, for New Zealand Transport Agency dated 12 June 2020, in relation to the Manawatū Tararua Highway Environment Court Proceedings (ENV-2020-WLG-000014).

11.1 Biodiversity Compensation Model

The following Tables presents the BCM inputs (i.e., impact and compensation) and the rational/justification used for each. These model inputs are informed through detailed desktop and field assessments associated with the completion of the EclA.

11.1.1 Wetland A

Table 17: BCM inputs and assumptions for impacts/compensation for managing residual effect attributable to the loss of Wetland A.

Model inputs	Explanation
Project name/ref	SL1 Residential South
Biodiversity type	Wetland A
Technical expert Inputs	Chad Croft
Benchmark	5 – Best Available The benchmark in the model is always 5. This represents a hypothetical, but realistic, potential state. i.e., a wetland ecosystem that has been subject to intensive weed and mammalian pest control over the long term and has a full suite of expected wetland adapted indigenous flora and fauna present at or near carrying capacity.
How many types or sites are affected	1 - Exotic dominated wetland. Moderate value wetland (moderate ecological values according to EclA guidelines).
Number of proposed compensation actions	3 - Implementation of wetland management plan - Creation of wetland habitat area - Planting of created wetland area - Pest plant and animal control.
Net gain target	10%
Habitat/site impacts	
Impact risk contingency	2 – Moderate risk/Moderate value The impact risk contingency addresses the increased likelihood that adverse effects will result in the permanent and irreplaceable loss of significant biodiversity values when impacting on habitats or species that are of higher ecological value. The assigned ecological value is based on the EclA guidelines ecological values assessment. A value of 2 multiplies the impact score by 1.05 (adds 5%).
Impact uncertainty contingency	1 - Low uncertainty This addresses the increased risk of permanent or irreplaceable biodiversity loss. We consider this to be 'low' because the habitat is not complex, is predominantly exotic and the values are relatively easy to quantify.
Aerial extent of impact (ha)	285 m² (0.0285 ha)
Value prior to impact	2 – Moderate We considered the impacted wetlands to have 'moderate' ecological values

	according to the EclA guidelines assessment equivalent to a score of 2. This includes potential value. If restored, Wetland A would be unlikely to achieve 'high to very high' value because of the small size, poor ecological connection, permitted baseline and surrounding land use and existing modifications to the catchment.
Value after impact	0 – Assumes Wetland A will be lost
Compensation ⁵	
Compensation actions	Off-site Pest Animal (Predator) Control
Discount rate	3% The discount rate accounts for the time lag between loss of values at the impact site and the gain in values at the compensation site. A discount rate of 3% is recommended (Baber et al. 2021). This is the same as the discount rate recommended in the BOAM user guide (Maseyk et al. 2015), which was informed by research in Gibbons et al. 2015.
Finite end point	1 - 10 years. The finite end-point is the time period (years) over which to calculate net present ecological value (NPBV). This equates to the time between the commencement of proposed compensation action(s) and an assessment of the associated benefits for the affected biodiversity value. For the creation wetland hydrology suitable to sustain wetland vegetation and pest control the benefits will be realised almost immediately so 1 year was used; however, the value of the gains will only realised after the establishment and sustained survival of a wetland vegetation community. Therefore, we used 10 years to provide sufficient time for vegetation community to develop.
Compensation confidence contingency	2 – 3 – High to Moderate confidence. While planting and pest plant control methods are well proven with technology always improving and plenty of evidence of restoration planting and pest control success, a 'very high confidence' (i.e. greater than 90%) in the outcomes cannot be certain. Therefore, a contingency rating of 'high confidence' (i.e. greater than 75% but less than 90%) was used for planting and pest control; while a conservative approach was used for the creation of wetland hydrology with a contingency rating of 'moderate confidence' (i.e. 50-75%) was used.
Aerial extent of compensation action	348 m² (0.0348 ha)
Value score prior to compensation action	0.001 (no value) The proposed ecological compensatory wetland area is not currently wetland habitat and would not revert to wetland habitat without intervention
Value score after compensation measure	0.5 – 3.25 – Moderate Restoration of wetland hydrology is expected to result in the opportunity for wetland plants to establish so a value of 0.5 was used. After wetland plant establishment the value jumps to 3 and after the implementation of pest plant control the overall value used as 3.25.

⁵ As previously stated, the BCM uses the term compensation, but we consider the proposed activities would achieve NNL/NG outcomes (i.e., offsetting).

The above BCM results in a 12.9% net positive outcome. It is important to note that the BCM has been run based on one scenario of compensation actions with one choice of uncertainty and restoration outcome.

Altering model inputs such as compensation actions and levels of uncertainty obviously alters the outputs of the BCM. In order to be conservative, and as part of sense checking the outputs, the model was run again using the same selection of compensation actions, with a greater impact risk (value of 3 rather than 2), and have also tested increasing the impact uncertainty from a value of 1 to 2. Both scenarios still resulted in a net positive outcome in the model ranging from 2.9% to 7.8%.

11.1.2 Bat habitat

For the purposes of bat habitat compensation modelling, habitat across the Site has been classified as either higher value (i.e. potential roosting, foraging and commuting habitat) or lower value (i.e. open pasture) based on physical characteristics and on-site bat survey data. We know Long-tailed bats prefer the use of tree/forest edges for roosting, commuting and foraging (i.e. higher ecological value). While it is difficult to quantify this area of functional edge, consented developments in the PSA proposed an edge area of 15 m wide along the length of tall, mature vegetation such as riparian corridors or hedgerows. This 15 m is a conservative width based on current understandings of bat behaviour and ecomorphology and was considered higher value. The level of disturbance expected within these habitats has also been classified as either 'permanently lost' or 'retained but functionally disturbed' through the application of different impact uncertainty contingencies.

Table 18: BCM inputs and assumptions for impacts/compensation for managing residual effect attributable to the loss of bat habitat.

Model inputs	Explanation
Project name/ref	SL1 Residential South
Biodiversity type	Long-tailed bat habitat
Technical expert Inputs	Chad Croft
Benchmark	5 – Best Available The benchmark in the model is always 5. This represents a hypothetical, but realistic, potential state. i.e., the best quality urban long-tailed bat habitat within Hamilton City based on expert opinion. Habitat that includes communal roost sites, high-quality roosting, foraging and flyway habitat, has high numbers of bats and is subject to intensive and effective pest control targeting the full suite of introduced mammals known to predate on bats as determined by a qualified bat ecologist.
How many types or sites are affected	4 – Exotic dominated low value pasture, moderate value stand of six kahikatea, moderate value riparian margin along Mangakōtukutuku Stream and artificial drains (ecological values according to EclA guidelines).
Number of proposed compensation actions	1 Off-site predator control within known high value long-tail bat roosting sites.
Net gain target	10%

Habitat/site impacts	
Impact risk contingency	1-2 – Low-Moderate risk/Low-Moderate value The impact risk contingency addresses the increased likelihood that adverse effects will result in the permanent and irreplaceable loss of significant biodiversity values when impacting on habitats or species that are of higher ecological value. The assigned ecological value is based on the EclAG ecological values assessment. A value of 1 multiplies the impact score by 1 (adds 0%). A value of 2 multiplies the impact score by 1.05 (adds 5%).
Impact uncertainty contingency	1 - Low uncertainty This addresses the increased risk of permanent or irreplaceable biodiversity loss. We consider this to be 'low' because the habitat is not complex, is predominantly exotic and the values are relatively easy to quantify.
Aerial extent of impact (ha)	43.2 ha
Value prior to impact	1-2 – Low - Moderate. We considered the impacted open pasture to have 'low' ecological value for long-tailed bats, equivalent to a score of 1, and the six kahikatea trees and planted riparian margins to have 'moderate' ecological value for long-tailed bats equivalent to a score of 2.
Value after impact	0 – 1.5 Assumes all open pasture habitat and the six kahikatea trees will be lost, equivalent to a score of 0. We assumed the ecological value of the 'functionally retained' riparian margin habitat to be partially impacted and therefore a score of 1.5.
Compensation ⁶	
Compensation actions	Off-site Pest Animal (Predator) Control
Discount rate	3% The discount rate accounts for the time lag between loss of values at the impact site and the gain in values at the offset site. A discount rate of 3% is recommended (Baber et al. 2021). This is the same as the discount rate recommended in the BOAM user guide (Maseyk et al. 2015), which was informed by research in Gibbons et al. 2015.
Finite end point	10 years. The finite end-point is the time period (years) over which to calculate net present ecological value (NPBV). This equates to the time between the commencement of proposed compensation action(s) and an assessment of the associated benefits for the affected biodiversity value. For pest control the benefits will be realised almost immediately; however, any gains realised will diminish once the pest control ceases. Therefore, we used 10 years to provide sufficient time for predator control gains to have a lasting positive effect on the long-tail bat population.
Compensation confidence	2 – High confidence. While predator control methods are well proven with technology always

⁶ As previously stated, the BCM uses the term compensation, but we consider the proposed activities would achieve NNL/NG outcomes (i.e., offsetting).

contingency	improving and plenty of evidence of pest control success, a 'very high confidence' (i.e. greater than 90%) in predator control outcomes cannot be absolutely correlated with direct benefits on long-tail bats. Predation is one of the leading threats to long-tail bats; however, there are a number of variables which reduce the confidence that predator control will translate to automatic gains for long-tail bats. Therefore, a contingency rating of 'high confidence' (i.e. greater than 75% but less than 90%) that the predicated gains will be realised has been chosen.
Aerial extent of compensation action	68 ha
Value score prior to compensation action	3 (High value) The expectation is the off-site predator control programme will target known 'high value' long-tail bat habitat where bat number are high and there are known bat roosts.
Value score after compensation measure	4.25 – Very high Implementation of predator control at known 'high value' long-tail bat habitats is expected to modestly increase the value to 'very high' in relation to the benchmark.

The above BCM results in a 10% net positive outcome. It is important to note that the BCM has been run based on one scenario compensation action with one choice of uncertainty and restoration outcome.

Altering model inputs such as compensation actions and levels of uncertainty obviously alters the outputs of the BCM. In order to be conservative, and as part of sense checking the outputs, the model was run again using the same selection of compensation actions, with a greater impact risk (value of 2 and 3), and have also tested increasing the impact uncertainty from a value of 1 to 2. Both scenarios still resulted in a net positive outcome in the model ranging from 0.5% to 5%.

11.1.3 Compensation funding proposal

The applicant proposes to provide upfront capital funding to manage and improve the resilience of Hamilton's long-tailed bat population across their range of critical habitats within the Hamilton District as a means of managing the residual effects attributable to the development. The most effective management intervention deserving of funding in this instance is considered to be large scale, regionally coordinated, pest animal (predator) control in high value long-tailed bat habitats such as communal and maternity roosting sites and high activity areas previously identified across the Hamilton long-tailed bat population's range.

The above model demonstrates that the area required for pest animal (predator) control to be applied in order to address the adverse residual effects of the development on long-tail bat habitat and achieve the ecological gains expected is 68 ha. Accordingly, the proposed funding amount is based on a calculation that estimates the dollar amount required per hectare to undertake comprehensive predator control for rodents, mustelids and possums in such habitats over a 10-year period. This approach to compensation for the management of residual effects on long-tail bat habitat has been previously consented across the Peacocke Structure Plan area, and specifically the Amberfield and Broadwater decisions.

A proposal has been submitted to Council with a proposed capital funding amount deemed commensurate with the residual effects on bat habitat attributable to the Residential South Development. The applicant is awaiting a response from Council.

12.0 Conclusions

This report provides an assessment of ecological impacts attributable to the proposed SL1 Residential South Development at 37a, 71 and 129 Saxbys Road, Hamilton. Overall, the value of terrestrial ecological features on the Site ranged from 'negligible' to 'very high' due to the predominance of exotic pasture grass and intensive farming and the presence of long-tailed bats (Threatened National Critical). Freshwater ecological features of the Site ranged from negligible to high due to the artificial watercourses (farm drains) and the presence of a predominately indigenous wetland (Wetland B). According to the WRC RPS ecological significance criteria this site can be considered significant due to the presence of Wetland B and long-tailed bats; however, the level of bat activity recorded across two acoustic surveys at the Site, in comparison to other areas of Hamilton south and east of the Site indicates the Site is not likely important bat habitat.

The application of effects management measures to minimise effects on indigenous fauna and habitat are outlined in specific management plans including a bird management plan (BirdMP), bat management plan (BMP), a fish management plan (FMP), a wetland management plan (WMP) and, a lizard management plan (LMP). A Wildlife Approval under the FTAA is being applied for to implement the LMP and authorise the handling and incidental killing of lizards which may be missed during lizard management.

The ecological impacts of the proposed development after application of effects management measures, ranged from 'very low' to 'moderate', in accordance with the EclAG. A residual adverse effect, after the application of avoid, remedy, and mitigate, has been identified, attributable to the loss of Wetland A and long-tailed bat habitat.

Commensurate compensation measures for the loss of these values have been proposed and sense checked with the Biodiversity Compensation Model (BCM) to achieve a 'net positive outcome'.

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APPENDIX A

EclAG Tables

Table 4: Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community (EclAG 2018)

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

 identification, habitat as proxy

Table 5 Factors to consider in assigning value to terrestrial species for EclA (EclAG 2018)

Determining Factors	
Nationally Threatened species, found in the ZOI 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 6 Scoring for sites or areas combining values for four matters in Table 4 (EclAG 2018).

Value	Description
Very High	Area rates High for 3 or all of the four assessment matters listed in Table 4. Likely to be nationally important and recognised as such.
High	Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or Area rates High for 1 of the assessment matters, Moderate for the remainder. Likely to be regionally important and recognised as such.
Moderate	Area rates High for one matter, Moderate and Low for the remainder, or Area rates Moderate for 2 or more assessment matters 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 3 matters and Moderate, Low or Very Low for remainder.

APPENDIX B

Bird Species List

eBird database records of birds within 10 km of the Site and their conservation status

Common name	Scientific name	Conservation status (Robertson et al. 2021)
Great egret	<i>Ardea alba</i>	Threatened - Nationally Critical
Australasian bittern	<i>Botaurus poiciloptilus</i>	Threatened - Nationally Critical
New Zealand falcon	<i>Falco novaeseelandiae</i>	Threatened - Nationally Increasing
New Zealand grebe	<i>Poliocephalus rufopectus</i>	Threatened - Nationally Increasing
Pacific black duck	<i>Anas superciliosa</i>	Threatened - Nationally Vulnerable
Caspian tern	<i>Hydroprogne caspia</i>	Threatened - Nationally Vulnerable
Long-tailed koel	<i>Urodynamis taitensis</i>	Threatened - Nationally Vulnerable
New Zealand pipit	<i>Anthus novaeseelandiae</i>	At Risk - Declining
Silver gull	<i>Chroicocephalus novaehollandiae</i>	At Risk - Declining
Yellow-crowned parakeet	<i>Cyanoramphus auriceps</i>	At Risk - Declining
South Island oystercatcher	<i>Haematopus finschi</i>	At Risk - Declining
North Island robin	<i>Petroica longipes</i>	At Risk - Declining
New Zealand fernbird	<i>Poodytes punctatus</i>	At Risk - Declining
Baillon's crane	<i>Zapornia pusilla</i>	At Risk - Declining
Spotless crane	<i>Zapornia tabuensis</i>	At Risk - Declining
Eurasian coot	<i>Fulica atra</i>	At Risk - Naturally Uncommon
Little black cormorant	<i>Phalacrocorax sulcirostris</i>	At Risk - Naturally Uncommon
Royal spoonbill	<i>Platalea regia</i>	At Risk - Naturally Uncommon
New Zealand kaka	<i>Nestor meridionalis</i>	At Risk - Recovering
Pied cormorant	<i>Phalacrocorax varius</i>	At Risk - Recovering
Little pied cormorant	<i>Microcarbo melanoleucos</i>	At Risk - Relict
Great cormorant	<i>Phalacrocorax carbo</i>	At Risk - Relict
Cook's petrel	<i>Pterodroma cookii</i>	At Risk - Relict
Gray teal	<i>Anas gracilis</i>	Not Threatened
New Zealand bellbird	<i>Anthornis melanura</i>	Not Threatened
New Zealand scaup	<i>Aythya novaeseelandiae</i>	Not Threatened
Shining bronze-cuckoo	<i>Chalcites lucidus</i>	Not Threatened
Swamp harrier	<i>Circus approximans</i>	Not Threatened
Black swan	<i>Cygnus atratus</i>	Not Threatened
White-faced heron	<i>Egretta novaehollandiae</i>	Not Threatened
Gray gerygone	<i>Gerygone igata</i>	Not Threatened
New Zealand pigeon	<i>Hemiphaga novaeseelandiae</i>	Not Threatened
Pied stilt	<i>Himantopus leucocephalus</i>	Not Threatened
Welcome swallow	<i>Hirundo neoxena</i>	Not Threatened
Kelp gull	<i>Larus dominicanus</i>	Not Threatened
Morepork	<i>Ninox novaeseelandiae</i>	Not Threatened
Tomtit	<i>Petroica macrocephala</i>	Not Threatened
Australasian swamphen	<i>Porphyrio melanotus</i>	Not Threatened
Tūī	<i>Prosthemadera novaeseelandiae</i>	Not Threatened
New Zealand fantail	<i>Rhipidura fuliginosa</i>	Not Threatened
Australasian shoveler	<i>Spatula rhynchotis</i>	Not Threatened
Paradise shelduck	<i>Tadorna variegata</i>	Not Threatened
Sacred kingfisher	<i>Todiramphus sanctus</i>	Not Threatened
Masked lapwing	<i>Vanellus miles</i>	Not Threatened
Silvereye	<i>Zosterops lateralis</i>	Not Threatened
Latham's snipe	<i>Gallinago hardwickii</i>	Vagrant
Redpoll	<i>Acanthis flammea</i>	Introduced and Naturalised

Common name	Scientific name	Conservation status (Robertson et al. 2021)
Common myna	<i>Acridotheres tristis</i>	Introduced and Naturalised
Eurasian skylark	<i>Alauda arvensis</i>	Introduced and Naturalised
Mallard	<i>Anas platyrhynchos</i>	Introduced and Naturalised
Graylag goose	<i>Anser anser</i>	Introduced and Naturalised
Canada goose	<i>Branta canadensis</i>	Introduced and Naturalised
Sulphur-crested cockatoo	<i>Cacatua galerita</i>	Introduced and Naturalised
California quail	<i>Callipepla californica</i>	Introduced and Naturalised
European goldfinch	<i>Carduelis carduelis</i>	Introduced and Naturalised
European greenfinch	<i>Chloris chloris</i>	Introduced and Naturalised
Rock pigeon	<i>Columba livia</i>	Introduced and Naturalised
Rook	<i>Corvus frugilegus</i>	Introduced and Naturalised
Mute swan	<i>Cygnus olor</i>	Introduced and Naturalised
Yellowhammer	<i>Emberiza citrinella</i>	Introduced and Naturalised
Common chaffinch	<i>Fringilla coelebs</i>	Introduced and Naturalised
Australian magpie	<i>Gymnorhina tibicen</i>	Introduced and Naturalised
Wild turkey	<i>Meleagris gallopavo</i>	Introduced and Naturalised
Helmeted guineafowl	<i>Numida meleagris</i>	Introduced and Naturalised
House sparrow	<i>Passer domesticus</i>	Introduced and Naturalised
Indian peafowl	<i>Pavo cristatus</i>	Introduced and Naturalised
Ring-necked pheasant	<i>Phasianus colchicus</i>	Introduced and Naturalised
Eastern rosella	<i>Platycercus eximius</i>	Introduced and Naturalised
Dunnock	<i>Prunella modularis</i>	Introduced and Naturalised
Spotted dove	<i>Spilopelia chinensis</i>	Introduced and Naturalised
African collared-dove	<i>Streptopelia roseogrisea</i>	Introduced and Naturalised
European starling	<i>Sturnus vulgaris</i>	Introduced and Naturalised
Eurasian blackbird	<i>Turdus merula</i>	Introduced and Naturalised
Song thrush	<i>Turdus philomelos</i>	Introduced and Naturalised

APPENDIX C

Wetland Vegetation Plot Data

Appendix C



APPENDIX D

Biodiversity Compensation Model Data

Model Inputs			
Input descriptors	Input data		
Project/reference name	SL1 Residential South		
Biodiversity type	Wetland		
Technical expert(s) input	CC		
Benchmark	5		
How many habitat types OR sites are impacted	1		
Number of proposed compensation actions	3		
Net gain target	10%		
Habitat/Site Impact(s)	Wetland A		
Impact risk contingency:	2		
Impact uncertainty contingency:	1		
Areal extent of impact (ha):	0.0285		
Value score prior to impact:	2		
Value score after impact:	0.001		
Compensation Action(s)	Wetland Creation	Planting	Pest Plant Control
Discount rate:	3.0%	3.0%	3.0%
Finite end point (years):	1	10	1
Compensation confidence contingency:	3	2	2
Areal extent (ha) of compensation type:	0.0348	0.0348	0.0348
Value score prior to compensation:	0.001	0.5	3
Value score after compensation:	0.5	3	3.25

Model outputs				
	Total impact score	Wetland A		
Impact score	-0.01256	-0.01256		
	Total compensation score	Wetland Creation	Planting	Pest Plant Control
Compensation score	0.01418	0.00211	0.01068	0.00139
Net gain outcome	12.9%			

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Model Inputs			
Input descriptors	Input data		
Project/reference name	SL 1 Residential		
Biodiversity type	Long Tailed Bats		
Technical expert(s) input	CC		
Benchmark	5		
How many habitat types OR sites are impacted	3		
Number of proposed compensation actions	1		
Net gain target	10%		
Habitat/Site Impact(s)	Open Pasture	Kahikatea Stand	Riparian
Impact risk contingency:	1	2	2
Impact uncertainty contingency:	1	1	2
Areal extent of impact (ha):	43.2	0.3	2.5
Value score prior to impact:	1	2	2
Value score after impact:	0.001	0.001	1.5
Compensation Action(s)	Predator Control		
Discount rate:	3.0%		
Finite end point (years):	10		
Compensation confidence contingency:	2		
Areal extent (ha) of compensation type:	68		
Value score prior to compensation:	3		
Value score after compensation:	4.25		

Model outputs				
	Total impact score	Open Pasture	Kahikatea Stand	Riparian
Impact score	-9.48391	-9.06293	-0.13223	-0.28875
	Total compensation score	Predator Control		
Compensation score	10.43592	10.43592		
Net gain outcome	10.0%			

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